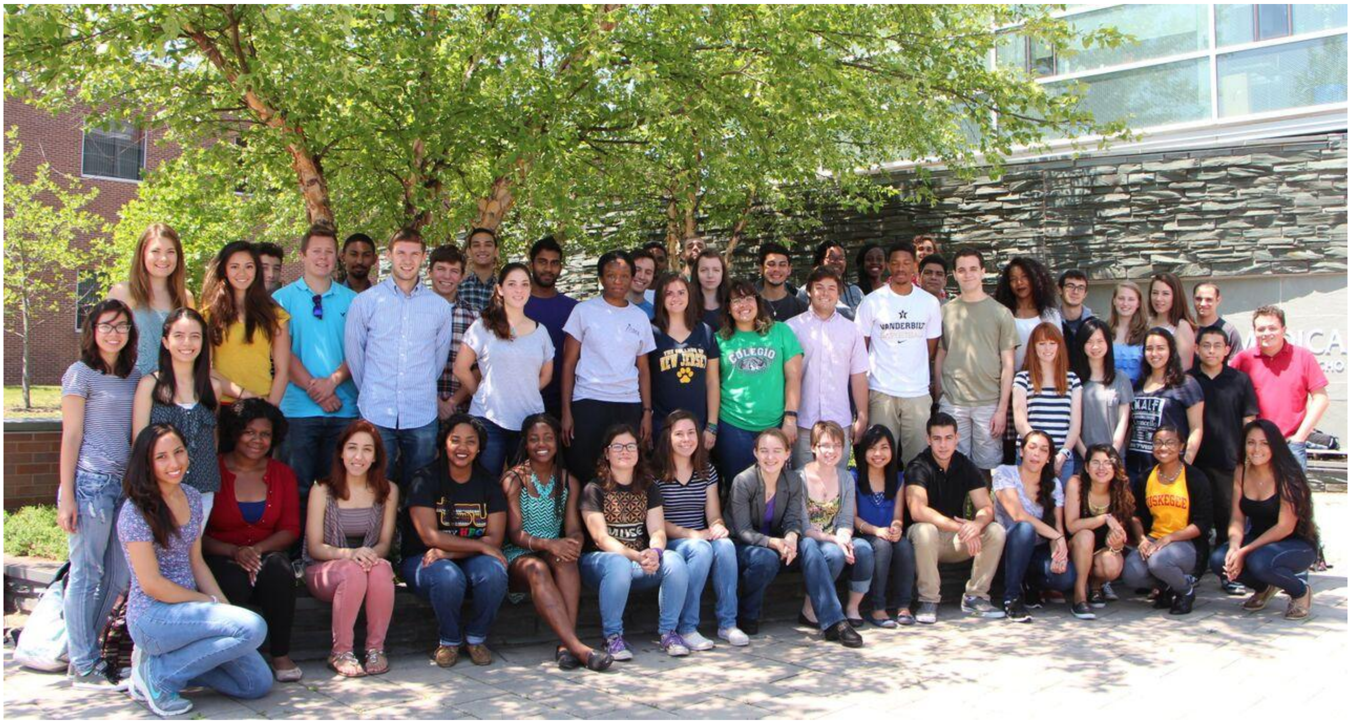
RiSE at Rutgers

Research in Science and Engineering

Summer Research Symposium

July 29, 2015



Sponsored by:

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

2015 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, July 29, 2015

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

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

Myrtle Davis, DVM, Ph.D.
Branch Chief, Toxicology & Pharmacology, National Cancer Institute
National Institutes of Health

"Balancing Efficacy and Toxicity - The Yin and Yang for Anticancer Therapies"

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

Sponsored by

RiSE (Research in Science and Engineering) at Rutgers

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

With selected participation from**:**
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER

MYRTLE DAVIS, DVM, PH.D.

"Balancing Efficacy and Toxicity - The Yin and Yang for Anticancer Therapies"

Myrtle Davis, DVM. Ph.D. is the currently the Branch Chief for Toxicology and Pharmacology in the Developmental Therapeutics Program of the Division of Cancer Diagnostics and Treatment of the National Cancer Institute and serves as Scientific Director of the Laboratory of Investigative Toxicology at the Frederick National Laboratory for Cancer Research (FNLCR). Dr. Davis contributes broadly to the DCTD by providing mechanistic toxicology expertise to drug discovery and development teams, creating and leading major research initiatives within DTP and managing the daily operations of the Toxicology and Pharmacology Branch. The branch is responsible for developing safety evaluation strategies to establish toxicology profiles for investigational agents in the NCI's Experimental Therapeutics Program (NExT). The branch also provides expertise in discussions with the FDA about the design and adequacy of planned (or completed) nonclinical toxicology studies that are expected to support Investigational New Drug Applications.

Prior to her appointment at NCI in 2008, Dr. Davis was a Research Advisor in the Investigative Toxicology Group at Lilly Research Labs, Eli Lilly and company. Prior to taking the position at Eli Lilly in 2002, Dr. Davis was an Associate Professor in the Department of Pathology at the University of Maryland, School of Medicine where she had an active grant-supported research program exploring mechanisms of toxicant-induced apoptosis and the role of protein phosphorylation.

Dr. Davis is an active member of the Society of Toxicology and is a long-standing member of the Society of Toxicological Pathology. She currently serves on SOT Council and on the Board of Trustees for the ILSI Health and Environmental Sciences Institute as an outside activity. She was a member of the Institute for Laboratory Animal Research Council, The National Academies of Sciences for a six-year term ending in 2012. She served as Co-Editor in Chief for the ILAR Journal and has served and an Associate Editor for various Toxicology sand Journals including Toxicological Sciences. She also served as a member of the standing NIH Study Section, ALTX1 for 5 years. She has authored several book chapters and co authored peer-reviewed publications on a range of topics including apoptosis, toxicant-induced cell signaling and biomarkers of tissue injury. She has also developed course content and lectures for medical and graduate student education.

A native New Yorker, Dr. Davis completed a postdoctoral fellowship in Toxicologic Pathology at the University of Maryland. She earned a Ph.D. in Toxicology from the University of Illinois Champaign-Urbana and obtained her Doctor of Veterinary Medicine degree from Tuskegee University School of Veterinary Medicine. She also completed undergraduate work in Chemistry and Math at Tuskegee University.

SUMMER PROGRAMS

RiSE (Research in Science and Engineering) at Rutgers

RiSE seeks to extend the pathway to graduate study and the workforce in the sciences, math and engineering. We particularly encourage participation by underrepresented minority, disadvantaged, and first generation college students as well as for students from Predominantly Undergraduate Institutions with limited academic-year research opportunities. Sponsored by the Office of Diversity and Inclusion, RiSE is hosting 48 scholars this summer. These students, selected from over 700 applicants, represent 34 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM and social/behavioral science disciplines. Students spend the summer actively engaged in cutting-edge research under the guidance of carefully matched faculty mentors. An outstanding suite of professional development activities, including training in scientific writing and speaking, career guidance, guest speakers, and GRE preparation, complements the research. Some of our scholars also participate in affiliated research programs at Rutgers sponsored by the National Science Foundation (NSF) or National Institutes of Health (NIH), as detailed below. For more information about RiSE and to meet our current Scholars and alumni, visit http://rise.rutgers.edu.

REU – Cellular Bioengineering: From Biomaterials to Stem Cells

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

REU – Structured Organic Particulate Systems

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

REU – Green Energy Technology Undergraduate Program (GET UP)

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

REU in Physics and Astronomy

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

Ernest Mario School of Pharmacy
Summer Undergraduate Research Fellowship Program

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

ACKNOWLEDGMENTS

~Institutional Sponsorship~

Office of Diversity and Inclusion

Graduate School – New Brunswick

Graduate School of Biomedical Sciences – New Brunswick/Piscataway

Ernest Mario School of Pharmacy

NSF CAREER Award to Anand Sawarte, Ph.D.

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

Research Collaboratory for Structural Bioinformatics Protein Data Bank

School of Engineering

~External Support~

NASA New Jersey Space Grant Consortium

NIH MARC Program

NSF Research Experiences for Undergraduates (REU) Program

NIH Summer Undergraduate Research Fellowship Program

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

~Special Thanks~

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

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

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

GUEST SPEAKERS

The Devil in the Details: Record Keeping and Laboratory Data
Terri Goss Kinzy, M.D., Ph.D.
Associate Vice President for Research Administration
Professor, Department of Biochemistry & Molecular Biology, Robert Wood Johnson Medical School

Graduate School: How to Get In, Get Funding and Meet Success
Bonnie Firestein, Ph.D.
Professor, Cell Biology & Neuroscience, Rutgers

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

Stephanie Oh
MD-PhD Candidate, Graduate Program in Neuroscience,
Rutgers Graduate School of Biomedical Sciences

Kimele Persaud
PhD candidate, Psychology, Rutgers

Maria Qadri
PhD candidate, Biomedical Engineering, Rutgers

Jill Tracey
PhD Candidate, Chemistry & Chemical Biology, Rutgers

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

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

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

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

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

Balaji Ganapathy, Ph.D.
Head - Workforce Effectiveness, North America
Tata Consultancy Services, Edison, NJ

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

Lisa Cloutier, Ph.D.
Associate Director, Medical Writing
Janssen Research & Development, Cranbury, NJ

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

Rebecca Baerga, Ph.D.
Lead Research Project Manager
Educational Testing Service (ETS), Princeton, NJ

Tanya Borsuk, Ph.D.
Senior Manager, Oncology Market Analytics
Eisai Pharmaceuticals Inc., Woodcliff Lake NJ

Perspectives on Global Health

Francis Barchi, Ph.D.
Senior Fellow, Institute for Women's Leadership
Assistant Professor, School of Social Work

Innovation and Entrepeneurship

Tim Maguire, Ph.D.
Associate Research Professor, Rutgers
CEO, Vasculogic

SUMMER PROGRAM STAFF

Research in Science & Engineering (RiSE)
Evelyn S. Erenrich, Ph.D., Director
, ODI
Assistant Dean, Rutgers Graduate School-New Brunswick
Visiting Associate Professor, Department of Chemistry & Chemical Biology

REU in Cellular Bioengineering: From Biomaterials to Stem Cells (REU-CB)
David I. Shreiber, Ph.D., Director
Professor, Department of Biomedical Engineering
Director, Graduate Program in Biomedical Engineering

Susan Engelhardt
Director, Center for Innovative Ventures of Emerging Technology

REU in Structured Organic Particulate Systems (REU-SOPS)
Henrik Pedersen, Ph.D., Director
Education Director, NSF Engineering Research Center
Professor, Dept. of Chemical and Biochemical Engineering
Associate Dean for Lifelong Learning and Education, School of Engineering

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

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

Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship (SURF)
Lauren Aleksunes, PhD., Director
Associate Professor, Pharmacology and Toxicology

Graduate School of Biomedical Sciences Scholar Program
Jerome Langer, Ph.D., Director
Associate Professor of Pharmacology, Robert Wood Johnson Medical School

Administrative Staff
Ms. Dawn Lopez, RiSE Program Coordinator
Office of Diversity and Inclusion

Ms. Linda Johnson
Rutgers Department of Biomedical Engineering

Teaching Fellows
Ms. Ana Rodriguez, PhD Candidate in Biomedical Engineering

Resident Advisors
Ms. Brittany Taylor, PhD Candidate in Biomedical Engineering

Ms. Antoinette Nelson, PhD Candidate in Biomedical Engineering

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

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

Mr. David Pickens, GSNB

Mr. Shamir Khan, GSNB

Photography and Social Media
Ms. Patricia Munoz, ODI

Ms. Sonia Espinet, ODI

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Tiara D. Askew *SURF/Pharmacy, RiSE*	**The effects of environmental toxicants and chemopreventive agents on cellular circadian rhythm in human mammary epithelial cells**	1A
Katrina J. Jara *Structured Organic Particulate Systems*	**Development and evaluation of gelatin foam films for oral drug delivery**	2A
Courtney R. Amster *Structured Organic Particulate Systems*	**Stabilization of liposomes using amphiphilic macromolecules to prevent drug leakage**	3A
Karina Lei C. Relatado *Structured Organic Particulate Systems*	**Effect of Blend Hydrophobicity on Drug Dissolution**	4A
Yanira Rodríguez-Valdés *Structured Organic Particulate Systems*	**Wet granulation and extrusion of alumina for catalyst supports**	5A
Kadijah D. Abston *RiSE*	**Effect of alcohol exposure on the mammary cancer stem cell population in mice**	6A
Shacquille Brown *RiSE*	**TiO_2-ZnO semiconducting oxide mixtures with fruit-based dyes in Dye-Sensitized Solar Cells**	7A
America Davila *RiSE*	**Economic abuse: an exploratory analysis of the mental health of Latinas in the U.S.**	8A
Kidus Y. Feleke *RiSE*	**The role of eIF2 kinase PERK in the liver response to dietary methionine restriction.**	9A
Sterling M. Hubbard *RiSE*	**Father's Perinatal Engagement and Maternal Alcohol Use**	10A
Eduardo R. Martinez-Montes *RiSE*	**Effects of small peptides on the interaction of the neuronal proteins cypin and PSD-95 and on dendrite branching**	11A
Nicole M. Robles-Matos *RiSE*	**Synthesis and characterization of bis-PEG2-aldehyde used as a crosslinker reagent of gelatin microparticles for targeted drug delivery**	12A

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10:45AM – 11:35AM

Jonathan Tyson *RiSE*	**Work Towards the Total Synthesis of the Chiral Ligand Sparteine**	13A
Maya M. Amouzegar *Physics & Astronomy*	**A study on multi-jets final states at the LHC**	14A
Alex Bixel *Physics & Astronomy*	**Measuring the dark matter content of galaxies with SALT**	15A
Ricardo J. Garcia *Physics & Astronomy*	**Gamow-Teller transitions and magnetic moments in the $f_{7/2}$ nuclear shell**	16A
James P. Horwath *Physics & Astronomy*	**Understanding electron energy loss mechanisms in EUV resists using photoemission and electron energy loss spectroscopies**	17A
Jyothisraj Johnson *Physics & Astronomy*	**Characterizing the zone of influence of dark matter clumps on image positions and flux ratios in gravitational lensing systems**	18A
Hector R. Lisboa *GSBS Scholar, RiSE*	**Effects of High-Polyphenol Rutgers Scarlet Lettuce [RSL] Murine Gut Microbiota**	19A
Anita H. Brown *Green Energy Technology (GET-UP)*	**Carbonating foamed cements**	20A
Kaitlyn M. Dickson *Green Energy Technology (GET-UP)*	**Photocatalytic biomass conversion using Pt supported on TiO_2**	21A
Jonathan D. Lonski *Green Energy Technology (GET-UP)*	**Using thermoelectric materials to generate electricity**	22A
John L. Sperduto *Green Energy Technology (GET-UP)*	**A windbelt with embedded flexible-inflatable-actuators for tunable energy-harvesting from wind**	23A
Jeremy E. Tucker *Green Energy Technology (GET-UP)*	**The design and analysis of an energy efficient household**	24A
Giovanni R. Deliz *Cellular Bioengineering*	**Observation of effects of NMDA on hippocampal neurons using optical scattering imaging**	25A

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Jamie Hernandez *Cellular Bioengineering*	**Engineering Lymphatic Vasculature Models for Cancer Surveillance**	26A
Joshua M. Leipheimer *Cellular Bioengineering*	**Characterization of a flexible, ultra-fast degrading polymer coated neural microelectrode probe.**	27A
Jacqueline Saenz *Cellular Bioengineering*	**Evaluating the effectiveness of nanofiber scaffolds on reducing astrocyte reactivity for developing therapies for traumatic brain injury**	28A
Jorge D. Zhingre Sanchez *Cellular Bioengineering*	**Release of conditioned medium encapsulated in PEGDA hydrogels for tendon healing**	29A

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Name and Affiliation(s)	Title	Poster
Arielis Estevez *SURF/Pharmacy, RiSE*	**Immunohistochemical Localization of Drug Transporters in the Human Blood-Placental Barrier**	1B
Kenneth O'Neill *Structured Organic Particulate Systems*	**Characterization of ion exchange capacities in Nafion® 117 membranes: synthesis of metal oxide nanoparticles for catalytic degradation of chemical warfare agents**	2B
Peyton E. Randolph *Structured Organic Particulate Systems*	**Axial dispersion coefficient in rotating cylinders: dependence on cohesion, drum diameter, and rotation speed**	3B
Gabriel J. Rodriguez *Structured Organic Particulate Systems*	**Bending rigidity measurement for model biological membranes**	4B
Zoha H. Syed *RiSE Associate*	**Electrophilic alkane functionalization: investigation of PheboxIr(OAc)(R) complexes in the presence of HX**	5B
Alex Alvarado *RiSE*	**The Protein Data Bank as an Educational Resource: Using 3D Structure to Explore Biology**	6B
Chelsea Cherenfant *RiSE*	**Fetal alcohol exposure may increase aromatase activity to enhance the susceptibility to pituitary tumorigenesis**	7B
Deidre V. Dillon *RiSE*	**Regulation of Glutaminase in GRM1-expressing Melanoma Cells**	8B
Deaetta A Grinnage *RiSE*	**Developing drug resistant cell lines expressing levels of ABCG2**	9B
José Liquet y González *RiSE*	**Method for the isolation of high-molecular-weight DNA from Mucilaginibacter frigoritolerans FT22 and Mucilaginibacter lappiensis ANJLI2.**	10B
Vanessa A. Putnam *RiSE*	**A toolkit for differentially private data analysis**	11B
Cristina C. Torres Cabán *RiSE*	**Understanding aging biology: the role of mir-34 in sarcopenia**	12B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Nicole Werpachowski *RiSE*	**The evolution of molecular visualization: building upon Irving Geis' framework to understand structural biology**	13B
Sabrina M. Appel *Physics & Astronomy*	**Spatially resolved star-formation in nearby analogues of Lyman break galaxies**	14B
Holly M. Christenson *Physics & Astronomy*	**Analysis of narrow-band optical imaging to discover Lyman Alpha Emitting galaxies at z~3.1**	15B
Shaun P. Hogan *Physics & Astronomy*	**Preparations for upgrades to the level 1 track trigger at the Compact Muon Solenoid for the High Luminosity Large Hadron Collider**	16B
Ian A Hunt-Isaak *Physics & Astronomy*	**Monte Carlo investigation of the quark-gluon plasma**	17B
Sunday O. Ebo *GSBS Scholar, RiSE*	**Testing the roles of hif-1 target genes in the *C. elegans* anoxia response**	18B
Jonathan D. Ambrose *Green Energy Technology (GET-UP)*	**The doping of flame Synthesized graphene**	19B
Salimar Cordero *Green Energy Technology (GET-UP)*	**Design of a microbial fuel cell to enhance degradation of polycyclic aromatic hydrocarbons**	20B
Ai lian Lin *Green Energy Technology (GET-UP)*	**Polymer-Based Cantilever Probe for Atomic Force Microscopy**	21B
María Elisa Ramos-Sepúlveda *Green Energy Technology (GET-UP)*	**Fabrication of nanoporous metals**	22B
Vanita R. Thompson *Green Energy Technology (GET-UP)*	**Exploring Piezoelectricity in Porous Polymers**	23B
Marleny M. Arones *Cellular Bioengineering*	**Measuring the biomechanical properties of tissues using optical coherence tomography**	24B
Rebecca L. Drake *Cellular Bioengineering*	**Determining the effects of pegylated epidermal growth factor on RPE cells**	25B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

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Robert C. Mines *Cellular Bioengineering*	**Development of a novel hepatocyte culture platform for high throughput pharmacokinetic screening**	27B
Ilse S. Valencia *Cellular Bioengineering*	**The effects of surface charge density and shear stress on the targeting efficacy of cationic liposomes as nano-carriers for anti-vascular treatment**	28B

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Yanira Rodríguez-Valdés *Structured Organic Particulate Systems*	**Wet granulation and extrusion of alumina for catalyst supports**	5A
Jacqueline Saenz *Cellular Bioengineering*	**Evaluating the effectiveness of nanofiber scaffolds on reducing astrocyte reactivity for developing therapies for traumatic brain injury**	28A
John L. Sperduto *Green Energy Technology (GET-UP)*	**A windbelt with embedded flexible-inflatable-actuators for tunable energy-harvesting from wind**	23A
Zoha H. Syed *RiSE Associate*	**Electrophilic alkane functionalization: investigation of PheboxIr(OAc)(R) complexes in the presence of HX**	5B

Alphabetical List of Scholars and Presentations

Vanita R. Thompson *Green Energy Technology (GET-UP)*	**Exploring Piezoelectricity in Porous Polymers**	23B
Cristina C. Torres Cabán *RiSE*	**Understanding aging biology: the role of mir-34 in sarcopenia**	12B
Jeremy E. Tucker *Green Energy Technology (GET-UP)*	**The design and analysis of an energy efficient household**	24A
Jonathan Tyson *RiSE*	**Work Towards the Total Synthesis of the Chiral Ligand Sparteine**	13A
Ilse S. Valencia *Cellular Bioengineering*	**The effects of surface charge density and shear stress on the targeting efficacy of cationic liposomes as nano-carriers for anti-vascular treatment**	28B
Nicole Werpachowski *RiSE*	**The evolution of molecular visualization: building upon Irving Geis' framework to understand structural biology**	13B
Jorge D. Zhingre Sanchez *Cellular Bioengineering*	**Release of conditioned medium encapsulated in PEGDA hydrogels for tendon healing**	29A

Cellular Bioengineering Business Pitches

In addition to the professional development component of the RiSE program, scholars in the REU in Cellular Bioengineering participate in weekly workshops on Innovation and Entrepreneurship. Led by Susan Engelhardt, Director of the Center for Innovative Ventures of Emerging Technology, these workshops introduce students to the fundamentals of taking an idea from benchtop-to-bedside. In teams of 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.

The three products are:

FlexiProbe - Technology for safe and reliable neural recordings for brain-computer interfaces
NeuralPros: *Marleny Arones, Jamie Hernandez, Joshua Leipheimer*

LipoDrones - Technology for targeted delivery of chemotherapeutics
Lipotech*: Ilse Valencia, Robert Mines, Jorge Zhingre-Sanchez*

NEWrona - Technology for the treatment of traumatic injury to the nervous system
Jeni Echafodaj: *Rebecca Drake, Giovanni Deliz, Adrianna Lebrón-García, Jacqueline Saenz*

Abstracts and Student Biographies

Tiara D. Askew **Poster # 1A**
Bowie State University

Mentors:
Younli Park
The College of Veterinary Medicine,
Seoul, Korea

Brian Estrella, Mingzhu Fang, Ph.D, Helmut Zarbl, Ph.D
Department of Toxicology
Rutgers University, The State University of New Jersey

The effects of environmental toxicants and chemopreventive agents on cellular circadian rhythm in human mammary epithelial cells

Numerous studies indicate that host factors and environmental stressors that disrupt circadian gene expression are associated with increased risk of disease, including breast cancer. However, the mechanisms by which these risk factors disrupt cellular circadian rhythm are largely unknown. In this study, human mammary epithelial cell lines (MCF10A and MCF12A) were to determine if estrogen receptors would involve in the disruption of cellular circadian rhythms by carcinogens. Both cell lines were transfected with the circadian reporter vector PER2-dLuc and used to determine cellular circadian rhythm using bioluminescence assay. Cells were treated with estrogen, N-Nitroso-N-methyl urea, or SIRT 1 inhibitors to disrupt the circadian rhythm, followed by a dosing of a chemopreventive agent (e.g., methylselenocyteine) to restore the circadian rhythm. The results of this study is pending. Upon completion of this study, the results, at least partially, will help us understand the underlying mechanisms of carcinogenesis associated with disrupted circadian rhythm.

Biography: Tiara Askew is a senior biology major at Bowie State University and will be graduating with a bachelor's degree in Natural Sciences in December 2015. She has previous research experiences through the Boonshoft School of Medicine's STREAMS program and Case Western Reserve University's 'Polymers @ Case' program. She is also a Washington Baltimore Hampton Roads-Louis Stokes Alliance for Minority Participation (WBHR-LSAMP) Scholar. She is a member of several scientific societies and an inducted member of the National Society of Leadership and Success. This summer, she is a participant of both the RiSE and SURF (Summer Undergraduate Research Fellowship) Program, working with Dr. Mingzhu Fang exploring circadian rhythms and carcinogenesis. After graduation, she will begin a PhD program to satisfy her passion for scientific research. In addition to research, she enjoys reading, traveling, and spending time with friends.

Abstracts and Student Biographies

Arielis Estevez **Poster # 1B**
University of Puerto Rico, Rio Piedras Campu

Mentors:
Lauren Aleksunes, Pharm.D., Ph.D., Associate Professor and Dr. Xia Wen, Ph.D.
Department of Pharmacology and Toxicology
Ernest Mario School of Pharmacy
Rutgers, the State University of New Jersey

Immunohistochemical Localization of Drug Transporters in the Human Blood-Placental Barrier

The placenta serves as the link between mother and fetus during pregnancy and forms a semipermeable barrier that mediates the exchange of nutrients, gases, wastes, drugs and xenobiotics between the maternal and fetal circulations. The human placental barrier consists of fetal capillary endothelia and epithelia known as syncytiotrophoblasts arising from cytotrophoblasts, which express transporters. Fetal exposure to chemicals is determined by the net combination of protein transporters, their localization in relation to placental cells and substrate specificity. Specifically, ATP-binding cassette transporters such as the breast cancer resistance protein (BCRP), and organic anion transporting polypeptides (OATP's) are highly expressed in human placenta. Immunohistochemical analysis of proteins in human placenta tissue using BCRP (BXP-21, BXP-53), OATP4A1 and OCT1 monoclonal antibodies to select which one will best allow us to observe where the protein is expressed and to determine how expression changes over gestation. The side of the syncytiotrophoblast (maternal vs. fetal) in which the protein is observed will provide information about its role in the exchange of chemicals. BXP-21, BXP-53, OATP4A1 and OCT1 among others transporters have been detected at the mRNA level in human placenta but their expression at the protein level and localization is not well described. This knowledge would help the scientific community develop new drugs and understand the potential fetal exposure to toxic chemicals.

Biography: Arielis Estevez is a rising senior undergraduate student at the University of Puerto Rico, Rio Piedras Campus. She is pursuing a B.S. in Chemistry, and expects to graduate in summer of 2017. She has research experience in Marine Analytical Chemistry, Organocatalysis, Synthesis of Marine Natural Products and recently, in Toxicology. She enjoys research and plans to continue graduate studies in the Biological Sciences to obtain a PhD in the Biological Sciences area. Arielis wants to be an interdisciplinary scientist to be able to apply her knowledge in different areas of science and life.

Abstracts and Student Biographies

Katrina J. Jara **Poster # 2A**
Rutgers University

Mentors:
Dr. Paul Takhistov, Ph.D
Da Som No
Department of Food Science
Rutgers, The State University of New Jersey

Development and evaluation of gelatin foam films for oral drug delivery

Thin polymeric films have the potential to be used as an alternative to pills and capsules for oral drug-delivery, especially in specialized areas such as pediatrics, gerontology and highly potent, insoluble drugs. These films are designed to bind active pharmaceutical ingredients (APIs) that can be released upon sufficient wetting and dissolution of the film in the oral cavity. It is important for efficient dissolution to occur in these films to increase the bioavailability and absorption of a drug into the human body. For this reason, our research focuses on the further improvement of dissolution profiles by fabricating a foam-like structure to increase film surface area, and permeability, and thereby, dissolution rate. The foaming properties of gelatin types A and B were investigated in this regard by varying gelatin concentration and foaming temperature and observing the air saturation, bubble-size distribution, and stability of the foam over time. Foams which exhibited high stability with enough air saturation were chosen for film-casting, and drying times were determined by measuring water efflux. A single concentration of each gelatin type was chosen from a peel test, for incorporation of the API curcumin. In further testing, we plan to compare the behavior of these novel foam films with regular films in terms of dissolution and release of curcumin.

Biography: Katrina was raised in Somerset, New Jersey and is currently a rising junior pursuing a B.S. in biomedical engineering at Rutgers University with expectations of graduating in May 2017. At Rutgers, she is an active member of the Society of Women Engineers and will be a tutor for lower level math and science classes through the Student Support Services in the fall semester. Aside from going to class and studying, Katrina enjoys running, swimming, reading, (sleeping!) and spending time with friends. This summer she has been working in Dr. Takhistov's lab in the Food Science department studying edible polymeric films for drug delivery applications. RiSE has been a valuable learning experience for her in terms of developing skills as a researcher and a professional--skills which she plans on taking away with her for whatever her future pursuits may be.

Abstracts and Student Biographies

Kenneth O'Neill **Poster # 2B**
The Cooper Union for the Advancement of Science and Art

Mentors:
Alexander V. Neimark, Ph.D., John Landers, Post-Doctorate, and Mr. Jonathan Colon.
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Characterization of ion exchange capacities in Nafion® 117 membranes: synthesis of metal oxide nanoparticles for catalytic degradation of chemical warfare agents

Society's technological progressions coincide with advances in military tactics and weaponry. As a result, the development and use of chemical warfare agents (CWAs) has become of paramount concern for national defense. Metal oxide nanoparticles (MONPs) have been investigated as a route for catalytically degrading various types of CWAs—organophosphorus-containing compounds in particular. MONPs catalytically combat CWAs in a manner such that the nanoparticles, upon degrading a CWA into nontoxic byproducts, would continue to function and not lend themselves to loss of activity or poisoning. MgO, ZnO, and NiO were investigated herein due to their reactivity and thus promise for their capacities to catalytically degrade CWAs. Nafion® 117 is a polyelectrolyte membrane (PEM) consisting of a hydrophobic fluorocarbon backbone, and the presence of sulfonate groups on the backbone leads to the emergence of hydrophilic sub-domains. MONPs were synthesized within the hydrophilic sub-domains of Nafion® 117 by first encouraging metal ion uptake by the membranes in metal nitrate solutions of varying concentrations (0.01 M, 0.05 M, 0.1 M, 0.5 M, 1.0 M), followed by conversion to the corresponding hydroxides in 0.05 M NaOH at 60 ˚C for 24 hours, and finally conversion to the corresponding oxides by heating at 100 ˚C for 24 hours. Metal ion uptake was quantified via complexometric titration; MONP synthesis was quantified through various instrumental methods—SEM, TEM, and XRD—allowing for determination of nanoparticle loading, as well as characterization of particle and cluster morphologies and the emergence of particular crystal planes; the effects of MONP synthesis on the mechanical and transport properties of Nafion® 117 were determined through calculating various parameters (water uptake, membrane void porosity, hydration number); adsorption and catalytic properties of the MONPs were investigated kinetically.

Biography: Kenneth O'Neill is a rising senior chemical engineering major at The Cooper Union for the Advancement of Science and Art on the lower east side of Manhattan. Kenneth is a New York native, born and raised on Long Island in the town of Huntington. His previous research experiences consist of various smaller projects in organic synthesis and separations under the advisement of Dr. Ruben Savizky. Working in Dr. Alexander Neimark's lab has been an invaluable experience for Kenneth, not having experienced the overlap between chemistry, chemical engineering, and materials science until his time here at Rutgers. After graduation, Kenneth would like to spend time working in the pharmaceutical industry before returning to graduate school for a PhD in Chemistry with a focus in organic synthesis. In his spare time Kenneth enjoys playing trombone, basketball, running, and spending quality time with his friends and family.

Abstracts and Student Biographies

Courtney R. Amster **Poster # 3A**
The College of New Jersey

Mentors:
Alysha Moretti, Kathryn Uhrich, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Stabilization of liposomes using amphiphilic macromolecules to prevent drug leakage

Liposomes are an important class of drug delivery vehicles that have been used to reduce drug toxicity and target specific sites of the body. To optimize the drug delivery capability, the liposomes must be stabilized. It has been shown that amphiphilic macromolecules (AMs) comprised of an acylated sugar backbone and poly(ethylene glycol) (PEG) are able to sterically stabilize liposomes, including 1,2-dipalmitoylphosphatidylcholine (DPPC) systems. Structurally, liposomes have a hydrophilic center pocket surrounded by a hydrophobic lipid bilayer. For drug delivery, different types of drugs can be encapsulated within different parts of the liposome and are also released at different rates depending on the type of drug and how tightly it is held in the liposome structure. In this study, DPPC liposomes were formulated with different concentrations of AMs to provide stabilization. DPPC and AM-based liposomes were then loaded with fluorescent dye to serve as a model for drug loading and release. By measuring the fluorescence of the dye released from the samples over time, the release profile of the AM-stabilized liposomes were evaluated. Evaluation of the results allows for the optimal percentage of AM to be incorporated to fine tune to the release profile for the desired application.

Biography: Born and raised in Holmdel, New Jersey, Courtney Amster is a rising senior at The College of New Jersey in Ewing. She is pursuing a B.S. Chemistry with a specialization in Forensic Science, as well as a minor in Criminology. Under a faculty mentor at TCNJ, she has done research in the field of Forensics, performing ink and paper analysis on ransom notes from the Lindbergh kidnapping case, and will continue this research during her senior year. In addition to her studies, Courtney is involved in several clubs and organizations on campus. She plays for the Women's Club Basketball team and is a member of the co-ed community service fraternity Alpha Phi Omega. She is very passionate about Anti-Violence education and serves as a peer educator on her campus organizing events and presentations about domestic violence, sexual assault, and stalking. After graduation, she plans to pursue a Ph.D. in chemistry and work in a state or federal Forensic Laboratory. This summer, she had the pleasure of working in Dr. Kathryn Uhrich's laboratory with her mentor, Alysha Moretti, researching the stabilization of liposomes for drug delivery. She has learned many new laboratory skills and techniques that she is excited to use throughout her future studies.

Abstracts and Student Biographies

Peyton E. Randolph **Poster # 3B**
Purdue University

Mentors:
Dr. Fernando Muzzio, Sarang Oka, and Chinmay Pathak
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Axial dispersion coefficient in rotating cylinders: dependence on cohesion, drum diameter, and rotation speed

Rotating cylinders processing solid particulates are encountered in a variety of industries, including catalyst manufacturing. The rotation is designed to promote mixing in the radial direction; however, mixing in the axial direction also occurs, and may cause unwanted product variability in processes governed by strict resident time distribution requirements. This work aims to define the effect of cohesion, drum diameter, and rotation speed using the axial dispersion coefficient as an experimental parameter. A scale-up equation which incorporates the aforementioned process and formulation parameters is also proposed.

Experiments were conducted with 3 size scales, rotation speeds, and cohesive powders and run in triplicate to determine the effects of each factor on the axial dispersion coefficient. The data are used to generate a correlating equation that will aid in the scale-up of the rotating cylinder process based on varying scales, powder cohesiveness, and rotation speeds. Powders are observed to experience an increased axial dispersion coefficient with increased cohesiveness, as well as increased drum diameter. Dispersion rates vary based on regime, with the cataracting regime generally resulting in the largest axial dispersion coefficient.

Biography: Biography: Peyton Randolph is a resident of Plainsboro, NJ, the town in which he was born in 1995. He grew up in a large family consisting of four sisters and a brother, and two mentors in his Mother and Father. Peyton's passion lies in the sciences, specifically Chemistry and it's application to the Pharmaceutical Industry. This passion stems from both his parents, who both have degrees in Pharmacy. Graduating from blue ribbon West Windsor- Plainsboro High School North in 2013, Peyton enrolled in the Chemistry Department at Mercer County Community College, where he earned his Associates in Chemistry this May (2015) with a cumulative GPA above 3.75, as well as being nominated for the excellence in organic chemistry award. This summer Peyton will be working under Dr. Fernando Muzzio in the ERC- SOPS REU program, focusing on research relating to pharmaceutical manufacturing processes. Peyton will be attending Purdue University's College of Pharmacy as a junior this upcoming fall where he will study Pharmaceutical Sciences. It is Peyton's goal to be admitted into a graduate program to pursue an advanced degree in either Medicinal Chemistry, Pharmacology, or Industrial Pharmacy. Peyton would like to thank Dr. Muzzio, Dr. Pedersen, Sarang Oka, Chinmay Pathak, and all of the RiSE program at Rutgers for their unwavering support.

Abstracts and Student Biographies

Karina Lei C. Relatado **Poster # 4A**
North Carolina A&T State University

Mentors:
Gerardo Callegari, PhD, Assistant Research Professor
Department of Chemical & Biochemical Engineering
Rutgers, the State University of New Jersey

Effect of Blend Hydrophobicity on Drug Dissolution

One of the critical quality attributes (CQAs) required by the FDA for every oral solid dosage form (e.g. tablet) is drug dissolution. The first step of the process is water penetration, which greatly depends on the wetting properties of the blend: drug substance (API) and excipients, and the porosity of the tablet. With this, a highly hydrophobic blend could significantly affect product dissolution. On the other hand, variation of compaction forces at which the tablets are produced could influence both dissolution and tablet tensile strength. In this study, two powder blends with either lactose or microcrystalline cellulose (MCC), acetaminophen and magnesium stearate were blended in a V-blender. Part of the blended powders were sheared in an ad-hoc Couette shearing device before compaction while the rest were directly compacted (no shear) at 100 to 300 MPa pressures. To measure wettability, the contact angles of DI water droplets on different tablet surfaces were analyzed using digital camera and droplet deposition technique. As the tablets are porous, the droplets were absorbed and the apparent external contact angle varies in time, which made the contact angle measurement a non-trivial task. Further video and image analyses quantified the effect of varying compaction forces to the formulation where a trend was observed: the increase of contact angle measurements and compaction forces indicate a more hydrophobic formulation. Finally, wettability measurements were correlated to the dissolution profiles, observing the behaviors of the excipients lactose and MCC.

Biography: Born and raised in the Philippines, 21 year-old Karina (cool) Lei (flower) Relatado moved to North Carolina, USA with her sweet family two years ago. She's determined to finish her degree in Biological Engineering (Bioprocess Engineering) 880 days from now, then graduate studies. Her interests exemplify a good chemical equilibrium of many things: from Eco houses and chemical applications to watching NCIS and aquatic life documentaries. A curious person herself, she always has some questions in mind. This summer, she gets her queries answered by working with Dr. Gerardo Callegari and the extra help of amazing graduate students- while realizing that Science and Research have a lot more to offer than teaching you laboratory techniques and chemical reactions.

Abstracts and Student Biographies

Gabriel J. Rodriguez **Poster # 4B**
University of Puerto Rico, Mayaguez Campus

Mentors:
Xiaolei Chu and Meenakshi Dutt.
Department of Chemical and Biochemical Engineering
Rutgers University

Bending rigidity measurement for model biological membranes

Computational approaches can be used to develop simulations of soft materials, including biological membranes. In this research, the main purpose is to determine the bending modulus of a biological membrane with a specific composition. By the determination of this property, the computational simulations will be more accurate and will be a better prediction for real life soft materials with promising applications. These applications include a better prediction, understanding and development of drug delivery, drug targeting and bioavailability of drug. In order to determine the bending modulus, a coarse-grained Molecular Dynamics approach will be used. With the use of MATLAB, single or multiple species of lipids and sterols are virtually pre-assembled into a cylindrical bilayer frame. This structure is stabilized by the use of Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS). We measure the mean curvature radii and tensor stress to derive the bending modulus of different systems. The average bending modulus for the six systems we developed was 95 kbT. Also, from our results we can observe that as the system's size decreases, the value for the bending modulus also decreases.

Biography: Gabriel Rodríguez was born in the island of Puerto Rico. He is currently an undergraduate student of the Industrial Biotechnology Program of the University of Puerto Rico, Mayaguez Campus. He is part of the Industrial Biotechnology Student Association. Gabriel has worked in the Bioenergy, Bioprocess, and Renewable Resources Laboratory under Dr. Lorenzo Saliceti. Currently, he is doing research on computer simulations of biological membranes in the Department of Chemical and Biochemical Engineering at Rutgers University as part of the RISE program. After he finishes his Bachelor's degree, he wants to pursue a PhD in Biomedical Engineering.

Abstracts and Student Biographies

Yanira Rodríguez-Valdés **Poster # 5A**
University of Puerto Rico, Río Piedras Campus

Mentors:
Kallakuri Suparna Rao, Savitha Panikar, PhD and Rohit Ramachandran, PhD
Department of Chemical and Biochemical Engineering
School of Engineering
Center for Structured Organic Particulate Systems
Rutgers, The State University of New Jersey

Wet granulation and extrusion of alumina for catalyst supports

Alumina powder is very frequently used as the raw material for the preparation of catalyst supports, which consists of a series of steps that serve to develop supports with properties such as high porosity and surface area, which make them suitable for impregnation with catalysts. The first step of the process is granulation, in which liquid binder is added to the catalyst powder to increase particle size by agglomeration. Granulation also helps in handling of product, reducing dust formation etc. Granulation is performed for a wide range of liquid-to-solid (L/S) ratios of liquid binder and alumina. The resulting granules were qualitatively examined based on their plasticity and other physical properties in order to select an extrudable range. Our experiments show that L/S ratios ranging from 30/70 to 40/60 yielded granules most suitable for extrusion. Granules from the selected range of extrudable L/S ratios were then extruded at a constant pressure and volume range. Further evaluation of the extrudates took place after extrusion in order to determine the optimal conditions for the development of high-quality extrudates. The quality of the extrudates is determined based on parameters such as porosity and overall hardness. Determining the optimal conditions for these processes is necessary in order to manufacture catalyst supports commercially for application in the chemical industry.

Biography: Born and raised in Puerto Rico, Yanira Rodríguez-Valdés is currently a rising junior majoring in Chemistry at the University of Puerto Rico, Río Piedras Campus. Her interest in science and research led her to conduct undergraduate research, in which she has been involved since her freshman year of college. During the academic year, Yanira conducts research which focuses on the development of sugar-responsive organic drug delivery systems, under the mentorship of Dr. José M. Rivera. This summer, as a member of the Research in Science and Engineering (RiSE) program and NSF's Center of Structured Organic Particulate Systems (C-SOPS) Research Experience for Undergraduates (REU) at Rutgers, Yanira worked under the guidance of Dr. Rohit Ramachandran in the Department of Chemical and Biochemical Engineering. This summer program has given Yanira the opportunity to explore research in areas of science that are out of her comfort zone and obtain experience and training in a research-intensive university. She is interested in pursuing graduate studies in the biomedical sciences, specifically in biochemistry or organic chemistry, after which she will continue to develop as a very passionate scientist. In her free time out of the lab, Yanira enjoys to read, listen to music and swim, all of which contribute to her personal growth and balance.

Abstracts and Student Biographies

Zoha H. Syed **Poster # 5B**
University of Washington, Seattle

Mentors:
Professor Alan Goldman, Ph.D., Yang Gao
Department of Chemistry and Chemical Biology
Rutgers University

Electrophilic alkane functionalization: investigation of PheboxIr(OAc)(R) complexes in the presence of HX

Saturated hydrocarbons, or alkanes, play a vital role in the energy economy, and are the major constituent of products such as natural gas and petroleum. Conversion of the chemically-inert bonds of alkanes to more useful functional groups requires a great deal of energy and is often expensive. Thus olefins, or hydrocarbons with double bonds, are often used as precursors to a variety of functionality such as oxygenates. Examples of oxygenates include alcohols, aldehydes, and carboxylic acids. It is for this reason that more efficient conversions of alkanes to olefins are desirable. Previous studies show C-H activation can be achieved with an iridium catalyst, an important precursor for catalytic electrophilic alkane functionalization. This catalytic cycle involves a (Phebox)Ir(III)$(OH_2)(OAc)_2$ complex as the catalyst. In the cycle, β-H elimination of the alkane gives the desired olefin. This β-H elimination step was the rate-limiting step but its rate increased greatly in the presence of Lewis acids (electron-pair acceptors), thus lowering the activation barrier for alkane functionalization. However, C-H addition is still very slow. This means we can afford to fine-tune the catalyst in order to continue to increase the rate of C-H addition, at the expense of other steps of the catalytic cycle, thus overall increasing the rate of C-H activation. This work explores the effects of acids, more specifically Brønsted acids (proton donors), on the rate of C-H activation. We will explore a variety of species for HX beginning with t-BuOH. In order to prevent unreactive “resting states” in the catalytic cycle, acids of differing acidities and binding abilities will be tested. Ethylene will be used as the default oxidant in these studies. Future goals involve developing a catalyst to convert alkanes to olefins using O_2 or air as the oxidant instead of ethylene.

Biography: In the past, Zoha has called Michigan, North Carolina, and Texas home, but she currently resides in Seattle, WA where she attends the University of Washington. In high school, Zoha hated chemistry, but when she took a chemistry class at UW her first quarter there, all of that began to change. Currently she is a chemistry (ACS certified) and biochemistry major, and very involved in the UW Department of Chemistry as a Teaching Assistant for general chemistry classes and as President of Phi Lambda Upsilon, the undergraduate chemistry honor society at UW. She came to Rutgers to work with Prof. Alan Goldman on a summer fellowship from the Center for Enabling New Technologies through Catalysis (CENTC) and is also part of the RiSE program. In the past, she has worked on projects in both organic and inorganic synthesis, such as copper-catalyzed hydrofunctionalization of unsaturated compounds, in the lab of Prof. Gojko Lalic, and will continue working on iridium-catalyzed alkane functionalization in the lab of Prof. Karen Goldberg, director of CENTC. After undergrad, she hopes to get an MD/PhD.

Abstracts and Student Biographies

Kadijah D. Abston **Poster # 6A**
The University of Mississippi

Mentors:
Mariana Saboya, Wendie Cohick, Ph.D.
Department of Animal Sciences
Rutgers, The State University of New Jersey

Effect of alcohol exposure on the mammary cancer stem cell population in mice

The American Cancer Society reported in 2013 that 1 in 8 women will contract breast cancer in her lifetime. Although there are known risk factors for breast cancer, such as alcohol consumption, the mechanism underlying these risks is relatively unknown. There is evidence that mammary stem cells play a role in mammary gland development and function and that stem cells/progenitor cells may be the origin of tumorigenesis. Therefore, the long-term goal of this study is to determine if direct alcohol exposure causes a change in mammary epithelial cell lineage that will increase tumorigenesis. The specific aim of this study is to establish a protocol to isolate mammary epithelial cells from adult mammary glands, which will be used to conduct an animal study to analyze changes in mammary stem cell population due to direct alcohol exposure. The isolation of mammary gland epithelial cells from adult female mice will be performed using a series of enzymes to create a single cell suspension that will be sorted by FACS to identify and compare changes in the mammary stem cell population. Changes in this population would suggest a mechanism by which alcohol promotes mammary tumorigenesis.

Biography: Kadijah Deniece Abston was born in Gulfport, MS and will graduate from The University of Mississippi in May 2016 with a B.A. in Biochemistry. She is the Vice President for the Louis Stokes Mississippi Alliance for Minority Participation (LSMAMP). Inducted into the Ronald E. McNair Program in 2014, Kadijah conducted research under Dr. Randy Wadkins. Her work on stabilizing i-Motif quadruplex DNA for regulating gene expression, biosensing, and drug targeting for cancer therapy was published in the 2014 R. E. McNair Journal and presented at several conferences including an American Chemical Society (ACS) regional meeting. She conducted international research on the water conditions of Mount Pleasant Creek Watershed in Belmopan, Belize in May 2015 under Dr. Ed Boles. As a 2015 RiSE at Rutgers scholar, she gained hands-on experience with mammary epithelial cell isolation in Dr. Wendie Cohick's research group. She plans to pursue a PhD in Toxicology and a Master's in Public Health because of her interest in the adverse effects of daily hygiene and food products on biochemical processes and their potential carcinogenic properties.

Abstracts and Student Biographies

Alex Alvarado **Poster # 6B**
University of Southern California

Mentors:
Stephen Burley, Christine Zardecki
Research Collaboratory for Structural Bioinformatics Protein Data Bank
Rutgers, The State University of New Jersey

The Protein Data Bank as an Educational Resource: Using 3D Structure to Explore Biology

The Protein Data Bank was founded as a non-commercial, publicly-available data center to catalog experimental information from the surge of structural biology. As iterations of the PDB evolved to better contain experimental data, the PDB also began to serve different audiences. RCSB PDB is a resource that provides access to the PDB archive in addition to the PDB-101 educational portal to help users understand structural biology. PDB-101 provides educational tools and resources to simplify structural biology, to explore the molecules of biological processes that define life. In collaboration with the Howard Hughes Medical Institute, RCSB PDB is developing the Irving Geis Digital Archive of the artists collection of molecular art to explain protein form and function.

Irving Geis was a pioneer in molecular visualization. Using myoglobin as an example, this poster details how the three different formats of material in the RCSB PDB interact to present a more complete understanding of structural biology. The Digital Archive presents an elementary glance at his myoglobin painting, showing the heme ligand as well as the binding pocket and globular structure. PDB-101 presents a more contextual understanding of the molecule, using resources and articles to explain how the molecule functions in the human body. The RCSB PDB provides access to primary experimental and external resources to provide a more detailed, experimental understanding of the molecule for more experienced users. Overall, RCSB PDB yields a better understanding of structural biology by providing access to primary experimental and educational resources.

The RCSB PDB is funded by a grant (DBI-1338415) from the National Science Foundation, the National Institutes of Health, and the US Department of Energy. The Irving Geis Digital Archive Project is funded as part of an NSF REU.

Biography: Alex Alvarado is a senior at University of Southern California in Los Angeles, California. He was born in Bakersfield, California and has lived in California his entire life. He expects to graduate at the end of the Fall Semester in 2016 with a Bachelor’s Degree in Biochemistry along with a minor in Bioinformatics. This summer he worked at the RCSB Protein Data Bank with Christine Zardecki and Stephen Burley as mentors. His summer project was to create a digital archive for the protein structure visualizations created by Irving Geis, which he accomplished alongside Nicole Werpachowski. His future goal is to continuing working in bioinformatics, possibly with genomics or quantitative biology.

Shacquille Brown **Poster # 7A**
Bloomfield College

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

TiO_2-ZnO semiconducting oxide mixtures with fruit-based dyes in Dye-Sensitized Solar Cells

Dye sensitized solar cells (DSSC) are an attractive, competitive and an environmental friendly alternative to produce energy. In contrast to the costly silicon-based cells, the assembly of DSSCs using oxides such as zinc oxide, titanium dioxide, and natural dyes, such as blueberries and cherries, extend the absorption of wavelengths into the ultra-violet range, so that photons from a wider part of the solar spectrum can be captured. A simple DSSC consists of a transparent conductive oxide (TCO) such as indium tin oxide coated on a substrate such as glass covered with a layer of mesoporous titanium dioxide (TiO_2) or zinc oxide (ZnO) as the semiconductor component and sensitized with a thin layer of dye. The counter electrode is also a transparent conductive oxide (TCO) on a substrate, but with a thin catalytic layer, and an electrolyte is inserted between the electrodes in a sandwich like assembly.

This project aims to identify the efficiency of solar energy conversion of DSSCs with semiconductor components fabricated from zinc oxide and titanium dioxide, in ratioed combinations with cherry and blueberry dyes. Ultraviolet-visible spectra of dyes were obtained and voltage output of assembled DSSCs was measured over a two week period. Overall, solar cells made with a ratio of higher zinc oxide (ZnO) to titanium dioxide (TiO_2) showed the best performance with both dyes. This indicates that the electron transfer between the dye and the semiconductor oxide was most favorable for these mixtures, and that the connectivity between ZnO and TiO_2 particles allowed for good current collection.

Biography: Shacquille Brown, a native of Jamaica, is a rising senior pursuing a Bachelor’s of Science in Chemistry with a concentration in Biochemistry at Bloomfield College. He wishes to pursue higher education by attaining a Ph.D. in Chemistry with a hope inspiring his younger sister to achieve academically. As a participant in the RiSE program, he is working with Dr. Lisa Klein in the department of material science and engineering where he works on semiconductor tuning for dye sensitized solar cells. He is grateful for this experience Rutgers and RiSE program have provided.

Abstracts and Student Biographies

Chelsea Cherenfant **Poster # 7B**
Harvard University

Mentors:
Shaima Jabbar and Dipak K. Sarkar
Endocrine Program, Department of Animal Sciences
Rutgers, The State University of New Jersey

Fetal alcohol exposure may increase aromatase activity to enhance the susceptibility to pituitary tumorigenesis

Fetal alcohol exposure (FAE) has been shown to increase offspring cancer susceptibility. Clinicians reported that many children who came to the hospital with fetal alcohol syndrome also had benign or malignant tumors. Animal researchers confirmed these observations and showed that FAE increases the incidence of prolactin-producing pituitary tumors (prolactinomas). The underlying mechanisms for increased carcinogenesis susceptibility in these offspring are not apparent. Many human tissues express the enzyme aromatase, which locally catalyzes the conversion of C (19) steroids to estrogens. There is increasing evidence that aromatase may be crucial in some tumor cell proliferation pathways. Hence, we hypothesized that aromatase expression could be increased in cases of fetal alcohol exposure, providing a source of estrogens which could stimulate the proliferation of prolactin-producing lactotrophs cells. We used frozen or paraformaldehyde-fixed pituitary tissues of adult Fischer 344 rats whose mothers had a liquid diet containing 6.7% alcohol (AF), pair-fed with isocaloric liquid diet (PF), or fed ad libitum with rat chow (AD) during gestational days 7 and 21. We examined these tissues for aromatase and prolactin cellular detection by single or double-staining immunohistochemical procedures. We then measured aromatase and alpha estrogen receptor mRNA levels in these tissues using quantitative RT-PCR methods. We found that aromatase mRNA, but not alpha estrogen receptor mRNA, expression was significantly higher in alcohol-fed animals. The immunohistochemical staining data showed increased aromatase levels in FAE animal pituitary tissues. These data provide preliminary evidence supporting that estrogen overproduction in pituitary increases susceptibility of prolactin-producing lactotropes to develop tumors.

Biography: Chelsea Cherenfant was born in Ann Arbor, Michigan and lived in both Port-Au-Prince, Haiti and Cambridge, MA before settling down in Wayland, MA. Currently, she is a rising junior studying Integrative Biology at Harvard University. In the past 10 weeks, she's relished the opportunity to work in Dr. Sarkar's lab and hopes to continue conducting research in immunology and infectious diseases after graduation in a dual degree MD-PhD program. In her free time, Chelsea loves to sing, dance, and play the ukulele, as well as spend time with family and friends.

Abstracts and Student Biographies

America Davila **Poster # 8A**
Marquette University

Mentors:
Judy L.Postmus
Associate Professor, Rutgers School of Social Work
Director, Center on Violence Against Women and Children

Economic abuse: an exploratory analysis of the mental health of Latinas in the U.S.

Currently, Latinos constitute the second largest and fastest growing minority group in the United States (U.S.) with approximately 50.5 million reported by the 2010 census (Humes, Jones, & Ramirez, 2011). Of the Latinas, 1 in every 6 will experience intimate partner violence (IPV) in her lifetime (Sabina, Cuevas, & Zadnik, 2015). While increasing research has documented significant detrimental effects of physical, sexual, emotional, and psychological violence, limited studies have addressed economic abuse, which may include tactics of economic control, economic exploitation, and employment sabotage. Investigations on this type of abuse within racial and ethnic minorities, particularly in the Latino community, are still unavailable. To address these gaps, the present study explores the mental health of Latina survivors of economic abuse in the U.S. Using a quantitative research design, self-reported data from 246 Latinas were gathered for this secondary data analysis. Overall, our participants reported frequent experiences of economic abuse (M=2.60, SD=.96; Min=1, Max=5) with economic control as the most persistent subtype faced. Additionally, the results revealed that economic abuse is a significant predictor of depression, anxiety, and posttraumatic stress disorder regardless of immigration status. These results support the literature suggesting that economic abuse is a unique form of IPV and—like other types of abuse—may degenerate the mental health of survivors, notably Latinas.

Biography: America is a senior in the college of Arts and Sciences at Marquette University with a double major in Psychology and Criminology & Law Studies. She is currently a McNair Scholar, the Vice-President of the Psi Chi society, a member of the Criminology & Law Study society, Youth Empowered in the Struggle (YES), and the Animal Health and Wellness Club at her home institution. Her research interests include intimate partner violence, adolescence, marriage and relationships, and discrimination with a focus on ethnic minority mental health. Experience with research include being a research assistant in the Mental Health Disparities Research Lab at Marquette University under Dr. Lucas Torres and co-authoring a research project with Dr. John H. Grych titled Breaking the Cycle: An Examination of Cognitive, Emotional, and Environmental Factors of Intimate Partner Violence Victimization in Adolescence as part of the Ronald E. McNair program, Summer 2014. This summer, she has worked in the Center on Violence Against Women and Children with Dr. Judy L. Postmus from Rutgers University in various projects about economic abuse among Latinas, a financial empowerment program, and an evaluation of an art summer camp for children. After graduation in 2016, she plans to pursue a doctoral degree in either clinical or counseling psychology.

Abstracts and Student Biographies

Deidre V. Dillon **Poster # 8B**
Tuskegee University

Mentors:
Raj Shah, Suzie Chen
Department of Chemical Biology
Rutgers University

Regulation of Glutaminase in GRM1-expressing Melanoma Cells

Melanoma is the most aggressive form of skin cancer. Although surgically curable at early stages, metastatic melanoma is relatively refractory to current therapies and has a poor prognosis. Our lab has previously illustrated the oncogenic properties of a neuronal receptor, metabotropic glutamate receptor 1 (GRM1) in melanocytes. Glutamate is the major excitatory neurotransmitter in the central nervous system and is the natural ligand of GRM1. Our group has demonstrated that glutamate production/release is upregulated downstream signaling pathways associated with increased cell proliferation in vitro. Recently interest in the reprogramming of tumor cell metabolisms particularly glutamine metabolism showed elevated expression of glutaminase (GLS), a key in modulation of GLS. We examined c-Myc and GLS expression in two different GRM1-expressing melanoma cells and one normal human immortalized melanocytes. GRM1 expression has been determined to be three times higher in these two human melanoma cell lines as compared to normal human melanocytes. C-Myc and glutaminase levels were found to be directly proportional to GRM1 expression. We examined expression of c-Myc, glutaminase and GRM1 by using Western immunoblotting methods. Currently, our focus is to confirm the association of GRM1 with c-Myc and glutaminase by silencing RNA (siRNA) to GRM1. We will first test to see if levels of both c-Myc and glutaminase are reduced with siRNA to GRM1. If the glutaminase levels do not decrease, it would suggest that other protein(s) may be involved in the regulation of glutaminase expression/function.

Biography: Deidre was born September 28th, 1994 in Jackson, MS. She is currently a rising junior pursing a B.S. in Chemistry with a minor in Biology at Tuskegee University in Tuskegee, Al. Deidre is a member of Sigma Alpha Pi, Alpha Kappa Mu Honor Society, Golden Key International Honor Society, and a 2014 recipient of the CRC Press Annual Chemistry Achievement Award. In the summer of 2014, she had the privilege of being a Chemistry and Structural Biology Researcher at the University of Louisville. She was under the wonderful leadership of her mentor, Dr. Muriel C. Maurer, cross-linking florescent substrates into Fibrin clots. Currently, Deidre is enjoying her summer in New Jersey at Rutgers University studying the regulation of glutaminase in GRM1-expressing Melanoma cells. She is honored to be working under the prestigious Dr. Suzie Chen in the Chemical Biology department. Upon graduation, Deidre plans to attend medical school in order to purse her passion of providing medical care in underrepresented areas. She will take her skills that she obtains from the RiSE program and apply it to her everyday life at her home institution, and in all of her future endeavors.

Abstracts and Student Biographies

Kidus Y. Feleke **Poster # 9A**
Jackson State University

Mentors:
Ashley Pettit, PhD
Department of Biochemistry and Molecular Biology
Robert Wood Johnson Medical School, Rutgers University

Tracy Anthony, PhD
Department of Nutritional Sciences
Rutgers University

The role of eIF2 kinase PERK in the liver response to dietary methionine restriction.

Methionine is an essential amino acid, i.e., not synthesized by the body and so must be obtained through the diet. Studies demonstrate that dietary methionine restriction (MR) increases longevity, decreases fat accumulation and fat mass, and improves metabolic health. A better understanding of the mechanisms that direct these health outcomes will help to determine if MR can be utilized as a nutrition-based therapeutic method for patients with diabetes or metabolic syndrome. Preliminary studies show that the translation factor eIF2 is phosphorylated by the eIF2 kinase called PKR-like ER-resident kinase (PERK) in the liver of both wild type (WT) and general control non-derepressible 2 (GCN2) knock-out (KO) mice fed a MR diet for 8 wk. The objective of this work was to investigate the immediacy of eIF2 phosphorylation by PERK. In this study the phosphorylation status of PERK and eIF2 was measured in the livers of both WT (n=16) and GCN2-KO (n=16) mice fed a high fat diet either sufficient (HF) or restricted in methionine (MR). Following a 2day MR diet exposure, livers were collected from mice to assess protein phosphorylation by immunoblot analysis. The results show that eIF2 phosphorylation was increased in the liver of female but not male WT mice after two days of MR diet. Further, females showed higher eIF2 phosphorylation overall (main effect of sex by factorial ANOVA, $P<0.05$). In contrast, hepatic phosphorylation of eIF2 was unchanged by MR in GCN2-KO mice and phosphorylation of PERK remained low in all samples. The data suggest that GCN2 is the initial responsive kinase in the phosphorylation of eIF2 by MR.

Biography: Kidus Y. Feleke is originally from Addis Abeba, Ethiopia. He currently attends Jackson State University in Jackson, Mississippi and he is majoring in Biology (pre-med). He is interested in cancer biology and contemplates attending graduate school. Kidus is multilingual. He likes to travel, meet new people, and experience different cultures. He enjoyed much of his experience in the RiSE program working in Dr. Tracy Anthony’s laboratory where he studied the activated pathways in the liver response to dietary amino acid restriction in mice.

Abstracts and Student Biographies

Deaetta A Grinnage **Poster # 9B**
Delaware State University

Mentors:
Kalkal Trivedi, Kathleen Scotto
Department of Pharmacology
Robert Wood Johnson Medical School

Developing drug resistant cell lines expressing levels of ABCG2

Prostate cancer is the second most common cancer among men in the United States and is also the second most common cause for cancer-related death in American men. ABCG2 (ATP-binding cassette transporter sub family G member 2) is a protein that is normally highly expressed in tissues such as the blood-brain barrier, gastrointestinal tract and placenta. This protein uses the energy released by ATP hydrolysis to efflux its substrates out of the cell. ABCG2 has several physiological substrates such as steroid hormones, uric acid, protoporphyrin, folate etc, while drugs such as Flavopiridol, Topotecan and Mitoxantrone are its chemotherapeutic substrates. Enhanced levels of ABCG2 are found in recurrent prostate cancer samples. Also, its chemotherapeutic substrate, mitoxantrone, is used in combination with hormone therapy for treating metastatic castration-resistant prostate cancer (mCRPC). In order to study the role of ABCG2-mediated drug resistance in prostate cancer, we needed to develop a drug-resistant cell line that over-expresses the protein. We hypothesized that prostate cancer cells (DU145), when treated with a high concentration of mitoxantrone (LD95)as determined by a cytotoxicity assay), will select for clonal population with elevated levels of ABCG2. The clones will be expanded to create cell lines and the level of ABCG2 expression in these cell lines will be tested by western blot analysis.

Biography: Deaetta Grinnage is an upcoming senior at Delaware State University located in Dover, DE. Deaetta majors in biology with a concentration of pre medicine. Here at Rutgers she is working in Dr. Scotto's lab located at the New Jersey Cancer Institute. Deaetta's project will be creating drug-resistant cell lines that express high levels of ABCG2 to study how it leads to drug resistance. In the fall she will be applying for Ph.D. microbiology/immunology programs to do clinical and translational research. Deaetta's hobbies include outdoor running and hanging out with friends. Every year Deaetta volunteers in her high school Family Career Community Leaders of America organization to serve as a judge in competitive events that take place.

Abstracts and Student Biographies

Sterling M. Hubbard **Poster # 10A**
Tennessee State University

Mentors:
Diana T. Sanchez, PhD.
Associate Professor
Rutgers University

Analia Albuja
Rutgers Uuniversity

Father's Perinatal Engagement and Maternal Alcohol Use

Healthy maternal behaviors during the perinatal period are essential to infant health and survival. Maternal health behaviors such as substance abuse and prenatal care, can be either negatively or positively influenced by the expectant father. This is why it is important to encourage father engagement and consonant health behavior during the perinatal period. This research will focus on whether perinatal paternal engagement promotes less substance use among pregnant mothers. This project utilizes the Fragile Families and Child Wellbeing Study (FFCWS) to examine whether father's perinatal engagement is associated with maternal substance use. Negative binomial regression controlling for relevant demographic relationship variables suggested that more father perinatal engagement was associated with less maternal alcohol use during pregnancy. This effect was specific to alcohol use and not to drug and tobacco use.

Biography: Cincinnati native, Sterling McKenzie Hubbard is an ambitious graduating senior hailing from Tennessee State University, a Historically Black University in Nashville, Tennessee. She has worked extremely hard striving to beat the odds that were already predestined. Her own obstacles and the struggles of her family are what motivates and humbles her journey to become great. Her aspirations include being able to help those who struggle with substance use and abuse, especially the adolescent population. While participating in the Research in Science and Engineering (RiSE) Program, Sterling has had the pleasure of working with two professors on two different projects. The first being Dr. Diana Sanchez, in social psychology focusing on perinatal paternal involvement. Improving this behavior may increase positive maternal health behavior and positive birth outcomes. The second being Dr. Danielle McCarthy, in clinical psychology focusing on clinic and patient characteristics that are associated with the tobacco cessation interests. This information will eventually help improve public health facilities in implementing and broadening the reach of tobacco treatments. Furthermore, Sterling is a hard-working student, determined to make her loved ones proud by graduating summa cum laude in December and hopefully attending an accredited Clinical Psychology, Ph. D. program in the fall.

José Liquet y González **Poster # 10B**
University of Puerto Rico- Mayagüez

Mentors:
Preshita Gadkari, Mrinalini Nikrad, Ph.D. and Max Häggblom, Ph.D.
Department of Biochemistry and Microbiology
Rutgers, The State University of New Jersey

Method for the isolation of high-molecular-weight DNA from Mucilaginibacter frigoritolerans FT22 and Mucilaginibacter lappiensis ANJLI2.

The genus Mucilaginibacter was proposed in 2007 and since, members of this genus have been isolated across distinct environments. Mucilaginibacter frigoritolerans FT22 and Mucilaginibacter lappiensis ANJLI2 were isolated from freeze-thaw treated Tundra soil samples and lichen samples, respectively, from the Finnish Lapland by Männistö et al. in 2010. Both strains produce high amounts of extracellular polymeric substances (EPS), which are thought to help the cell survive disadvantageous conditions, such as freeze-thaw. The EPS is also responsible for the troublesome task of isolating high-molecular-weight DNA; since it makes the isolation of a high-concentration of cells difficult. By centrifuging the cell biomass into pellets and using a protocol with: glass bead-beating, CTAB and phenol:chloroform:isoamyl alcohol for cell lysis and extraction of nucleic acids; PEG and ethanol for DNA precipitation, we were available to obtain high quality genomic DNA. Moreover, high-molecular-weight bands appeared on a 1% agarose gel, and were quantified. The DNA will be used for generating a draft genome sequence of strains FT22 and ANJLI2 using Illumina Deep-sequencing. With the genome sequenced, we could determine certain genetic markers common among psychrophilic, freeze-thaw tolerance and EPS producing genes, along with a genetic profile of their physiology.

Biography: Born in Mayagüez, Puerto Rico, José Liquet y González is majoring in microbiology and expects to graduate from the University of Puerto Rico-Mayagüez in May 2016. During the summer of 2015, José worked in Dr. Max Häggblom's lab. In the lab, his task was to extract high-quality DNA from Mucilaginibacter frigotolerans, among other psychrophilic bacteria, for genome sequencing. He's especially interested in the use of bacteria to make the environment a cleaner place. His future plans are to obtain a Ph.D. in Environmental Microbiology and become a professor in Puerto Rico, where he plans to inspire youngsters and contribute to the island's scientific progress.

Eduardo R. Martinez-Montes **Poster # 11A**
Universidad de Puerto Rico, Rio Piedras

Mentors:
Harita Menon, PhD
Department of Cell Biology and Neuroscience, Rutgers University

Heidi Chapman, Tiffany Wang, Mark Spaller, PhD
Pharmacology and Toxicology, Geisel School of Medicine at Dartmouth and Norris Cotton Cancer Center

Bonnie Firestein, PhD
Department of Cell Biology and Neuroscience, Rutgers University

Effects of small peptides on the interaction of the neuronal proteins cypin and PSD-95 and on dendrite branching

Correct formation of dendrites is essential for communication between neurons, and many neurodegenerative diseases are associated with limited or poor dendrite morphology. Cypin (cytosolic PSD-95 interactor) regulates the post synaptic trafficking of PSD-95, a neuronal scaffolding protein, by interacting with the PDZ domains of PSD-95 and plays a role in the formation of dendrite networks. Overexpression of cypin is directly associated with increased dendrite formation in rat hippocampal neurons. Conversely, overexpression of PSD-95 results in diminished dendrite complexity. Interestingly, the seemingly antagonistic interaction of PSD-95 with cypin has proven necessary for the formation of stable dendrite networks. To further elaborate the mechanisms by which PSD-95 and cypin act to regulate dendrite morphology, we performed a series of competitive binding assays using small peptides that demonstrate affinity for the PDZ domains of PSD-95. One of these peptides, HMC2049, significantly diminished PSD-95 binding to cypin, and in addition to two other experimental peptides, altered dendrite complexity in rat hippocampal neurons. Our data suggest that the use of these small peptides will aid us in understanding the role of the interaction between cypin and PSD-95 in shaping the
dendritic arbor.

Biography: Eduardo R. Martínez Montes was born and raised in San Juan, Puerto Rico and is currently attending the University of Puerto Rico (UPR), Rio Piedras Campus and plans to graduate in the spring of 2017 with a B.S. in Chemistry. He has conducted research with Dr. Carlos I. Gonzalez in the area of Molecular Biology and Biochemistry researching posttranscriptional regulators at his local institution for the past year. At UPR he is also currently a fellow of the NIH-funded RISE program for minority students interested in pursuing graduate studies in science. This summer he has worked with Dr. Bonnie Firestein studying neuronal proteins implicated in dendrite formation. After graduation he plans to continue to complete a PhD in Neuroscience specifically in the area of neurodegenerative diseases like Alzheimer's and to continue to conduct scientific research with biomedical and translational potential in this area.

Abstracts and Student Biographies

Vanessa A. Putnam **Poster # 11B**
University of California Santa Cruz

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

A toolkit for differentially private data analysis

Individuals providing sensitive data to entities such as hospitals or companies are often concerned about privacy. Due to massive increases of personal data collection in recent decades, privacy has become harder to define explicitly. We define privacy in terms of confidentiality; privacy risk is measured as the risk of being individually identified. We develop efficient privacy preserving tools for data analysis that will keep individual's sensitive and personal information secure. By protecting against disclosing information that uniquely identifies any given individual, we can guarantee privacy even when the analysis is done by an adversary. We use differential privacy to quantify privacy risk. The differential privacy framework allows us to trade off the accuracy of the data analysis with the privacy risk to individuals. We build a toolkit of differentially private mechanisms that will allow us to maximize the number of queries at a given accuracy level subject to a bound on the privacy risk. Our toolkit will be the foundation for implementing more complex privacy preserving methods commonly used in many fields such as machine learning, data science, and statistics. We investigate the trade off between our privacy and accuracy by evaluating our differentially private mechanisms on common functions of interest in statistical analysis. Our end goal is to create reusable implementations as part of the open source library for others who would like to enable differentially private analysis of their data.

Biography: Vanessa Putnam is a rising junior attending the University of California Santa Cruz. She is currently perusing a bachelors degree in Computer Science with a minor in Technology and Information Management, and hopes to graduate during the spring of 2017. This summer at Rutgers University, Vanessa worked with mentor Anand Sarwate to implement a differentially private toolkit for privacy preservation among individuals. In the future, Vanessa hopes to attended graduate school and further her research in machine learning and use technology to improve the lives of others.

Abstracts and Student Biographies

Nicole M. Robles-Matos **Poster # 12A**
University of Puerto Rico, Rio Piedras Campus

Mentors:
Dr. Patrick Sinko, Dr. Zoltan Szekeley, Kristia A. Rivera
Ernest Mario School of Pharmacy, Rutgers University, Piscataway, NJ

Synthesis and characterization of bis-PEG2-aldehyde used as a crosslinker reagent of gelatin microparticles for targeted drug delivery

The design of lung targeted drug delivery systems (LT-DDSs) is one of the major focus in pharmaceutical applications, since the drug can be delivered the appropriate amount of drug, while at the same time avoiding side effects in the body. This type of drug design presents advantages like: drug administration in a smaller dose, improved efficacy and reduced toxicity. To achieve an ideal drug delivery is necessary to introduces carriers that can effectively deliver the drug to the tumor cells in the lung. Recently, gelatin microparticles are widely used as carriers, because the gelatin is known to be nontoxic, biodegradable and a natural polymer. This polymeric microparticles are among the most studied drug carriers for LT-DDSs to introduce the drug by intravenous route instead of pulmonary administration. In order to complete a drug delivery, gelatin microparticles are usually prepared by crosslinking with glutaraldehyde, but result in some toxicity and less water solubility associated with it. For this reason we proposed the synthesis of bis-PEG2-aldehyde, since polyethylene glycols (PEGs) are water soluble to react with the amino groups of the gelatin microparticles. We expect that this PEG-aldehyde will improves the solubility this crosslinking reagent and the gelatin and decrease toxicity. In our methodology we apply the synthesis presented on a patent, which is a suitable method to obtain the desired product with a high purity. We conclude PEG-OH is volatile and the best conditions to crystallize it are Petroleum ether al -30 °C. Sodium borohydride was not strong enough to reduce the desired ester. As a future direction, we expect to optimize the synthesis, react the PEG-aldehyde with the gelatin microparticles and perform drug release and microparticles degradation studies.

Biography: Nicole is an undergraduate Chemistry major student at the University of Puerto Rico, Rio Piedras Campus. Since her second year in college, she started research in Organic Chemistry, as a MARC (Maximizing Access for Research Careers) scholar. This research experience shows her the different ways in which we can combine Organic Chemistry to biological processes, drugs, and environmental problems. Actually, in the RiSE Summer Program at Rutgers University, she experienced chemistry research applied to targeted drug delivery systems. At this moment, her future plans are obtain a Ph.D. in Environmental Chemistry or Biochemistry and then work as a researcher and professor. With this academic career, she will share her knowledge with the humanity, provide solutions through chemistry, and collaborate with other scientists in different areas of Chemistry to solve the major challenges on the world: health, energy, and environment. Also, as a professor, she will hope to develop research on Chemical Education to be an instrument in the scientific development of the future generations of our society. Moreover, she wants to show to general community the role Chemistry takes in the development of environmental and health solutions. For this reason, she wants to be a Ph.D. chemist: to discover new knowledge, but also to communicate to the humanity that we can make biggest changes in the world if we work together. On the other hand, outside the scientific area, she loves animals, do hiking, read, take pictures, dance salsa and eat “mofongo”.

Abstracts and Student Biographies

Cristina C. Torres Cabán **Poster # 12B**
University of Puerto Rico - Aguadilla

Mentors:
Carolina Ibáñez-Ventoso, Ph.D., MBA, Monica Driscoll, Ph.D.
Department of Molecular Biology and Biochemistry
Rutgers, The State University of New Jersey

Understanding aging biology: the role of *mir-34* in sarcopenia

Aging is an inevitable component of life across phyla, and is universally accompanied by diminished strength and mobility. In humans, this is called sarcopenia and is thought to be the primary contributor to frailty. A general goal of aging research is therefore to understand and combat sarcopenia. The nematode *Caenorhabditis elegans* is a powerful system that can be used to study this age-associated complication. A type of molecule known to modulate the aging process is called microRNA (miRNA). miRNAs are small single-stranded RNA molecules that target mRNA transcripts to regulate gene expression. One miRNA of interest in our laboratory is *mir-34*. The *mir-34* sequence is highly conserved in evolution and is found from *C. elegans* to humans, which suggests a universal role for this miRNA in fundamental biology. In *C. elegans*, *mir-34* expression levels rise with age and depletion of functional *mir-34* molecules extends lifespan. To increase our understanding of the molecular mechanisms of action of *mir-34* in sarcopenia, we first want to define the age-related decline in physical capacity of genetic mutants with *mir-34* loss of function (lf). We must clean *mir-34(lf)* animals of unwanted additional mutations by a series of genetic outcrosses with wild types. Then, we will measure the physical capacity of aging *mir-34(lf)* mutants in liquid using software our laboratory developed called CeleST. CeleST provides a detailed account of the physical capacity of animals via an output of ten swim parameter measures. We would expect that *mir-34(lf)* will exhibit delayed sarcopenia and thus extended muscle healthspan. Our laboratory is also interested in exploring the effects of other miRNAs in sarcopenia for which there are currently no loss of function mutants. We would use CRISPR/Cas technology to do precise genome editing to create specific genetic mutants of other miRNAs that are candidate modulators of sarcopenia.

Biography: Cristina C. Torres Cabán is a rising third year Biology major at the University of Puerto Rico, Aguadilla campus. She is a newspaper editor and manages public relations for the Green Chemistry Division of the American Chemical Society chapter at her campus. She is also the coordinator of the #PrettyIncredible program, which encourages young girls to get involved in STEM fields. Her previous research at the University of Minnesota in molecular genetics of yeast led to her participation in several conferences including ABRCMS, the 249th ACS National Meeting, and the ERN Conference in STEM, in which she won first place for her poster presentation in the Cell and Molecular Biology division. For the "RiSE at Rutgers" program, she was awarded a Summer Undergraduate Research Fellowship from the New Jersey Space Grant Consortium (a NASA-Sponsored Program). She is working in Dr. Monica Driscoll's lab under the mentorship of Dr. Ibáñez-Ventoso, studying how microRNAs impact *C. elegans* aging. When Cristina graduates, she plans to pursue a PhD in the Biomedical Sciences.

Abstracts and Student Biographies

Jonathan Tyson **Poster # 13A**
Rider University

Mentors:
Daniel Seidel, Ph.D, Rutgers Univerisity
Weijie Chen, Rutgers Univerity

Work Towards the Total Synthesis of the Chiral Ligand Sparteine

The dissimilar reactivities of different stereoisomers within biological systems results in the need for novel catalytic methods for the stereoselective synthesis of chiral molecules. This study explores the synthesis of the naturally occurring chiral compound, sparteine, which due to its inherent chirality and electron-rich amine groups can serve as a chiral ligand, thus allowing for the synthesis of only the desired chiral product. Synthetic strategy utilizes commercially available ethyl-3-bromopropionate, which is in three steps converted to divinyl ketone, to react with two equivalents of tetrahydrapyridine to form the desired product.

Biography: Jonathan Tyson is a senior biochemistry major at Rider University. After completing his undergraduate degree, he intends to pursue a Ph.D in molecular medicine. Jonathan is extremely passionate about sharing and teaching science, and as such, his current plan is to obtain a full-time faculty position at a research one university, so that he can teach known science, while contributing to the field through his research.

Abstracts and Student Biographies

Nicole Werpachowski **Poster # 13B**
Fordham University Lincoln Center

Mentors:
Stephen K. Burley, Christine Zardecki
Research Collaboratory for Structural Bioinformatics Protein Data Bank

The evolution of molecular visualization: building upon Irving Geis' framework to understand structural biology

Before the development of modern computer graphics for seeing molecules, the process of visualizing protein structures at the level of the individual atom was difficult. Beginning in the 1960s, Irving Geis, a famous artist, became recognized for his intricate, lucid scientific illustrations of newly discovered macromolecules like myoglobin and hemoglobin. He was able to take complex macromolecular information and present it in a way that was more easily understood by the scientific audience and lay public. In the same way, modern molecular visualizations (space-filling models, ribbon structures, etc.) present macromolecules and their comprehensive information in a readable, but highly more interactive way. Thus, through a partnership between the Howard Hughes Medical Institute and the RCSB Protein Data Bank (RCSB PDB; rcsb.org), a digital gallery archive of Geis' scientific illustrations is being developed to integrate both historical and modern visualizations, emphasizing the importance of both in better understanding molecules and their structures. The Geis Digital archive will be housed within PDB-101–an educational website within the RCSB PDB scientific resource for structural biology. The digital archive will enhance public outreach by improving the accessibility and conception of knowledge regarding complex structural biology.

RCSB PDB is supported by the NSF (DBI-1338415), NIH, and DOE. This work is part of an NSF REU.

Biography: Nicole Karolina Werpachowski, a NYC native and first-generation college student, is currently going into her second year at Fordham University at Lincoln Center. She is majoring in psychology on the pre-medicine track. After obtaining a B.S. in Psychology at Fordham, she plans on pursuing the M.D./Ph.D program, with a possible gap year to acquire more research experience. Nicole designed a research proposal, titled: "Potential Genes that May Influence the Progression of Retinopathy in Diabetics", in hopes of targeting genes and improving therapeutics for treating retinopathies in diabetics. In 2014, this proposal won second-place in the national "Design a Brain Experiment" competition led by the prestigious Dana Foundation. In 2015, she was nominated for and graduated from the Fordham University Emerging Leaders program, where she developed and improved upon her leadership skills and potential. Most recently, she was accepted into the 2015 Research in Science and Engineering (RiSE) undergraduate research program at Rutgers University. At Rutgers, she works with the Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB) on creating the framework and molecular visualizations for a digital archive of Irving Geis' scientific illustrations. She will leave the RiSE program with a deeper understanding behind the meaning of research, which will be an aid in her future academic journey in research and medicine.

Abstracts and Student Biographies

Maya M. Amouzegar **Poster # 14A**
University of Maryland, College Park

Mentors:
Yuri Gershtein, Ph.D., Eva Halkiadakis, Ph.D., Amitabh Lath, Ph.D., Scott D. Thomas, Ph.D.
Department of Physics and Astronomy
Rutgers, The State University of New Jersey
CMS Collaboration,
LHC, CERN

A study on multi-jets final states at the LHC

The Large Hadron Collider (LHC) at CERN, located in Geneva, Switzerland is the largest particle collider in the world. The LHC collided protons at an 8 TeV energy from 2012-2013 (Run 1), and after a long shut down for upgrades, the LHC started its second run at a higher energy of 13 TeV in March 2015 (Run 2). The Compact Muon Solenoid (CMS) is one of the four experiments at the LHC. CMS is a particle detector that looks at high-energy collisions at the LHC in order to find particles or phenomena beyond the standard model of particle physics referred to as "new physics". This "new physics" may include Supersymmetry (SUSY), extra dimensions, and dark matter particles. Each collision detected at CMS contains information about particles that were produced through different interactions. There is already new data collected in Run 2 and we studied events composed of multiple jets in the final state in the data and compared them to simulated Monte Carlo events. Jets are narrow cones of hadrons and other particles, which are produced by hadronization of quarks and gluons. By comparing jets in new physics signals with ones produced through QCD (Quantum Chromo Dynamics), we would be able to predict where new physics might be lying. If there is an excess of jets at a certain energy, it is possible that a process beyond the standard model is producing those jets. Most of our simulated Monte Carlo signals considered are R-Parity Violating SUSY interactions. R-Parity is a quantum number SUSY, which may or may not be violated. In order to perform these studies, we studied the jets' transverse momentum divided by the total hadronic energy in the event as a function of the jet multiplicity, between 2 and 8 jets. If there is an excess of transverse momentum, there is the possibility that new SUSY particles are created and are decaying into jets.

Biography: Maya Amouzegar is a senior double major in Physics and Astronomy at the University of Maryland, College Park. She is the vice president of the society of the physics students at her school, and is an active member of Women in Physics. She has been doing research in high-energy physics for nearly 2 years. She is a part of the CMS (Compact Muon Solenoid) collaboration, and does research with them through both Rutgers University and University of Maryland. CMS is one of the four experiments at the LHC (Large Hadron Collider), at CERN (the European Organization for Nuclear Research). Maya is very glad to be a part of Rutgers University's Physics and Astronomy REU, and work with Professor Halkiadakis and Professor Lath. Maya will be applying to PhD programs in physics in Fall 2015, with the hope of starting a PhD program in Fall 2016. Her long-term goal is to conduct post-doctoral research, and eventually get a permanent research position either in academia or a national laboratory. In her spare time, Maya enjoys playing the piano, reading, and playing video games.

Abstracts and Student Biographies

Sabrina M. Appel **Poster # 14B**
Reed College

Mentors:
Andrew J. Baker
Department of Physics and Astronomy
Rutgers, The State University of New Jersey
Kirsten R. Hall
Department of Physics and Astronomy
John Hopkins University

Spatially resolved star-formation in nearby analogues of Lyman break galaxies

At redshifts of z > 1.5, UV selected galaxies (such as z ~ 3 Lyman break galaxies = LBGs) are the population with the largest number of known redshifts, giving them an important role in the development of our understanding of the history of galaxy formation. However, LBGs are rather poorly understood at longer wavelengths, and thus our understanding of the total star formation rates and gas masses in galaxies such as LBGs is highly uncertain. A common strategy is to assume that the Kennicutt-Schmidt law relating star formation rate (SFR) and gas mass surface densities holds, even in these high redshift galaxies, when testing the relation is not feasible. To test the validity of this assumption, this project aims to examine in greater detail the Kennicutt-Schmidt law in nearby (z ~ 0.2) starburst galaxies in the hope of understanding key questions regarding star formation processes in UV selected galaxies. Several nearby galaxies with high UV luminosities and surface brightnesses, reminiscent of those found in LBGs, have been identified and used for this project. We have investigated new, spatially resolved observations of these nearby analogues. We determine the SFR surface density from the Paschen alpha emission line (of hydrogen) and the gas mass surface density using carbon monoxide emission. We then plot these surface densities and fit the relation between them in order to examine whether they follow the expected Kennicutt-Schmidt law, and to investigate any implied variation in gas depletion times between and within galaxies. This work was funded by the National Science Foundation grant AST-0955810.

Biography: Sabrina Appel is a student at Reed College in Portland, Oregon. This fall she will begin her junior year as a physics major. This summer she is working with Professor Andrew Baker on the relationship between star formation rate and gas surface densities in nearby starburst galaxies; this project is her first research opportunity. She intends to go to graduate school and hopes for a career that involves education.

Abstracts and Student Biographies

Alex Bixel **Poster # 15A**
University of Virginia

Mentors:
Jerry Sellwood, PhD and Carl Mitchell
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Measuring the dark matter content of galaxies with SALT

In order to test the predictions of galaxy formation models, we seek to measure the detailed dark matter distributions of spiral galaxies. The best way to accomplish this is through measurements of the Doppler shift of the Hα line that is emitted by excited hydrogen gas. From these, we can produce detailed velocity maps and rotational models of a galaxy. Since the gas flows in rough centrifugal balance, we can use the rotational models to estimate the central gravitational attraction and therefore the mass distribution. For our measurements, we utilize the Southern African Large Telescope (SALT) equipped with a Fabry-Perot interferometer. We present a velocity map produced from Fabry-Perot observations of the spiral galaxy NGC 908 scanning over the Hα line. We fit axisymmetric and non-axisymmetric rotational velocity models to the velocity map, and find that the fitted systemic velocity gives good agreement with previous measurements in the literature.

Biography: Alex Bixel is from Roanoke, Virginia. He is currently in his fourth year at the University of Virginia, where he studies astronomy and physics and is involved in the student astronomical society. His current research focuses on mapping the rotation curves of nearby galaxies as part of an effort to test the predictions of models of galaxy formation. Upon graduation, Alex plans to enter a doctoral program in astronomy.

Abstracts and Student Biographies

Holly M. Christenson **Poster # 15B**
Western Washington University

Mentors:
Nakul Gangolli, Eric Gawiser, Catie Raney, & Jean Walker
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Analysis of narrow-band optical imaging to discover Lyman Alpha Emitting galaxies at z~3.1

We present an optical image of the MUSYC 1030+05 field taken with the MOSAIC II CCD camera at the CTIO 4m telescope using a narrow-band filter centered at 5015 Angstroms. The raw images were reduced with the MSCRED package of IRAF, including the crucial steps of bias subtraction, flat-field correction, cosmic ray and satellite trail rejection, astrometric calibration, tangent plane projection, weighted stacking, and sky background removal.

We are using the reduced images to produce a catalog of Lyman Alpha Emitting galaxies (LAEs) at redshift z~3.1. LAEs are young, compact galaxies with high rates of star formation; they are characterized by Lyman-alpha emission from electrons recombining with protons in clouds of ionized gas within the galaxy. The catalog of LAEs will be further analyzed and compared to other catalogs in order to characterize how the star formation rate, number density, clustering, color locus, and associated dark matter halos of LAEs evolve with redshift.

Biography: Holly Christenson is a junior majoring in physics at Western Washington University in Bellingham, WA. She is spending this summer in the Rutgers University Physics & Astronomy REU program, working with Professor Eric Gawiser and her co-authors on the reduction of narrow-band optical images in order to produce a catalog of Lyman Alpha Emitting galaxies at z~3.1. Upon completing her undergraduate degree, she intends to pursue a PhD in astronomy.

Abstracts and Student Biographies

Ricardo J. Garcia **Poster # 16A**
University of Puerto Rico, Rio Piedras

Mentors:
Larry Zamick, Ph.D.
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Gamow-Teller transitions and magnetic moments in the $f_{7/2}$ nuclear shell

We apply the matrix-operator representation of quantum mechanics within the context of the nuclear shell model to study the so-called $f_{7/2}$ shell, the shell that is immediately above the outermost filled shell in ^{40}Ca. We study the Gamow-Teller transition (a type of beta decay in which the electron and antineutrino come out in a spin one state) and compute magnetic moments for several nuclei by means of four simple interactions of theoretical interest: the J=0 and J=7 (maximum) pairing interactions (extreme cases) and the J=Half pairing interaction (intermediate between J=0 and J=7 pairing), along with the ‘realistic’ MBZE interaction, each one characterized by a specific Hamiltonian matrix. More precisely, we obtain allowed energy levels and corresponding wave functions for a nuclear transition by means of the interaction under consideration’s Hamiltonian, and we use these wave functions to calculate the probability amplitude (the so-called B(GT)) that a transition from a certain nuclear state with spin Ii to another state with spin If will occur, and to calculate the magnetic moment of the nucleus. We analyze our calculations to identify theoretical trends and/or selection rules, and we compare our results to experiment, keeping in mind the highly simplified nature of the interactions studied.

Biography: Ricardo Garcia Santiago is a rising senior at the University of Puerto Rico, Rio Piedras, where he is working towards a double major in physics and mathematics. He underwent his first research experience this summer, working with Dr. Zamick, a nuclear theorist, to uncover the rules that govern nuclear transitions. After completing his undergraduate studies, he intends to pursue a master’s degree in theoretical and mathematical physics and afterwards a Ph.D. in physics.

Abstracts and Student Biographies

Shaun P. Hogan **Poster # 16B**
The University of Alabama

Mentors:
Eva Halkiadakis, Ph.D, Yuri Gershtein, Ph.D,and Ms. Clare Shanahan
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Preparations for upgrades to the level 1 track trigger at the Compact Muon Solenoid for the High Luminosity Large Hadron Collider

The Large Hadron Collider (LHC) has been instrumental in testing some of the most prominent theories of particle physics. By colliding two protons head-on at high energies, detectors such as the Compact Muon Solenoid (CMS) are able to probe matter and interactions at extremely small length scales. A measurement of how many proton-proton collisions occur within a given time is called the luminosity. The LHC was designed to operate with a luminosity on the order of 10^{34} $cm^{-2}s^{-1}$. An upgrade planned for the mid-2020's, designated the High Luminosity Large Hadron Collider (HL-LHC), aims to increase the luminosity by a factor of ten. With every proton-proton event, data from the collision gets sent to a Level 1 (L1) Trigger, which quickly analyzes whether the event contains useful information or not. With the implementation of the HL-LHC, the amount of data to be processed by the L1 Trigger will increase significantly, and new methods of processing information, particularly identifying charged particles and tracks, at this level will be required. Emulations of future L1 Track Trigger upgrades were tested with simulated data of pileup events (collisions besides those deemed to contain useful information) to analyze the efficiency of detection algorithms. Furthermore, one particular search that will be conducted at the HL-LHC will be that of the Standard Model Higgs boson to light Higgs bosons. These light Higgs are predicted to decay into combinations consisting of bottom quarks and tau leptons. Simulations of such events were generated, and subsequently analyzed in order to determine how these decays would appear within the detector, so that new detection algorithms may be created, and existing ones may be refined in order to detect the charged tracks created by these particles, and look for signatures of new physical events.

Biography: Shaun Patrick Hogan, born in Alton, Illinois, is a rising junior at the University of Alabama and is pursuing a double major in physics and mathematics. He is a member of the Computer-Based Honors Program, an undergraduate research initiative, and began his research experience as a sophomore. At Alabama, Shaun is a member of the Collider Physics Group, and researches exotic particles at the Large Hadron Collider under Dr. Conor Henderson. Currently, he is planning on going to graduate school for particle physics and obtaining a doctorate.

James P. Horwath **Poster # 17A**
Alfred University

Mentors:
Robert Bartynski, Sylvie Rangan
Department of Physics & Astronomy and Laboratory for Surface Modification
Rutgers, The State University of New Jersey

Understanding electron energy loss mechanisms in EUV resists using photoemission and electron energy loss spectroscopies

In order to continue to enhance the performance of computers, processes to efficiently and accurately manufacture nanoscale processors must be developed. One such process, Extreme Ultraviolet (EUV) Lithography, involves exposing photoactive resist materials to high-energy UV light, the resulting reaction changing the solubility of exposed areas to allow for chip patterning after development. In this work, we have examined novel organometallic resist materials (diphenyl tellurium diacrylate, triphenyl antimony diacrylate, tricyclohexyl antimony diacrylate, and triphenyl bismuth diacrylate) using X-ray and UV Photoemission Spectroscopies (XPS and UPS), and Reflection Electron Energy Loss Spectroscopy (REELS) to understand the key mechanisms by which excited low energy electrons ($E < 90$ eV) interact with, and deposit energy into resist films. Under ultra-high vacuum conditions, we explored the electronic structure of resist thin films using XPS, and UPS aided with electronic structure calculations. Subsequently, we exposed the resist samples to electron beams of varying energies ($E = 30, 50, 70, 90, 110$ eV), measuring energy loss channels with REELS, while using XPS and UPS to monitor chemical changes in the films. Using empirical calculations to predict the chemical shift of core-level metal XPS peaks based on their coordination, we were able to propose a mechanism, consistent for all four resists, leading to the formation of stable di- or triphenyl metal compounds embedded in a new cross-linked polymer.

Biography: Jay Horwath, of Doylestown, PA, is a rising junior at Alfred University studying Glass Engineering Science. Jay has spent the summer working in experimental condensed matter physics under the guidance of Drs. Robert Bartynski and Sylvie Rangan. After graduation in May of 2017, he plans on attending graduate school with hopes of conducting materials research.

Abstracts and Student Biographies

Ian A Hunt-Isaak **Poster # 17B**
Oberlin College

Mentors:
Dr. Sevil Salur, and Raghav Kunnawalkam Elayavalli
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Monte Carlo investigation of the quark-gluon plasma

The Quark Gluon Plasma (QGP) is a hot, dense state of matter in which the Quarks and Gluons which make up Hadrons are freed. The QGP is theorized to be similar to the conditions during the first few milliseconds of the universe. The LHC can create QGP via the collision of Lead(Pb) ions at ultra relativistic velocities. The QGP is short lived so external probes cannot be used to glean information. So instead we turn to internal probes such as jets, which are sprays of particles from a hard scattering of quarks and gluons. It is expected that Proton-Proton (pp) collisions do not generate a QGP so by comparing jet observables in PbPb and pp collisions, we can gain information about the medium. To quantify the medium properties we then compare measurements with Monte Carlo (MC) simulations. In this presentation I will discuss Jewel MC Generator in comparison to data for a particular jet observable i.e., 3 Jet to 2 Jet event ratios.

Biography: Ian was born and raised in Byrn Mawr Pennsylvania. He is currently studying Physics and Mathematics at Oberlin College, and is expecting to graduate in 2017. Upon completion of undergraduate studies he hopes to continue on to graduate work in Physics. This REU was particularly valuable as it allowed him to experience an interesting area of Physics as well gain insight into the graduate school experience. Outside of his coursework Ian spends his time running Oberlin College's 3D printing club and organizing science activities for the Oberlin Boys and Girls club.

Abstracts and Student Biographies

Jyothisraj Johnson **Poster # 18A**
Hunter College

Mentors:
Charles Keeton, Ph.D. and Sean Brennan Ph.D. Candidate
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Characterizing the zone of influence of dark matter clumps on image positions and flux ratios in gravitational lensing systems

The Cold Dark Matter (CDM) model of the universe predicts that there should be hundreds to thousands of clumps surrounding a massive galaxy. However, observations have shown that we only see dozens of dwarf galaxies and not the hundreds that are projected. This means that either the CDM model prediction is wrong, or most of those clumps consist of dark matter that cannot be observed directly. Massive galaxies serve as natural gravitational lenses throughout the universe that allow us to indirectly observe these dark matter perturbations. Strong gravitational lensing occurs when these massive elliptical galaxies have the critical density required to bend light from a source located behind it and produce multiple images of that same source. Dark matter clumps located near these multiple images affect their positions and flux ratios. Our goals were to quantify how dark matter clumps affect image properties and characterize this zone of influence through color maps. Our results showed regions around each of the image positions that display significant perturbations for low mass clumps; these distinct regions bleed together when considering higher mass clumps. We also found a correlation between area perturbed by the dark matter clump and its mass.

Biography: Jyothisraj Johnson is a rising junior at Hunter College. He is double majoring in Physics and Mathematics and hopes to be a Fulbright Scholar and/or take part in the Teach For America program after his undergraduate studies and before pursing a Ph.D. in Physics. His work with Professor Keeton focused on understanding the effects of dark matter substructure on the positions and flux ratios of images produced by a gravitational lens. His experience this summer has taught him valuable programing skills including Python, Terminal and Shell-scripting. Overall, he has enjoyed his experience in the Physics REU program and hopes to take part in another REU next summer.

Sunday O. Ebo **Poster # 18B**
Rutgers, The State University of New Jersey

Mentors:
Dr. Christopher Rongo, Dr. Stephanie Pyonteck
Genetics Department
Rutgers, The State University of New Jersey

Testing the roles of hif-1 target genes in the *C. elegans* anoxia response

The complete lack of oxygen (anoxia) is detrimental to the survival of aerobic organisms. Oxygen is a key component in the production of cellular energy. Neurons specifically require a substantial amount of energy to survive, but have no energy storage system, prompting the rapid death of neuronal cells following anoxia. Cells sense and respond to changes in oxygen levels using the evolutionarily conserved hypoxia response pathway. In this pathway, the prolyl hydroxylase enzyme EGL-9 uses oxygen to promote the turnover of the transcription factor HIF-1. Thus, under normal levels of oxygen (normoxia) HIF-1 levels are low. Without oxygen EGL-9 is unable to hydroxylate HIF-1, leading its stabilization and altered transcription of its target genes. Despite having a conserved hypoxia response pathway to humans, *C. elegans* can survive anoxia substantially better. In the occurrence of anoxia, neuronal mitochondria undergo fission and split to become very small. Upon reoxygenation, the mitochondria undergo fusion and return to their normal size. However, in egl-9 mutants where HIF-1 is always stable the mitochondria become hyperfused and extra long upon reoxygenation. This hyperfusion of the mitochondria is a HIF-1-dependent process because it is not observed in egl-9 hif-1 double mutants. We do not know which HIF-1 target genes are responsible for mediating this response. We hypothesize that the up-regulation of the HIF-1 target gene T18D3.9 is necessary for hyperfusion because of its homology to human MPV17, which encodes a mitochondrial inner membrane protein. I have undertaken several strategies to test the function of T18D3.9. To disrupt the function of T18D3.9, I have validated a mutant missense allele and generated several vectors for RNA interference (RNAi) mediated knockdown. I am also generating a reporter gene that will express T18D3.9 tagged with the fluorescent protein GFP or mCherry to confirm that its protein product is mitochondrially localized.

Biography: Growing up in Nigeria I could always envision myself in a lab coat, however I could not see any possible way I could achieve that goal. My parents also believed that living in Nigeria was not the best conditions for me and my three other siblings to succeed in life. After countless number of attempts, my parents were able to bring the entire family to America. Living here for 8 years, my sister is doing well in medical school, my older brother is about to graduate from Rutgers Camden, and my younger brother is about to start college here at Rutgers New Brunswick. I am going to college and will hopefully graduate in 2 years, with endless possibilities. My goal of becoming a medical doctor is within my grasp. These were achievements that I could not envision growing up in Nigeria. These achievements thus far, were only possible with my parents working 2 jobs each, to give us the best education possible. I appreciate the effort my parents are putting in to get me to achieve my goal, and I want to make them proud by becoming a medical doctor.

Abstracts and Student Biographies

Hector R. Lisboa **Poster # 19A**
Rutgers University

Mentors:
Kristin Moskal, Ilya Raskin, Diana E. Roopchand
Department of Plant Biology and Pathology
Rutgers, The State University of New Jersey

Effects of High-Polyphenol Rutgers Scarlet Lettuce [RSL] Murine Gut Microbiota

Diet, lifestyle, and genetic factors contribute to development of metabolic syndrome (MetS), which increases the likelihood of developing type 2 diabetes (T2D) and cardiovascular disease (CVD). Metabolic syndrome (MetS) is diagnosed in individuals with three of the following symptoms: hypertension, hyperglycemia, hyperlipidemia, visceral adiposity, and hyperinsulinemia. MetS is also associated with an unhealthy gut microbiota profile. This experiment tested the effects of polyphenols from Rutgers Scarlet lettuce (RSL) on the gut microbiota profile of C57BL/6 male mice after 12 weeks of supplementation. Mice were fed: low-fat diet (LFD), very high-fat diet (VHFD), VHFD incorporating 6.4% green lettuce (GL-VHFD), and VHFD incorporating 6.4% RSL (RSL-VHFD). RSL contains 0.2% of anthocyanins, which give its red color. At end of twelve weeks fecal samples were collected and frozen for 16S rRNA sequencing to assess microbial ecology. Microbial DNA was isolated from the fecal samples, and the V3 and V4 regions of the 16S rRNA gene was amplified (amplicon PCR) and barcoded (index PCR) prior to sequencing on the Illumina MiSeq. Analysis was performed using 16S Metagenomics on Illumina BaseSpace website. Results showed that the RSL-VHFD and GL-VHFD slightly improved the gut microbiota profile by increasing Verrucomicrobia concentration and Bacteroidetes/Firmicutes, but remained poorer than the profile of the LFD. Also, the differences found between GL and the anthocyanin-rich RSL were negligible. A comparison of these results to the results found in a grape polyphenol (GP) study provides evidence that the proanthocyanidins found in GP could be the key ingredient in an anti-MetS dietary supplementation.

Biography: Hector Lisboa is a rising junior at Rutgers University. He is majoring in Exercise science and intends to pursue an M.D. after graduation. Hector has achieved academic success in Rutgers, twice awarded the ODASIS High Achiever's award in addition to the Rutgers University Academic Excellence Award. Hector has also expanded beyond academics by performing as a member of the Rutgers University Marching Scarlet Knights for two years. At RiSE, Hector is working with Diana E. Roopchand and Kristin Moskal in analyzing the effects of Rutgers Scarlet Lettuce on murine gut microbiota, as well as the influence of dietary supplementation on metabolic syndrome. This is Hector's first time conducting research and he is very grateful for this opportunity. He hopes a background in research can leave a positive impact on his approach to science and health as an M.D.

Abstracts and Student Biographies

Jonathan D. Ambrose **Poster # 19B**
Univeristy of Puerto Rico Mayagüez

Mentors:
Hua Hong, Stephen Tse
Department of Mechanical and Aerospace Engineering
Rutgers-School of Engineering

The doping of flame Synthesized graphene

Lithium batteries are important to consumer life since they are used in all cell phones, computers, etc,. These devices have a growing number of applications and the market growth is exponential. Hence, every person demands technology with higher energy storage capacities. Researchers have tried to improve energy storage for anodes using various materials, but carbon is showing improved storage capacities, conductivity, and low electrochemical potential for a better price than lithium. Currently, N-doped graphene is being fabricated using a two-step method and this lab group has devised a single step process involving flame synthesis. The single step process uses Methane as fuel and the precursor for graphene growth while using N_2 instead of ammonia, NH_4, for doping. The latter process is less toxic, cheaper, and has promising industrial aspects even though preliminary results have not been obtained.

Biography: Jonathan D. Ambrose Torres was born on February 12, 1994 in San Bernardino, California to John Ambrose and Nelky Ambrose Torres. During his youth he asked many questions and also enjoyed imagining and then creating structures/things from LEGOs. Currently, he is a third year Civil Engineering student with a minor in Material Science at The University of Puerto Rico –Campus Mayagüez (UPRM). He has presented in the North Eastern Alliance Poster conference (March 20 2015), and has researched sustainable water filters under Dr. Marcelo Suarez (August 2015 to May 2015) –funded by Training in Agriculture and Related Sciences (CETARS). He is also the second author in a paper, Photo-Degradation of Atrazine with sintered TiO_2 / recycled Glass Composites, which has been submitted and is under review.. He was accepted into the GET-UP summer program for 2015 and is currently researching the doping of flame synthesized graphene under Dr. Tse at The State University of Rutgers New Brunswick NJ campus. Note, the latter research is part of the following thrust within GET-UP: nanotechnology and materials for energy storage and conversion. He has also been the co-director of Decoration and Activities for the Adventist Federation of The University (FADU). These roles have developed his leadership and management skills. For example, he has led groups of 15 people to manage the logistics of FADU's activities for up to 150 people, planned many social activities related to the group, and has participated in several staff meetings. Although Mr. Ambrose is still exploring his academic field, he intends to pursue graduate study in either Civil Engineering with a Material Science emphasis or Pure Material Science to relive the joys of his youth - To simply imagine, create and find the answers to his questions.

Abstracts and Student Biographies

Anita H. Brown **Poster # 20A**
Duke University

Mentors:
Mr. Ryan Anderson, Kevin Blinn, Ph. D., Richard Riman, Ph. D.
Department of Material Science
Rutgers, The State University of New Jersey

Carbonating foamed cements

The development of ceramic materials that are lightweight and less energy intensive is important when moving forward in the greening of materials. The manufacturing of ceramics typically demands a great deal of energy due to the high temperature kilns required for processing. This research project focuses on two aspects: designing low density cement and hardening the cement through lower temperature methods. By making the material lightweight, less material is used and by hardening the cement through low temperature methods, less energy is used. In order to create a low density material, foamed cements were created and hardened using the gas assisted reactive hydrothermal liquid phase densification (g-rHLPD) process developed by the Riman Research Group. The cement foams are evaluated by their chemical characteristics, physical characteristics, and microstructural features. The chemical characterization is completed by obtaining the carbonate content of the cement by thermogravimetric analysis (TGA). The physical characterization is done by testing the compressive strength of the cement to confirm if the cement is suitable for application. The density is also measured to indicate its relationship with the compressive strength of the cement. The microstructural features are observed through optical microscopy. In order to determine the properties of the foam, foam processing conditions were varied. Additional studies were conducted to compare the energy consumption and carbon footprint in manufacturing Ordinary Portland cement (OPC) vs carbonatable cement and to compare the curing methods by looking at the amount of water OPC consumes during curing vs the amount of carbon dioxide carbonatable cement sequesters. This study is important for developing materials that use less water and energy during manufacturing and processing.

Biography: Anita Helene Brown, a native of Rock Hill, SC, is a senior Civil Engineering major in the Structural Engineering and Mechanics track at Duke University, located in Durham, NC. She was awarded the Marjorie B. and Robert W. Carr, Jr. Scholarship in 2013; named as a Peggie C. Cleveland Scholar in 2014; and was a recipient of the American Society of Civil Engineers (ASCE) NC Section Scholarship Award in 2014 and 2015. She is a member of the first trumpet section in the Duke University Marching and Pep Band as well as a Dean's list recipient. Anita has worked as a Calculus 1 and Linear Algebra tutor as part of Duke's Peer Tutoring Program. In the summer of 2014, Anita participated in the Summer Program to Increase Diversity in Undergraduate Research (SPIDUR) under the direction of Dr. Brett Tempest, at the University of North Carolina at Charlotte. She presented her work, Permeable Porosity of Geopolymer Cements, at the 2014 Summer Undergraduate Research Symposium at UNC Charlotte and the 2014 State of North Carolina Undergraduate Research and Creativity Symposium (SNCURCS). Anita was recently elected to serve as President of Duke University's Chapter of the American Society of Civil Engineers for the 2015-2016 school year. This summer Anita is participating in the Green Energy Technology Undergraduate Program (GETUP) at Rutgers University. She is working under Dr. Richard Riman in the Department of Material Science. Her project, "Particle Stabilized Foams and Carbonatable Cements", focuses on the materials research thrust of GETUP in the reduction of energy consumption and resources during production. Anita plans to pursue graduate study in Structural Engineering or Material Science.

Abstracts and Student Biographies

Salimar Cordero **Poster # 20B**
University of Puerto Rico, Mayaguez Campus

Mentors:
Dr. Nicole Fahrenfeld
Department of Civil and Environmental Engineering
Rutgers, The State University of New Jersey

Design of a microbial fuel cell to enhance degradation of polycyclic aromatic hydrocarbons

The release of crude oil to the environment during leaks and spills poses a serious health hazard for wildlife and humans by introducing organic contaminants like polycyclic aromatic hydrocarbons (PAHs). Utilizing Microbial Fuel Cells (MFCs) to increase the rate of degradation of contaminants has been studied, with a focus on mixes of alkanes, alkenes and BTEX. This work is focused on developing a design for a MFC which can produce energy, but also, more importantly, can help increase the rate at which PAHs degrade. Voltage measurements of the MFC will be taken with a multimeter to produce polarization and density curves, which help determine useful current parameters for maximum voltage production. Samples of the sediment will be stored for future chemical analysis via HPLC. A prototype single-chamber MFC has been constructed to test for voltage and power production. A maximum of 220mV has been recorded for a power density of $20mW/m^2$. The objective of this study is to compare power generation and biodegradation in two different sediment types, a historically contaminated sediment and a spiked sediment.

Biography: Salimar Cordero Mercado was born in the town of San Juan, Puerto Rico. Currently, she is a rising senior at the University of Puerto, Mayaguez Campus pursuing a bachelor’s degree in Chemical Engineering with a focus on environmental chemistry and engineering. Along the way she has earned a grant from the Louis Stoke Alliance for Minorities toward her research in the bioremediation field and she has participated in the Training in Agriculture and Related Sciences (CETARS) program were students are encouraged to do research as well as to participate in community outreach, by visiting schools and teaching students about soil and agricultural sciences. She is also a member of the Golden Key International Honour Society and the American Institute of Chemical Engineers which have provided her opportunities in professional development. During this summer, she is working under the guidance of Dr. Fahrenfeld in a project focused on the design of microbial fuel cells as an effective and efficient method for bioremediation. This project is part of her work as being a Get-Up REU working under the devices and energy management systems for energy generation, conversion and storage thrust. After graduation she aspires to obtain a Master’s degree in Environmental Engineering.

Abstracts and Student Biographies

Kaitlyn M. Dickson **Poster # 21A**
The College of New Jersey

Mentors:
Ashley M. Pennington, Fuat E. Celik Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Photocatalytic biomass conversion using Pt supported on TiO_2

Photocatalytic production of hydrogen gas via biomass reforming is a sustainable and renewable source of energy. Titanium dioxide is a commonly used photocatalyst due to its photocatalytic activity under ultraviolet conditions and it's stability under reaction conditions. Its band gap, however is too large for an electron to be excited from the valence band to the conduction band by visible light and therefore it is not active under visible-illumination. Visible illumination accounts for 43% of solar irradiation that reaches earth, whereas UV illumination only accounts for 4%. By supporting metals (Ag, Cu, Ni, Pd, Pt) on TiO_2 it is possible to shrink the band gap which will allow absorbance of lower energy light. The metal-modified catalysts were prepared using incipient wetness impregnation (IWI) technique of a metal salt solution in Degussa P25 TiO_2 (P25). The photocatalysts were tested in both a quartz tube kinetic reactor and a diffuse reflectance reactor (DR). Reactions were run under three conditions, no illumination, UV-light illumination and visible light illumination. The conversion of methanol as well as the production of hydrogen gas were measured via GC analysis. In situ spectra of the DR reactor were taken via a UV-visible spectrophotometer. These spectra were converted to Kubelka Munk Units (KMU) which are analogous to absorbance units for diffuse reflectance experiments. KMU were converted using the Tauc equation in order to determine the band gap of the sample. The ex situ band gaps were determined to be 3.39eV, 3.36eV and 3.27eV for the as prepared 1% Pt/P25, calcined 1% Pt/P25 and calcined P25 respectively. The catalyst will be reduced and passivized and then tested for methanol oxidation, methanol steam reforming, methanol oxidative steam reforming, and methane steam reforming.

Biography: Kaitlyn Dickson was born and raised in northern New Jersey. She is currently a rising Junior pursuing a Bachelors of Science in Chemistry at The College of New Jersey. She was recently elected as the vice president of TCNJ's Environmental Club and is a certified responding emergency medical technician (EMT) for the college's volunteer squad. She is also a Dean's list recipient. During the academic year she is doing research under Dr. Bradely in an organic chemistry lab researching new methods of synthesizing benzyl azetidine compounds. As a participant in the GET UP REU Kaitlyn is working in Dr. Celik's lab researching photocatalytic biomass reforming using metal-modified TiO_2, which falls under the GET UP thrust to research possible renewable and sustainable fuels. After her undergraduate studies she hopes to pursue a PhD in Chemistry with a focus in environmental chemistry or organic chemistry.

Abstracts and Student Biographies

Ai lian Lin **Poster # 21B**
Clarkson University

Mentors:
Fangzhou Yu; Jaeseok Jeon
Department of Electrical and Computer Engineering
Rutgers University

Polymer-Based Cantilever Probe for Atomic Force Microscopy

This work demonstrates a polymer-based V-shaped cantilever probe for atomic force microscopy, to enable non-invasive topographical imaging and nanomechanical measurements of live mammalian cells. The prototype fabricated using a low-cost process and bio-compatible materials shows a sharp tip with a radius of curvature well below 100 nm.

Biography: Ai lian was born in China and currently lives in Brooklyn, NY. She is a rising senior at Clarkson University, majoring in Chemical Engineering with a Mathematics minor and a concentration in Biomolecular Engineering. She is a member of Omega Chi Epsilon (Chemicla Engineering Honor Society) and Tau Beta Pi (Engineering Honor Society) as a result of her high academic achievement. Ms. Lin was chosen as a McNair Scholar for the summer of 2014, conducting research on the Fluidized Bed and Tray Dryer. Currently, she is working with Dr. Jeon in the Electrical Engineering Department of Rutgers University under the GET-UP program. Her research focus is on microfabrication which follows the nanotechnology and materials thrust of the GET-UP program. Her short-term goal is to obtain a Master's degree in an Engineering field and her long-term aspiration is to achieve a doctoral degree in Engineering with a focus on consumer products.

Abstracts and Student Biographies

Jonathan D. Lonski **Poster # 22A**
Rutgers School of Engineering

Mentors:
Dr. Mona Zebarjadi, Xiaobing Zhang, Ivan Solomahhin
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Using thermoelectric materials to generate electricity

This research project is part of the Green Energy Technology Undergraduate Program and focuses on devices and energy management systems for energy generation, conversion, and storage. As the world's natural resources continue to be depleted, it is necessary to explore more sustainable energy options. There is an abundance of thermal energy on Earth, whether it come from solar energy or the heat given off by mechanical processes that go to waste each day. One method to utilize this thermal energy is to convert it into electricity by inducing a temperature gradient across thermoelectric materials which will create a voltage. Attempts thus far have been inefficient, as no known material possesses a high enough figure of merit to make this technique plausible on a large scale, so researchers at Georgia Tech University and University of California - Santa Barbara are fabricating new materials. Their goal is that the new thermoelectric materials will have a much higher figure of merit than has been measured before. This project aims to create an accurate and precise experiment to test the properties of these new thermoelectric materials once they arrive at Rutgers in the fall. Others have created similar experiments to test for thermoelectric properties, but there are few that have done so at high temperatures in a vacuum as this design accomplishes. Once the experiment is set up, and ample trials have been run on thermoelectric materials with known properties, statistical analysis will be performed on the data and compared with the known values to determine the accuracy and reliability. Once we determine that the experiment gives us a high enough confidence interval, we will be able to verify that the experiment is ready to test the properties of new materials.

Biography: Jonathan Lonski was born in New Brunswick, New Jersey, but has lived in East Brunswick, New Jersey his whole life. He graduated from East Brunswick High School in 2012 where he was awarded a scholarship his senior year by DCH Honda for his efforts to end distracted driving. Jon is currently a rising senior at Rutgers working towards a degree in industrial engineering with a minor in economics. After his first semester at Rutgers, Jon was invited to become a member of the National Society of Collegiate Scholars, and since then has become a member of Delta Epsilon Iota and Alpha Pi Mu honors societies. Additionally, Jon was awarded the Phi Kappa Sigma Foundation Scholarship award during the fall 2014 semester, the Estate of E.M. Toomey Scholarship during the spring 2015 semester, and the Material Handling Society of New Jersey Scholarship also during the spring 2015 semester, all for his high academic success, leadership qualities, and recommendations. Outside of academics, Jon is a brother of Phi Kappa Sigma International Fraternity in which he has held positions such as alumni relations chair, fundraising chair, sergeant-at-arms, and housing manager. Jon was hired as an intern for a trucking company called Hermann Transportation in the summer of 2013. Jon's GET UP research falls into the thrust regarding devices and energy management systems for energy generation, conversion, and storage under the guidance of Dr. Mona Zebarjadi. His specific project focuses on designing an accurate and reliable method to test for the seebeck coefficient, resistivity, and conductivity of thermoelectric materials at high temperatures inside a vacuum. After graduating, Jon plans on pursuing graduate studies in industrial engineering after graduation.

Abstracts and Student Biographies

María Elisa Ramos-Sepúlveda **Poster # 22B**
University of Puerto Rico at Mayagüez

Mentors:
Zeqing Shen, Rutgers University, Department of Chemistry and Chemical Biology

Deirdre M. O'Carroll, Rutgers University, Department of Chemistry and Chemical Biology, Material Sciences and Engineering, Institute for Advanced Materials, Devices, and Nanotechnology

Fabrication of nanoporous metals

In previous research, scientists and engineers have come to the conclusion that light-emitting devices using electrodes with different morphologies (e.g., planar, nanorod array, and nanostripe) exhibit remarkably varied efficiencies. Nanoporous metal (NPM) is an electrode type that hasn't been widely studied but, recently, work by Shen and O'Carroll indicated that NPM has the potential to improve both the light-extraction efficiency and internal quantum efficiency of thin-film light-emitting materials because of its strong light-matter interactions. Therefore, using NPM thin films as electrodes could lead to the fabrication of devices for light generation with high efficiency. In this project, a procedure is developed to control the size and density of nanopores in Ag thin films to tune their optical response. Based on the results of a previous experiment, the dewetting method is chosen to obtain the nanoporous Ag (NPAg). In this method, the time and temperature of annealing are changed to study their influence on the final NPAg morphology. The morphology and optical properties of planar Ag and different NPAg morphologies are characterized using scanning electron microscopy (SEM), correlated dark-field, bright-field and transmission optical microscopy, and UV-Visible absorption spectroscopy. Data show that higher annealing temperatures drive higher porosity and larger pores width. As expected, Ag films with larger thicknesses require higher temperatures to form porous structures because of their lower surface-to-volume ratio. In films of 100 nm in thickness, no pores are generated at temperatures as low as 100 ^{o}C, and even at 200 ^{o}C pore density is small and almost impermissible. However, in 50-nm-thick films, pores are readily formed at these two temperatures and, in certain cases, metal particles are generated, but the uniformity of the Ag surface morphology is low compared to the 100-nm-thick films. These results prove that both annealing time and temperature are important variables to control the morphology of the NPAg.

Biography: María Elisa Ramos-Sepúlveda was born and raised in Utuado, Puerto Rico. Now she is a student at the University of Puerto Rico, Mayagüez about to start her fourth year in a five-year civil engineering program. At her university, María Elisa has worked on a research project on the fabrication and characterization of bamboo and chitin compounds with Dr. Marcelo Suárez, and presented her work at the XX Sigma Xi Poster Day. She was chosen to be the new secretary of the Material Advantage team for the 2015-2016 academic year. In March, she was accepted into the Green Energy Technology for Undergraduates Program (GET UP) at Rutgers University in a research project that focus in devices and energy management systems for energy generation. At Rutgers she currently works with Dr. Deirdre M. O'Carroll and Ph.D student Zeqing Shen improving light extraction from light-emitting devices using nanoporous metal films. Becoming an expert in her field and gaining a position in her dream job is her mayor purpose in life. María Elisa's long-term career goal is to enter the world of academia and become a university professor. Specifically, with her knowledge in civil engineering and green energy, she wants to help Puerto Rico become a country known by its ecofriendly environment.

Abstracts and Student Biographies

John L. Sperduto **Poster # 23A**
The College of New Jersey

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

A windbelt with embedded flexible-inflatable-actuators for tunable energy-harvesting from wind

Many sustainable energy production researchers are developing systems and devices that harvest the kinetic energy from wind and convert it to usable electrical energy. One form of harvesting energy from wind receiving recent attention is aeroelastic vibration-based energy-harvesting. A major issue facing researchers is the limited range of wind speeds for which aeroelastic vibration-based energy-harvesting devices effectively harvest energy. One solution to remedy the limited operation range is adjusting the geometry of the airfoil to the optimal characteristics for a particular wind speed. This paper seeks to validate the application of flexible-inflatable-actuators (FIAs) to develop a tunable airfoil for an aeroelastic vibration-based device, which remove the limited operation range of these devices and allow for the dynamic adjustment of airfoil geometry for maximum power output at a given wind speed. First, an aeroelastic energy-harvesting device, called a windbelt, is designed and fabricated. Next, composite windbelts are fabricated using latex-rubber and various fabrics with multiple FIA designs. The effects of FIAs on the tunability of the windbelt energy-harvesting are investigated by experimentally testing the relationship of wind speed, windbelt tension, FIA shape, and FIA inflation on the vibration frequency, RMS voltage, power output, and efficiency of the windbelt. Experimental results indicate that the application of FIAs to a windbelt allows for the dynamic adjustment of airfoil geometry, which leads to the desired energy-harvesting for a given wind speed. The further application of FIAs to other aeroelastic vibration-based energy-harvesting devices could improve their energy-harvesting and efficiency characteristics.

Biography: John L. Sperduto is a native of Middletown, NJ and a rising-Senior pursuing a B.Sc. in Mechanical Engineering at The College of New Jersey (TCNJ). A distinguished scholar at TCNJ, John is a member of Tau Beta Pi, and a recipient of the Armstrong Scholar Award, In-State Merit Scholarship, Dean's List, and School of Engineering Employee of the Year. John has held multiple leadership positions at TCNJ, serving as the 2014-2015 President of the TCNJ American Society of Mechanical Engineers (ASME) student-section, student representative on the TCNJ School of Engineering Curriculum Committee, and a Web Media Specialist for the TCNJ School of Engineering. In addition, John is dedicated to leadership outside of the classroom by spreading STEM education, and is actively working to develop a TCNJ School of Engineering high school outreach program. John twice served as Team Captain in the ASME Student Design Competition, his team placing third in 2013 and fourth in 2014 for District A. He is the team manager of the 2016 TCNJ Baja SAE Senior Project team. John is currently performing research on integrating electrospun nanofibers into microfluidic channels with Dr. Karen C. Yan. This research has been published and presented in the 2015 Northeast Bioengineering Conference and 2015 New Jersey Space Grant Consortium Poster Session, and is accepted for the 2015 International Mechanical Engineering Congress and Exposition. As a member of the GET UP REU, John is working under the guidance of Dr. Aaron D. Mazzeo and Jingjin Xie. Specifically, John is studying flexible-inflatable-actuators for tunable energy harvesting applications. Following the completion of his undergraduate degree, John plans to pursue a PhD in Mechanical Engineering, focusing on medical devices, medical robotics, and advanced manufacturing of biomaterials.

Abstracts and Student Biographies

Vanita R. Thompson **Poster # 23B**
Kingsorough Community College

Mentors:

Stephen Rowe, M.S., Hossein Revantalab, Ph.D. Candidate, Shahab Shojaei-Zadeh, Ph.D.
Department of Mechanical and Aerospace Engineering
Rutgers, the State University of New Jersey

Exploring Piezoelectricity in Porous Polymers

Piezoelectricity is the ability some materials have that allows them to generate an electric charge. The piezoelectric effect occurs in response to mechanical stress applied to the material. The piezoelectric effect is related to dipole moments that occur in certain molecular structures. A unique ferroelectric characteristic of the piezoelectric effect is, it can be reversed. When mechanical stress is applied to a piezoelectric material, shifting of positively and negatively charge dipoles result in an external electric charge. In reverse, piezoelectric materials mechanically deform, exhibiting stress when they are applied to an electric field.[5] Synthetic piezoelectric polymers are considered a part of the “smart” materials group. Smart materials exhibit a type of behavior that involves the transformations of sensed information into a desired response. In 1969, Kawai discovered the piezoelectric effect of Poly(vinylidene fluoride) (PVDF) was ten times stronger than other synthetic polymers. When poled, PVDF can be a useful in sensor, actuator and damping applications. Typically, the piezoelectric effect of PVDF is examined in polarized thin films, obtained by melt processing the polymer. However, little study has been done on the piezoelectric effect of PVDF as a porous material. PVDF is commercially available as a crystalline solid powder. Pores can be induced with the use of a foam facilitation agent. Commonly used foam facilitation agents are surfactants. Surfactant compounds lower the surface tension between gaseous and liquid phases, resulting in foam. However, many polymer-surfactant foams are considered unstable. Polymers can also be foamed through the process of particle-stabilizing. The particle-stabilizing of a polymer can be achieved by colloidal suspension, which is considered highly stable. Particle-stabilized foams are a low density porous material made from polymers. As a low density material, these foams are a useful material in structural, insulation, and functional applications.[1-2] E. Fukada observed piezoelectric behavior in poled polymers that suggest active materials based on polymeric foams are possible. We will be exploring the piezoelectric properties of a porous polymer. PVDF particle-stabilized foams will be used to design porous polymers.

Biography: Vanita R. Thompson was born and raised in Brooklyn, New York. She obtained an Associate’s degree in Biological Sciences from Kingsborough Community College (KCC) of the City University of New York (CUNY). Currently, she attends City College of CUNY majoring in Chemical Engineering. She has held a place on the Dean’s List four concurrent semesters, and was given a merit award for her contributions to the KCCBiological Science Department. In addition, she became a member of Kingsborough’s Collegiate Science & Technology Entry Program (CSTEP) and the Bridges to Baccalaureate Program, and participated in the Louis Strokes Alliance for Minority Participation (LSAMP) and National Science Foundation Research Experience for Undergraduates (NSF- REU) programs .She has interned at Rutgers, Kingsborough Community College, and Medgar Evers College. She has presented her research at several conferences, most notably the Annual Biomedical Research Conference for Minority Students (ABRCMS). In the future, she intends to pursue a graduate degree in Chemical Engineering and continue her research.

Abstracts and Student Biographies

Jeremy E. Tucker **Poster # 24A**
Vanderbilt University

Mentors:
Keivan Esfarjani, Ph.D.
Department of Mechanical and Aerospace Engineering
Rutgers University

The design and analysis of an energy efficient household

Majority of the world's energy needs are met by burning hydrocarbon-based fossil fuels that emit toxic and greenhouse gases harmful to the environment. In an effort to reduce the dependency of fossil fuels researchers have been focused on developing green technology, which operate on renewable energy sources, such as solar, hydropower, and wind. Transitioning to an eco-friendly habitat requires these technologies, which relates to the research thrust of devices and energy management systems for energy generation, conversion and storage. Various technologies have been developed and are used for several applications in households, but depending on the house size and location technologies can vary. The research focuses on determining which renewable energy technologies are needed for electricity, space heating, cooling and storage, while calculating the cost of the technology and payback period. Numerical models were used to calculate heat flux through a drawing-based simulation program, and analytical models were used to determine the household power consumption, production and cost. The technologies used for electricity production and storage was a 300 W Polycrystalline Solar Panels and 48 V 1120 AmpHr Battery Banks, respectively. Space heating was provided by 7/8" PEX Floor Tubing and space cooling was satisfied by an absorption refrigerator. Water heating was satisfied by a 80 G Thermosyphon/Solar Water Heater and Paraffin A22 phase change material was used to store heat for when the room temperature exceeded a level of comfort at 22 °C. The transition from fossil fuels to these technologies proves to be environmental friendly as well as energy and cost efficient based on the analysis and comparison to standard home devices used for residential electricity, heating and cooling.

Biography: Jeremy Tucker, born and raised in Manhattan, NY, is a rising senior at Vanderbilt University majoring in civil and environmental engineering with a minor in engineering management. In May 2012 Jeremy was awarded a full tuition scholarship to Vanderbilt University, by the Posse Foundation, recognizing him for his academic and leadership capability and potential on campus. Jeremy is a member of the National Society of Black Engineers (NSBE), American Society of Civil Engineers (ASCE) and the American Water Works Association (AWWA). In addition he is the treasurer of an organization he helped establish on Vanderbilt's campus, Single Mothers Improving Life's Expectations (SMILE), which aim is to provide assistance to youth in single parent households. Jeremy intends to pursue graduate studies in sustainable and renewable energy and aspires to work with sustainable infrastructure systems in the future. As a participant of GET UP program Jeremy works with Dr. Keivan Esfarjani in the Department of Mechanical and Aerospace Engineering. His project research thrust focuses on devices and energy management systems for energy generation, conversion and storage. His research project for GET UP requires a numerical approach using residential heat transfer simulation software as well as an analytical approach calculating renewable energy technologies for energy production, heating, cooling and storage for a household.

Marleny M. Arones **Poster # 24B**
University of Florida

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

Measuring the biomechanical properties of tissues using optical coherence tomography

Biomechanical properties have a powerful effect on the development and growth of tissue. Certain diseases affect the biomechanical properties of tissues; for example, one of the characteristics of cancerous lesions is that they are stiffer than benign tissue. Early diagnosis can help improve the chances that these diseases can be treated effectively. Today's common mechanical testing methods are accurate but they result in permanently destroying or deforming the tissue sample. Traditional histological examinations alone cannot measure the biomechanical properties of tissues, cannot be performed in vivo, and can be misrepresentative of the entire organ. In order to overcome the limitations of current histology-based diagnosis, an alternative diagnostic method is needed. Optical coherence elastography (OCE) is an emerging technique that uses optical coherence tomography (OCT) to calculate the biomechanical properties of tissues. The OCT system provides a high-resolution micron scale image of a tissue's microstructure. When the tissue is placed under dynamic stimulation, the OCT system can be used to measure the tissue's resulting displacement. In this study, tissue-mimicking samples with varying stiffness were exposed to acoustic frequencies in order to determine the sample's resonant frequency. This in turn was converted to elastic modulus by using a model derived from Euler-Bernoulli beam theory. The accuracy of the OCE-derived moduli were validated by independently measuring the same samples using an Instron machine. Future work will develop a hand-held probe to implement the OCE technique in the clinical setting. The OCE technique may then provide a quantitative, high-resolution, in vivo image of a tissue's biomechanical properties that can be obtained in a non-destructive and minimally invasive manner.

Biography: Marleny Arones is a rising senior from West Palm Beach, FL pursuing her bachelors in Biomedical Engineering at the University of Florida. After graduating, Marleny plans to attend graduate school in order to obtain her Ph.D. As a participant in the Cellular Bioengineering REU and RiSE program, Marleny had the chance to spend the summer in Dr. Mark Pierce's lab and she is very grateful for that opportunity.

Abstracts and Student Biographies

Giovanni R. Deliz **Poster # 25A**
University of Puerto Rico - Humacao

Mentors:
Mohamed Naser, Nada Boustany, PhD
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Jeanne Linares
Institut d'Optique Graduate School, Palaiseau, FR

Observation of effects of NMDA on hippocampal neurons using optical scattering imaging

The purpose of our research is to provide a sensitive and objective measure of subcellular structure, and to use this measurement to characterize the relationship between structure and function in injured neurons. Investigating this structure/function relationship could potentially help advance the understanding of neuronal diseases, such as stroke, autism and Alzheimer's disease. Using a recently developed technique, Optical Scattering Imaging (OSI), we can examine the composition of primary samples of cells and tissues without the need of fixation or staining. OSI implements two-dimensional optical Gabor filters to observe and characterize subcellular structure. This technique was previously used to quantify mitochondrial fission during programmed cell death. In this project, our goal is to use OSI to observe and quantify the changes caused by N-methyl-D-aspartate (NMDA), an excitotoxin that kills neurons by overexcitation, on hippocampal neurons. Neurons were treated with 60μM NMDA for 10 minutes and imaged with a bank of 144 Gabor filters every 5 minutes for 1 hour. The images will be processed in Matlab to obtain an S_{max} plot, which shows the optimal filter period in which maximum signal is obtained, and an S_{max} histogram that shows the distribution. S_{max} is expected to scale with the size of the local underlying structural features. The results will be discussed during the poster presentation.

Biography: Giovanni Deliz was born and raised in Puerto Rico. He currently attends the University of Puerto Rico – Humacao campus and is a rising fifth year student. He is interested in pursuing an MD or MD-PhD program after earning his Bachelor’s degree in biology in the spring of 2016. His research interests include cancer biology and neurobiology. He is very grateful for the opportunity he had of participating in the 2015 RiSE/REU program, where he had the chance to meet and work with great people that are passionate for science, as he is.

Abstracts and Student Biographies

Rebecca L. Drake **Poster # 25B**
California Lutheran University

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

Determining the effects of pegylated epidermal growth factor on RPE cells

Age-related macular degeneration (AMD), the leading cause of blindness in developed nations, is marked by photoreceptor death caused by altered transport into the retina. The Bruch's membrane along with the retinal pigment epithelium create a highly selective barrier for transport into the retina. This structure is crucial to maintaining photoreceptor viability, and in AMD this structure becomes dysfunctional. The dynamic relationship between the Bruch's membrane and the photoreceptors of the retinal pigment epithelium (RPE) make these structures a target for therapies. Recently, stem cell derived RPE has been used to arrest the photoreceptor death. Similarly, polymer scaffolds have been developed as a supportive structure to restore mechanical and transport properties while optimizing cell attachment and growth. Here, succinimidyl valeric acid polyethylene glycol (PEG-SVA), a hetero-bifunctionalized PEG chain, was functionalized with epidermal growth factor (EGF), a substance previously shown to promote cell growth. It was found that, when treated with EGF in both the bound and unbound forms, the RPE cells experienced a relative increase in growth after three days as compared to cells untreated with EGF. Similarly, RPE cells treated with EGF were also found to have morphology different from that of the untreated cells, signifying differences in cell development. Further studies can be used to examine the effect of EGF on the RPE cells in scaffolds and further study the proliferation of these cells.

Biography: Rebecca Drake was born and raised in Southern California. She now attends California Lutheran University and is on track to graduate in May of 2016 with a degree in Bioengineering. Upon graduation, Rebecca plans to pursue a PhD in Biomedical Engineering. In her free time, Rebecca enjoys playing tennis for her university's team, eating exotic foods, and traveling with her friends. Rebecca leaves the CB REU/RiSE program with many invaluable new skills and with new insights into the world of graduate school.

Jamie Hernandez **Poster # 26A**
University of Arizona

Mentors:
Harini Kantamneni
Department of Chemical and Biochemical Engineering

Margot Zevon, Vidya Ganapathy, Ph.D.
Department of Biomedical Engineering

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

Engineering Lymphatic Vasculature Models for Cancer Surveillance

Over 230,000 women are diagnosed with breast cancer annually. Currently, sentinel lymph node biopsy is used as a diagnostic tool to determine whether a tumor has metastasized from the breast. This leads to high false negative rates leading to repeated surgeries and death of the patient. Our approach is to use bioactive nanoprobes made of ceramic nanoparticles doped with rare earth (RE) cations encapsulated in human serum albumin (REANCs). In previous in vivo experiments, REANCs were not detected within the lymphatic system. The aim of this project is to engineer a model that mimics lymphatic vasculature to test the particles' ability in cancer surveillance by molecular discrimination of different tumor cell populations in this model and also size exclusion principle of REANCs. Determination of cell phenotype of heterogeneous tumor populations is critical in tailoring effective cancer treatments. Using a co-culture model of breast cancer cells with the HER2 receptor present or absent, cells were molecularly discriminated by cell type using a HER2+ antibody and REANCs functionalized to a marker, CXCR4, on breast cancer cells. Because CXCR4 is found in both phenotypes, this receptor was blocked in the HER2+ cells in culture. The populations were successfully differentiated in a co-culture model by microscopy and FACS. To test the behavior of these particles, a model was fabricated with the anatomical dimensions of an axillary lymph vessel, with future applications for in vitro cancer cell tracking and phenotyping. The dimensions for mouse, rat, and human axillary lymph vessels were modeled using 3D printed master mold to form a structure from PDMS. Albumin nanoparticles (~ 90nm) were also successfully synthesized and shown to pass through a basic fluidic channel with above dimensions. We were able to discriminate heterogeneous populations in addition to initiate a 3D model for lymph node tracking.

Biography: Jamie Hernandez is a rising senior at the University of Arizona, where she is majoring in Biomedical Engineering and minoring in Mathematics. As a student at the University of Arizona, she is involved as a biomedical undergraduate mentor, and participates in research as a MARC scholar. After graduation, she hopes to continue her education towards a Ph.D. in Biomedical Engineering.

Abstracts and Student Biographies

Adrianna N. Lebrón-García **Poster # 26B**
University of Puerto Rico-RUM

Mentors:
Madison Godesky, David Shreiber
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Co-modulating the mechanical and bioactive properties of CMHAS-PEGDA hydrogels for neural tissue engineering

According to the CDC, each year trauma accounts for 41 million emergency department visits and 2.3 million hospital admissions in the United States. It is reported that 3%-5% of all trauma patients are affected by peripheral nerve injuries. These types of injuries may result in loss of motor function, sensory function, or both. Peripheral nerves can regenerate intrinsically across small gaps, but there are no therapeutic options for gaps larger than 3 cm. To address this need, we are developing a bioengineered peripheral nerve regeneration (PNR) nerve guidance conduit to enhance neurite outgrowth and motor axon targeting over large injury gap sizes. The biomaterial we have studied serves as a potential conduit filler, and consists of a thiol-modified hyaluronic acid (CMHAS) and (poly)ethylene glycol diacrylate (PEGDA) hydrogel. This hydrogel will serve as a substrate for neurite outgrowth and introduce peripheral nerve regeneration (PNR)-enhancing elements to stimulate and improve the accuracy of PNR. Neurite outgrowth is enhanced within matrices that have mechanical properties similar to that of native neural tissues. For this reason, we used rheology to identify the cross-linking conditions needed to generate CMHAS-PEGDA hydrogels with mechanical properties within the range of native nerve tissue (100-1000 Pa). We found that higher cross-linking densities produced a stiffer hydrogel network. Then, we coupled a thiol-modified cell adhesive ligand, RGDC, to the hydrogel network to add bioactivity. After adding the RGDC peptides to the hydrogel, we repeated the study of mechanical properties to understand how the peptide-hydrogel interaction modified the stiffness of the gel. We determined that RGDC peptide grafting was an effective strategy to co-modulate the mechanical and bioactive properties of the CMHAS-PEGDA hydrogel.

Biography: Adrianna N. Lebrón-García, born and raised in San Juan, PR, is a rising senior in the University of Puerto Rico-Mayaguez majoring in Industrial Biotechnology graduating in May 2016. This summer she has been conducting research in the Biomedical Engineering Lab with Dr. David Shreiber, and PhD candidate Madison Godesky as part of the Cellular Bioengineering REU program at Rutgers University. She researched the mechanical and bioactive properties of a biomaterial for peripheral nerve regeneration therapy. She has previous research experience in the Bioenergy, Bioprocess, and Renewable Resources research lab in the Chemical Engineering Department at her school under the mentorship of Dr. Lorenzo Saliceti optimizing fermentation bioprocess of sugar-cane bagasse for the production of ethanol as a biofuel. Also, she is an active member of the Industrial Biotechnology Student Association, Society of Hispanic Professional Engineers and a MARC Scholar. After graduating, Adrianna hopes to pursue a PhD degree in biomedical engineering or a researcher position in the biotechnology or consumer goods industry. Outside the classroom and laboratory, she likes sports, movies, and is going to be learning American Sign Language this year. This REU experience has been an amazing opportunity to grow as a researcher and a professional giving her the opportunity of getting a sneak preview of what life in grad school is like, and meeting a great group of new friends!

Joshua M. Leipheimer **Poster # 27A**
Robert Morris University

Mentors:
Jean Lo, Jack Zheng, and Jeffrey D. Zahn
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Characterization of a flexible, ultra-fast degrading polymer coated neural microelectrode probe.

Neural microprobes are utilized in Brain Computer Interface technologies to record the electrical signals from single or multiple neurons. Previous neural probes have not been successful in chronic implantation because of their large and rigid structure, causing a glial scar to form around the probe implant site during prolonged implantation. This glial scar, composed of astrocytes and microglia, encapsulates the probe, increasing impedance and preventing usable signal acquisition. At Rutgers, a small, flexible, ultra-fast degrading Tyrosine derived terpolymer coated neural microprobe was designed and fabricated that is believed to have the necessary mechanical requirements that would allow for better long term implantation in brain tissue. Because the probe is designed to be mechanically compliant with the neural tissue, it is too flexible for insertion alone. A biodegradable derived polymer coating is used to give the probe a limited rigidity which aids in insertion. Our goal is to electrically characterize said neural microprobe to assure functionality, use image analysis to quantify glial scar formation of different size probes, and to assure that the tyrosine polymer will completely degrade during implantation. Impedance spectroscopy of the coated probe is performed in PBS to monitor polymer degradation. Our results show that the polymer coating around the probe degraded completely in 90 minutes by reaching an uncoated probe impedance value of 4.25 kΩ. Glial scar formation was quantified by immunohistochemically staining slices of post-implant rat brains for astrocytes and profiling for intensity values via Matlab image analysis. Intensity values are the concentration of astrocytes located around implant sites in the images. At 24 weeks post implant, a 30 μm wide × 5 μm thick probe with a polymer coating of 100 μm ×100 μm had an intensity value of 20 while a 320 μm × 5 μm probe and polymer coating of 350 μm × 100 μm had a value of 202. These results show that the smaller probe and polymer coating size has less of a glial scar formation than that of a larger probe and polymer coating.

Biography: Josh Leipheimer is a senior at Robert Morris University located in Pittsburgh, PA. He is currently dual majoring in biomedical and mechanical engineering with a minor in mechatronics. An active member on campus, Josh is presently founder and President of his Mechatronics Engineering Club on campus, President of the Biomedical Engineering Society chapter at RMU, and scholarship chair of his school's Alpha Chi Rho fraternity. His hobbies include robotics and creating Arduino based projects including interactive LED light and sound display systems. In his free time at home, Josh enjoys playing the piano to relax and de-stress. After graduation, he plans to pursue a PhD in the neural interface field.

Robert C. Mines **Poster # 27B**
University of South Alabama

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

Development of a novel hepatocyte culture platform for high throughput pharmacokinetic screening

Non-Alcoholic Fatty Liver Disease (NAFLD) and Non-Alcoholic Steatohepatitis (NASH), which respectively occur in 65% and 40% of the severely obese, can progress to non-alcoholic cirrhosis and are significant risk factors for liver cancer. NAFLD and NASH are histologically characterized by macrovesicular steatosis, the accumulation of large lipid droplets (LD) capable of displacing cell nuclei. The LDs impair various aspects of liver-specific function including drug metabolizing enzymes (DMEs) which metabolize roughly 75% of all pharmaceutical agents. A high throughput 96-well fatty, primary hepatocyte (or HepG2/C3A) culture platform that accurately simulates fatty liver disease was developed and used to (1) assess the impact of fatty liver on drug pharmacokinetics, (2) identify adverse drug side effects for the obese, and (3) screen novel weight loss agents. To induce steatosis, cells were exposed to fatty acid media for 6 days. After this, the LDs (Nile Red) and nuclei (DAPI) were stained to quantify LD parameters including diameter, area, and droplet to nuclei ratio indicating that while six days of fattening were appropriate for hepatocytes a shorter period should be used for HEPG2. Then, LD catabolism pathways were upregulated with defatting cocktail. LD size reduction, cell viability, and triglyceride concentration were assessed and compared to lean controls. To further improve the defatting process, the weight-loss agent niclosamide ethanolamine (NEN) was added to the defatting cocktail. NEN's activity was measured by monitoring viability and lipid storage metrics. Preliminary data suggest that it rapidly and safely reduces LD size comparably to the SRS media and superiorly when used in combination. Lean, fatty, and defatted cells were then exposed to various resorufin derivatives in order to quantify changes in DME activity. The conversion from prodrug to fluorescent resorufin was measured spectrofluorimetrically over 90 minutes. Preliminary data shows a decreased rate of clearance of the prodrugs in fatty livers.

Biography: Robert Mines was born in Pensacola on June 7th, 1995. He is a rising senior in the University of South Alabama's Honors Program and Early Medical Acceptance Program (EAP) where he is pursuing a BSChE in Chemical and Biomolecular Engineering. In the spring of 2015, Robert Mines was awarded the Barry Goldwater Scholarship for his previous research in the optimization of gene therapy vectors and in the development of novel chemotherapeutic agents. This summer, Robert is extremely grateful to be working under the guidance of Drs. Francois Berthiaume and Gabriel Yarmush on the "Development of a Novel Hepatocyte Culture Platform for High Throughput Pharmacokinetic Screening" as part of the NSF's Cellular Bioengineering REU. In addition to his research, Robert is shadowing medical specialists as part of an M.D.-Ph.D. immersion program at Robert Wood Johnson University Hospital. This fall, Robert will continue working on his honors thesis under the guidance of Drs. Thomas Rich and Silas Leavesley.

Jacqueline Saenz **Poster # 28A**
California State University, Northridge

Mentors:
Ijaz Ahmed, Chris Lowe, David I. Shreiber
Department of Biomedical Engineering
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Evaluating the effectiveness of nanofiber scaffolds on reducing astrocyte reactivity for developing therapies for traumatic brain injury

Traumatic brain injuries (TBI) are a significant cause of death and disability. TBI starts with a physical insult that is followed by a secondary injury cascade. One outcome of the secondary injury cascade involves astrocytes becoming reactive as they attempt to restore homeostasis. These reactive astrocytes often form a glial scar to protect healthy tissue from elements in the injured tissue. However, the scar tissue also prevents regeneration into the wounded area. We have found that the physical environment of the astrocytes can influence their reactivity. One way to control the physical environment and thereby potentially control reactivity is with a culture substrate. For example, we have demonstrated that quiescent and reactive astrocytes cultured on nanofiber scaffolds respond differently compared to planar substrates.To establish the potential of these scaffolds to modulate astrocyte behavior, we must identify the characteristics of the scaffolds that give instruction to keep astrocytes less reactive. Two different polymers Polylactic acid (PLLA) and Nylon-6 have been electrospun at various concentrations to generate a range of characteristics per scaffold. The scaffolds were imaged with scanning electron microscopy and fiber size was measured with Image-J. We found that fiber diameter increased with increasing polymer concentration. Astrocytes were cultured on the fibers in a quiescent or reactive state. Dibrutyl cAMP (dBcAMP) was used to activate the astrocytes. Control surfaces were glass coated with poly-L-lysine and nanofibers from the Donaldson Company. Astrocytes were cultured for 24 or 48 hours. Astrocyte reactivity was assessed by labeling for glial fibrillary acidic protein (GFAP). Cytoskeleton and nuclear labeling were also used to identify astrocyte reactivity and morphology. Preliminary data suggests that larger nanofibers allow for better astrocyte attachment and reduce reactivity.

Biography: Jacqueline Saenz is a Mexican American born in Los Angeles, California. She is currently attending California State University, Northridge (CSUN) and is pursuing a B.S. in Biotechnology and a minor in Chemistry. As an undergraduate, she's had the opportunity to be part of a few research experiences, working with stem cells and spastic paresis rats with and autosomal recessive gene mutation in a neuroscience lab. She spent the summer working with astrocytes and nanofiber scaffolds with Dr. David Shreiber in his tissue engineering lab. She is looking to obtain a PhD in Neuroscience when she finishes her studies at CSUN.

Ilse S. Valencia **Poster # 28B**
University of Texas at San Antonio

Mentors:
Michelle Sempowski, Ph.D Candidate
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Stavroula Sofou, Ph.D
Department of Bimoedical Engineering and Department of Chemical & Biochemical Engineering
Rutgers, The State University of New Jersey

The effects of surface charge density and shear stress on the targeting efficacy of cationic liposomes as nano-carriers for anti-vascular treatment

Cancer accounts for over 8.2 million deaths every year. These deaths can be attributed in large part to the limited effectiveness of conventional drug delivery methods. Tumor vessels possess unique physiological features that might be exploited for improving drug delivery. Tumor vessels are abnormal structures that exhibit irregular shapes, and contain discontinuous endothelial cell linings, which lead to increased vascular permeability. Tumor blood vessels leakiness not only influences the internal micro-environment of tumors, but it also governs the accessibility of liposomal drug delivery systems to tumor cells. Previous studies have demonstrated some of the advantages of liposomal nano-carriers for anti-vascular treatment, including ability to encapsulate both hydrophilic and hydrophobic therapeutic agents, the high drug to carrier ratios, and improved release of therapeutics at the tumor site. In the present study, we investigate the possibility of modifying cationic charge of PEGylated liposomes to optimize delivery to tumor vessels. Through a series of drug retention and cell association studies, we attempted to evaluate the effects of surface charge density and shear stress on the targeting efficacy of cationic liposomes as nano-carriers for anti-vascular treatment. Increasing the surface charge density of liposomes resulted in lower drug retention, under pH 7.4. On the other hand, increasing the surface charge density of liposomes resulted in increased binding to human umbilical vein endothelial cells (HUVECs), followed by internalization of liposomes under static (no flow) cell culture conditions.

Biography: Ilse Valencia was born in San Antonio, Texas. She was raised in Uruapan Michoacan, a very small town in Mexico, where she lived most of her life. In 2011, she graduated from the Instituto Tecnologico de Monterrey. Soon after, she came back to the United States to continue her higher education at the University of Texas in San Antonio. Currently, she is a senior in Biomedical Engineering. Her areas of concentration are Tissue Engineering and Nanotechnology, and she has a particular interest in cancer research and tissue regeneration. After graduating in May 2016, Ilse plans to attend to graduate school and obtain a PhD related to Biomedical Engineering. This summer, Ilse was given the chance to work in Dr. Sofou's laboratory in the development of pH- Sensitive Liposomes as Drug Delivery Carriers for Cancer. As her first summer internship experience, it has been a life-time opportunity to enrich her academic and professional life, create valuable connections and reinforce her plans of attending to graduate school.

Abstracts and Student Biographies

Jorge D. Zhingre Sanchez **Poster # 29A**
Rensselaer Polytechnic Institute

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

Release of conditioned medium encapsulated in PEGDA hydrogels for tendon healing

Tendon damage to the surrounding collagenous tissue of muscles, such as strains and sprains, are a constant reoccurring problem among labor workers and athletes, with over 32 million annual reported injuries cases in the US. Advancement in the healing of tendon sub-failure injuries has been at a standstill with current treatment methods, RICE and drug therapy, considered to be conservative and incomplete in healing. Due to these limitations, there is a need for a non-surgical, regenerative method for the recovery and healing of tendon injuries. Conditioned medium, which contains specific growth factors and matrix proteins, is currently being investigated in the field of regenerative medicine. In order to control the localization, concentration, and stable release of the conditioned medium to tenocytes, polymer based hydrogels can be used as the delivery system as opposed to simple injections. The main objective of this project is creating poly(ethylene glycol) diacrylate (PEGDA) based hydrogels as a delivery system for conditioned medium for healing tendon sub-failure injuries. Currently, our work is focused on designing and testing the PEGDA hydrogel release system. Multiple PEGDA weight percentages and medium encapsulation methods were tested to determine the optimal formulation to allow for the most stable and prolonged release of conditioned medium. As hypothesized, hydrogels with increased amounts of PEGDA (weight percent and total amount) displayed the greatest medium release over specified time points. Future work aims to evaluate the potential healing effect of conditioned medium encapsulated PEGDA microspheres in vitro using tenocyte scratch assays that will be quantified with collagen staining.

Biography: Jorge Zhingre Sanchez was born on October 24, 1993 in Queens, New York. He is currently a senior at Rensselaer Polytechnic Institute majoring in Biomedical Engineering with a focus on biomaterials. Jorge plans to graduate from RPI with a Bachelor of Science in Biomedical Engineering by 2016. This summer, Jorge had the privilege of working under the guidance of Dr. Joseph Freeman and PhD candidate, Michael Pellegrini in researching conditioned medium encapsulated PEG hydrogels for tendon healing. Jorge is extremely grateful to the RISE-REU program at Rutgers for giving him the opportunity to truly experience research and consider graduate school as the next step in his career.