RiSE at Rutgers

Research in Science and Engineering

Summer Research Symposium

July 31, 2013

Sponsored by:

Rutgers Graduate School -New Brunswick

and the

Graduate School of Biomedical Sciences at Robert Wood Johnson Medical School

2013 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, July 31, 2013

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**

Luis Echegoyen, Ph.D.
Robert A. Welch Chair Professor of Chemistry
University of Texas-El Paso

"Carbon Materials and Serendipity: The Inside and Outside Story"

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**

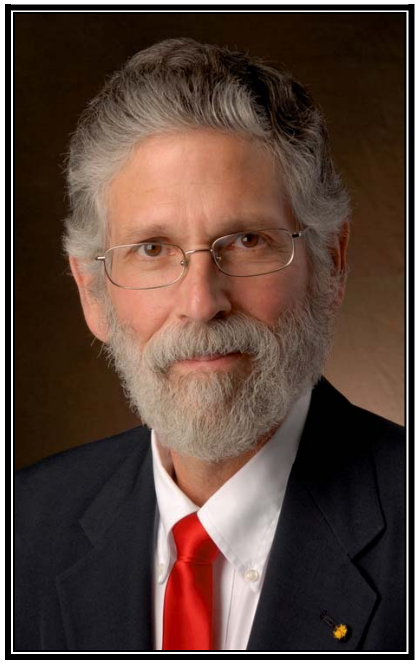
Sponsored by

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**:**
REU in International Environmental Sciences
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER



LUIS ECHEGOYEN, PH.D.

"Carbon Materials and Serendipity: The Inside and Outside Story"

Luis Echegoyen is the Robert A. Welsh Chair Professor of Chemistry at the University of Texas at El Paso and the Editor in Chief of the *Journal of Physical Organic Chemistry.* Among his notable previous positions are director of the chemistry division at the National Science Foundation, where he was instrumental in establishing new funding programs and research centers, and professor and chair of chemistry at Clemson University, where he maintained an active research program. Dr. Echegoyen has published around 300 research articles and more than 40 book chapters. He holds a bachelor's degree in chemistry and a doctorate in physical chemistry from the University of Puerto Rico, Rio Piedras. Dr. Echegoyen was a postdoctoral fellow at the University of Wisconsin-Madison, and has been continuously funded since the start of his academic career. He is proud to have directed the research of a large number of undergraduate and graduate students in Puerto Rico, Miami and Clemson, all of whom have gone on to successful academic, professional, and industrial careers. Professor Echegoyen is the recipient of numerous honors for his contributions to chemistry research.

<u>SUMMER PROGRAMS</u>

RiSE (Research in Science and Engineering) at Rutgers

RiSE, http://rise.rutgers.edu, 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. Jointly sponsored by Rutgers Graduate School–New Brunswick and the Graduate School of Biomedical Sciences at RWJMS, RISE is hosting 48 scholars this summer. These students, selected from almost 500 applicants, represent 38 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.

REU – Cellular Bioengineering: From Biomaterials to Stem Cells

Following a successful renewal through the Division of Engineering Education and Centers (EEC) at the National Science Foundation, the Research Experiences for Undergraduates (REU) in Cellular Bioengineering (<u>http://celleng.rutgers.edu</u>, NSF EEC-1262924) is in its fourth 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 where Rutgers is the lead university; the other three are NJIT, Purdue, and the University of Puerto Rico Mayaguez. This ERC is producing globally competitive engineers with the depth and breadth of education needed for success in technological innovation 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 has welcomed its inaugural cohort of eight 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/.

REU in International Environmental Sciences

Our program is formally titled "Biogeography of Biotransformations for Halogenated Organic Compounds: A Comparison of the Tropics, Temperate and Sub-Arctic Environments". The goal is to compare biotransformation processes carried out by naturally occurring microbes in the environment across distant geographic regions. The compounds we are investigating are brominated and chlorinated organic compounds used in flame retardants, pesticides and other industrial processes. Three students went to Helsinki, Finland, to examine the sub-arctic microorganisms, 3 students went to Guangzhou, China, to study microbial communities in the tropics and 2 stayed in NJ to study temperate communities. All students met at the beginning of the program and at the end to compare their results and to share their experience on doing science around the globe. Science is international and will become more so in the future. To experience the international scope of scientific discovery prepares our young researchers for a more globally engaged future.

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, 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 grants from the National Institutes of Health (R25ES020721) and the American Society for Pharmacology and Experimental Therapeutics. 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~

Rutgers, The State University of New Jersey:
Graduate School – New Brunswick

Office for the Promotion of Women in Science, Engineering and Mathematics

Douglass Development Disabilities Center

Graduate School of Biomedical Sciences at Robert Wood Johnson Medical School

~External Support~

New Jersey Space Grant Consortium

NIH MARC Program

NSF Innovation in Institutional Integration (I3) Program

Howard Hughes Medical Institute

NSF Research Experiences for Undergraduates (REU) Program

NSF CAREER Award to Professor Andrew Baker

NIH Summer Undergraduate Research Fellowship Program

U.S. Department of Education McNair Scholars Program

~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, Ph.D.
Senior Associate Dean, Graduate School of Biomedical Sciences and Professor, Robert Wood Johnson Medical School

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

Gail Ferstandig Arnold, Ph.D.
Associate Director of Graduate Studies, Computational Biology & Molecular Biophysics

Nada Boustany, Ph.D.
Associate Professor, Biomedical Engineering, Rutgers

German Drazer
Associate Professor, Mechanical & Aerospace Engineering

Jinesh Gheeya
MD-PhD candidate,Robert Wood Johnson Medical School and
Graduate Program in Cellular & Molecular Pharmacology

Ivelisse Irizarry
PhD candidate, Plant Biology, Rutgers

Maria Qadri
PhD candidate, Biomedical Engineering, Rutgers

Elizabeth Stucky
PhD candidate, Chemical & Biochemical Engineering, Rutgers

Perspectives on Global Health

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

CV/Resume Workshop

Sue Pye
Career Management Specialist, Rutgers Career Services

Careers in Research and Innovation at a Large Multi-National Corporation

Arturo Pizano, Ph.D. and Juliann Nutaitis
Siemens Corporate Technology, Princeton, NJ

How to Prepare Winning Applications for Fellowships and Funding

Teresa DelCorso
Director of GradFund and Assistant Dean, Graduate School-New Brunswick

Innovation and Entrepeneurship

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

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

Deborah Silver, Ph.D.
Professor, Electrical & Computer Engineering; Director, Professional Science Masters Program, Rutgers

Roselin Rosario, Ph.D.
Research Scientist, Ingredion, Inc.

Eduardo Perez, Ph.D.
VP of R&D and Business Development, Signum Biosciences, Inc

Sudheer Reddy Beedanagari, Ph.D.
Research Investigator, Bristol Myers Squibb

Elysa Goldberg, Ph.D
Associate, Greenberg Traurig Law

Lydia Prendergrast, Ph.D.
Assistant Dean for Academic Affairs and Engineering Education, Rutgers University

SUMMER PROGRAM STAFF

Research in Science & Engineering (RISE)

Evelyn S. Erenrich, Ph.D., Director
Assistant Dean, Rutgers Graduate School-New Brunswick (GSNB)
Visiting Associate Professor, Dept of Chemistry & Chemical Biology

Beatrice Haimovich, Ph.D., Associate Director
Associate Professor of Surgery, Robert Wood Johnson Medical School

REU in Cellular Bioengineering: From Biomaterials to Stem Cells (REU-CB)

David I. Shreiber, Ph.D., Director
Associate Professor, Dept. of Biomedical Engineering

REU in Structured Organic Particulate Systems (REU-SOPS)

Henrik Pedersen, Ph.D., Director
NSF Engineering Research Center, Professor, Dept. of Chemical and Biochemical Eng., and Associate Dean for Lifelong Learning and Education, School of Engineering

REU: Green Energy Technology Undergraduate Program (GET UP)

Kimberly Cook-Chennault, Ph.D., Director
Assistant 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
Assistant Professor, Pharmacology and Toxicology

REU in International Environmental Sciences (Biogeography and Biotransformations)

Lily Young, Ph.D., Director
Professor, Environmental Sciences

Administrative Staff

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

Graduate School of Biomedical Sciences (GSBS) at Robert Wood Johnson Medical School
Ms. Tina Cicolella

Rutgers Department of Biomedical Engineering
Ms. Linda Johnson

Teaching Fellows

Ms. Ana Rodriguez, PhD Candidate in Biomedical Engineering

Ms. Lydia Louis, PhD Candidate in Public Health

Resident Advisors

Ms. Shanique Edwards, PhD Candidate in Cell and Development Biology

Ms. Christy Hullings, M.S. Candidate in Nutritional Sciences

Mr. Benjamin Druffel, PhD Candidate

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Owen Abe' *Green Energy Technology , RiSE*	**Long-range alignment of gold nanorods in a conjugated polymer thin film**	1A
Alejandra Aguilar *Cellular Bioengineering , RiSE*	**Imaging-based method to predict topography-induced osteogenic differentiation**	2A
Abigail J. Ameri *RiSE*	**Molecular evolution of RNA-dependent RNA polymerase in ticks**	3A
Marcos J. Ayala Rivera *RiSE*	**Analysis of the impact of insulin ligands on life and health span in *C. elegans***	4A
Elizabeth Benn-Hirsch *RiSE*	**miR-9 Expression in Alcoholism**	5A
Ryan Blackman *Physics & Astronomy*	**Optical follow-up observations of lensing candidates for millimeter sources**	6A
Reena Blade *Ernest Mario School of Pharmacy, RiSE*	**Hydrogen peroxide detection using iron (III)tetrasulfonatophthalocyanine as a mimic of horseradish peroxidase**	7A
Yssavo Camacho *Physics & Astronomy*	**Spectroscopy of type Ia supernovae with the Southern African Large Telescope**	8A
Murchtricia Charles *RiSE*	**Quantitative modeling of RNA - metal ion interaction**	9A
Olivia Dahl *RiSE*	**Memory as Mediated by Hippocampal ARC Protein**	10A
Kevin P. Dillon *International Environmental Science, RiSE*	**Community comparison of mono- and di- chlorinated and brominated phenol-degrading bacteria**	11A
Nateisha L Drayton *International Environmental Science*	**Comparison of dehalogenation rates in brominated phenols**	12A

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Alix M. Duarte *RiSE*	**Effect of the chemokines CCL-2, CCL-5 and CXCL-12 on pancreatic cancer cell signaling, mobility and proliferation.**	13A
Katrina R. Ellis *Structured Organic Particulate Systems*	**The effect of water content on the mechanical properties of hydroxypropyl methylcellulose edible films for drug delivery**	14A
Travis J. Feaker *Green Energy Technology*	**Vapor-phase carbonylation of propylene over H-zeolites to produce butanol**	15A
Jessica M. González-Delgado *Green Energy Technology , RiSE*	**Synthesis and characterization of lithium-nickel-cobalt oxides for water oxidation catalysis**	16A
Taneisha M. Gordon *Green Energy Technology , RiSE*	**Soft, inflatable actuators for kite-based energy harvesting**	17A
Michelle T. Graham *Cellular Bioengineering*	**Quantifying altered subcellular structural dynamics during apoptosis in apoptotic resistant cells**	18A
Kirsten R. Hall *Physics & Astronomy, RiSE*	**Star formation in local analogs of Lyman Break Galaxies**	19A
Mikala R. Hanson *RiSE*	**The role of teacher affect on problem behaviors during instruction of a child with autism**	20A
Jose A. Hawayek *Cellular Bioengineering , RiSE*	**Modulating neuro-inflammatory response in in-vitro model by treatment with encapsulated hMSCs**	21A
Wesley T Hodges *RiSE*	**The roles of GCN2 versus PERK in mediating hepatic stress response to Asparaginase**	22A
Jessica K. Huhnke *Cellular Bioengineering, RiSE*	**Finite element analysis of a novel composite scaffold for bone regeneration**	23A

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Brittany N. Johnson *Green Energy Technology , RiSE*	**Development of barium titante strontium ferrite thick films**	24A
Stephanie M. Knowlton *Cellular Bioengineering , RiSE*	**Assessment of neurite growth in methacrylated collagen gels with patterned stiffness**	25A
Emily A. Kraus *Physics & Astronomy*	**On the nucleon charge distributions**	26A
Lauren E. Langbein *RiSE*	**Msc1 interacts with the kinetochore to ensure accurate chromosome segregation**	27A
Leah Langer *Physics & Astronomy*	**Thin film topological insulators in a field effect transistor**	28A

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35AM

Name and Affiliation(s)	Title	Poster
Dylan McClung *RiSE*	**Nucleotide substitution biases and model selection in phylogenetic inference of double-stranded DNA and RNA viruses**	1B
Samantha A. Myruski *RiSE*	**Role of actin regulators in neuronal polarity of *Caenorhabditis elegans***	2B
Javier J. Olmeda *RiSE*	**Preparation of 2-(prop-2-ynyl)-2-(tetrahydrofuran-3-yl)malonate from tetrahydrofuran-3-ol**	3B
James R. Palmer II *Green Energy Technology , RiSE*	**Development of zinc oxide nano-generators**	4B
Ariel C Parker *RiSE*	**Localization of Zyxin and Ajuba proteins in cultured mammalian cells under mechanical tension and cell density conditions**	5B
Isamar Pastrana Otero *Structured Organic Particulate Systems , RiSE*	**Swelling dynamics in pharmaceutical tablets**	6B
Carlos A. Paz *Green Energy Technology , RiSE*	**Determining methionine content in 5 genera of duckweed through ethionine assay and biosensor using cystathionine-gamma-synthase deficient *E.coli*.**	7B
Stephen L. Randall *Physics & Astronomy*	**High-energy searches for supersymmetry at CMS**	8B
Jordana P. Rosenberg *Cellular Bioengineering , RiSE*	**Effect of liposome composition, targeting, and incubation time on penetration into multicellular spheroids**	-
Karina N. Ruiz-Esteves *RiSE*	**Role of Palmitoylation in Proteins Associated to Autism Spectrum Disorder**	9B
Marissa N. Saladin *RiSE*	**A structure-based predictive model for the substrate specificity of the tobacco etch virus (TEV) protease**	10B
Monica Salazar *Green Energy Technology , RiSE*	**Breeding for improved ethanol yield in switchgrass**	11B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35AM

Name and Affiliation(s)	Title	Poster
Daniel S. Seara *Green Energy Technology , RiSE*	**Few-layer graphene synthesis using pulsed laser deposition**	12B
Genesis Serrano *RiSE*	**Determination of single nucleotide polymorphism associations in miR-9 region with alcoholism in humans**	13B
Ligin M. Solamen *Cellular Bioengineering , RiSE*	**Non-invasive imaging camera for quantification of metabolic properties of tissue**	14B
David W. Sroczynski *Structured Organic Particulate Systems , RiSE*	**Characterization of fluid behavior in adsorptive nanopores through Monte Carlo simulation**	15B
Julius L Taylor *Cellular Bioengineering , RiSE*	**The effect of temozolomide and STAT3 silencing on glioma stem cells**	16B
Daniel G. Tekverk *Cellular Bioengineering , RiSE*	**Investigation of molecular delivery enhancement through microscale electroporation pulse manipulation**	17B
Gabriell J. Thorne *Ernest Mario School of Pharmacy, RiSE*	**Activation of Nrf2 signaling and protection from chemical injury by the investigational drug LH601A in cultured human kidney cells**	18B
Kumar L. Tiger *Cellular Bioengineering , RiSE*	**Cryopreservation of alginate sheets containing mesenchymal stromal cells for the treatment of chronic wounds**	19B
Jill I. Tracey *Structured Organic Particulate Systems , RiSE*	**Development and assessment of fast-dissolving oral films embedded with naproxen and acetaminophen for the treatment of rheumatoid arthritis**	20B
Natasha L. Vélez *Structured Organic Particulate Systems , RiSE*	**NIR Spectroscopy as a non-destructive tool to predict dissolution from acetaminophen tablets**	21B
Tatiana Vélez *Structured Organic Particulate Systems, RiSE*	**Effect of plasticizers on the physical & permeability properties of chitosan-gelatin edible films**	22B
Ryan K. Whitcomb *Physics & Astronomy*	**Angle-Resolved X-Ray Photoemission Spectroscopy of epitaxial iron (II) fluoride thin films upon exposure to atomic lithium**	23B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35AM

Name and Affiliation(s)	Title	Poster
Reginald J. Wilbourn *Structured Organic Particulate Systems , RiSE*	**Order reduction for discrete element models, using neural networks for use in population balance models.**	24B
Marc A. Wonders *Physics & Astronomy*	**Search for light stops with pair-produced dijet resonances**	25B
Leslie E. Wynn *RiSE*	**Influence of fruit-based dyes on dye-sensitized solar cells (DSSCs)**	26B
Heather N. Zaccaro *RiSE*	**Modeling affective responses to Hurricane Sandy on an emotional-cognitive scale**	27B

Abstract and Student Biography

Owen Abe' **Poster # 1A**
University of Maryland, Baltimore County

Mentors:
B. Yu
Department of Chemistry and Chemical Biology

R. Thomas, PhD
Department of Material Science and Engineering

Deidre O'Carroll, PhD
Institute for Advanced Materials, Devices and Nanotechnology.
Rutgers, The State University of New Jersey

Long-range alignment of gold nanorods in a conjugated polymer thin film

Gold nanorods exhibit a variety of unique anisotropic, and size-dependent electrical and optical properties such as polarized light scattering and directional electrical transport. Therefore, long-range alignment of gold nanorods is of interest in order to take advantage of these properties on a large scale for their use in various optoelectronic devices such as organic photovoltaic solar cells and light emitting diodes. To help address the need for long-range nanorod alignment, the work presented here attempts to combine the well-known techniques for aligning polymer chains in thin films with the idea of polymer-directed alignment of embedded gold nanorods. We have demonstrated a procedure in our lab for rubbed alignment of polyimide thin films and have optimized the process to create surfaces that exhibit densely-spaced grooves on the polyimide surface. The next step will be to create a colloidal solution of gold nanorods and a compatible conjugated polymer and to subsequently coat the solution onto the rubbed polyimide surface. This will form a thin composite conjugated polymer/nanorod film. Through subsequent annealing, the conjugated polymer molecular chains are expected to align along the direction of the rubbed polyimide grooves. We will investigate if alignment of the conjugated polymer chains causes alignment of the embedded gold nanorods using optical dark field microscopy and transmission electron microscopy. If controlled alignment of the gold nanrods is successful, the mechanisms behind their anisotropic and their interactions with polymer semiconductors can be systematically studied and characterized with the ultimate goal of optimizing current and future optoelectronic devices.

Biography: Owen Abe’ was born in Baltimore, MD. He expects to graduate in fall 2013 with a Bachelor’s degree in Mechanical Engineering. He currently attends The University of Maryland Baltimore County where he is a member of the Meyerhoff program. This summer he has been working with Dr. O’Carroll’s optoelectronic group conducting research on conjugated thin films and gold nanorod alignment. Owen has been particularly grateful for the opportunity to participate in this year’s RISE/GET-UP REU program particularly because he is graduating in December 2013 and plans on attending graduate school the following year. Owen hopes that his experience here will give him better insights on various research paths and a firsthand look at the graduate school experience as a whole.

Abstract and Student Biography

Alejandra Aguilar **Poster # 2A**
University of the Pacific

Mentors:
Prabhas Moghe, Ph.D, Mr. Sebastián Vega, and Mr. Varun Arvind
Department of Biomedical Engineering, Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Imaging-based method to predict topography-induced osteogenic differentiation

Human mesenchymal stem cells (hMSCs) are a promising cell source for tissue engineering therapies due to their regenerative nature and their ability to differentiate into lineages of several connective tissues. Ongoing research focuses on understanding how biomaterial properties (e.g., chemistry, stiffness, topography) affect stem cell differentiation. Classically, to test biomaterial-induced stem cell lineage commitment, stem cells must spend several weeks in culture before differentiation assays can be employed. Motivated by the need to accelerate the pace of screening biomaterial-induced cellular responses, the Moghe lab recently developed an imaging-based platform capable of predicting soluble growth factor-induced stem cell differentiation by distinguishing early cytoskeletal morphologies of fixed cells on two-dimensional microenvironments. The goal of this REU project is to expand upon these findings by probing biomaterial-induced stem cell differentiation responses to more complex microenvironments. To do so, we first created biomaterials with unique and reproducible topographical features. Next, using high-resolution images of stem cells cultured in the conditions, we identified morphological features that can be used to predict the long-term differentiation potential of biomaterials. The benefit of this project is to create a methodology that will shorten the screening process for predicting long-term differentiation potential of various biomaterials. This realization can complement current techniques to discover biomaterial niches that exhibit properties useful for tissue regeneration therapies.

Biography: Alejandra was born in Stockton, California and is the proud daughter of her Mexican immigrant parents, Josefina and Roberto. Alejandra currently attends the University of the Pacific and is on track to graduate in May 2014 with both her Bachelor's degree in Bioengineering and a Master's degree in Engineering Science. After graduation, she plans to pursue a Ph.D in Bioengineering and plans to work in the medical device industry. One of her hobbies is working on her nail art blog which contains budget friendly step-by-step pictorials on how to create DIY nail art designs. Alejandra is extremely grateful for the opportunity to have participated in the REU in Cellular Bioengineering and to have worked in Dr. Prabhas Moghe's lab with her mentors Sebastián Vega and Varun Arvind. She feels blessed and thanks everyone she has worked with this summer and the REU-RiSE program for providing her with this incredible opportunity.

Abstract and Student Biography

Abigail J. Ameri **Poster # 3A**
Ramapo College of New Jersey

Mentors:
Dr. Kevin Chen, Ph.D.
Department of Genetics and BioMaPS Institute for Quantitative Biology
Rutgers, The State University of New Jersey

Molecular evolution of RNA-dependent RNA polymerase in ticks

RNA interference (RNAi) is involved in genetic processes such as chromatin remodeling, gene silencing and viral suppression. The RNAi pathway is highly conserved and is found in plants, fungi, nematodes, flies and mammalian cells. In certain organisms, the pathway contains the enzyme RNA dependent RNA polymerase (RdRP). RdRPs were previously known to exist only in viruses, plants and nematodes, but in 2009 they were found in the I. scapularis tick. Ticks, found world-wide, are second only to mosquitos as vectors for human disease. Furthermore, the existence of a non-typical RNAi pathway containing an RdRP makes the tick an important and unique arachnid to study. Insight into the origin and mechanism of the I. scapularis RdRP could not only elucidate the function and evolution of tick RdRP-dependent processes, but could help in the advancement of tick control methods. This study uses a bioinformatics approach to explore the mechanism of the tick's RdRP and two alternate hypotheses about the origin of RdRP in the tick: (1) a viral genome integration event or (2) retention from an ancestor. RdRP sequences were run through BLAST to test for homology between eukaryotes and viruses. Manual computations for dN/dS (the ratio of non-synonymous to synonymous nucleotide substitutions) and the yn00 method from PAML were utilized to confirm whether selective pressure is present. The BLAST searches have revealed the tick RdRP to be more closely related to eukaryotes than to any of the 37 viral RdRPs searched. The dN/dS was computed for the alignment found in the previous BLAST search between the RdRP of M. occidentalis, the western predatory mite, and I. scapularis. The results indicate that the aligned portion of the RdRP protein is under negative selection. Four other key proteins in the RNAi pathway were evaluated and also found to be under negative selection. The fact that mites and ticks both have RDRP is significant in predicting the mechanism of RdRP because M. occidentalis has a very small genome, while I. scapularis has a very large genome; this suggests that transposable element control is not the main role of RDRP in ticks. Future work includes sequencing other species in the subclass Acari and comparing their RNAi pathway proteins.

Biography: Abigail is currently pursuing a degree in Bioinformatics with a minor in Chemistry and expects to graduate in Spring 2015 with a Bachelor of Science from Ramapo College of New Jersey. Abigail has expressed her excitement and good fortune to be participating in the RiSE program during the summer of 2013. At present, she is working in the Computational Genetics department with Dr. Chen's lab on the RNAi pathway in ticks in addition to research at Ramapo College of New Jersey working with Dr. Xu's lab on comparative genomics of various plant species. In conjunction with her research work, Abigail is the historian of the Bioinformatics Club at Ramapo College as well as a member of NSCS, Phi Theta Kappa and Golden Key Honor Societies.

Abstract and Student Biography

Marcos J. Ayala Rivera **Poster # 4A**
University of Puerto Rico, Río Piedras Campus

Mentors:
Carolina Ibanez-Ventoso, PhD, Monica Driscoll, PhD

Analysis of the impact of insulin ligands on life and health span in *C. elegans*

The nematode *Caenorhabditis elegans* is a powerful model organism for the study of ageing biology. Several factors have been described that regulate health and lifespan of *C. elegans*, including the Insulin/IGF1 signaling pathway. There are over forty insulin-like ligands in C. elegans and mutations in some, but not all, have shown to regulate lifespan. Further understanding of the roles of these insulin-like ligands is needed to find novel interventions to ameliorate ageing and its associated deleterious conditions. In this study we decided to identify the role of insulin-like ligands by using different deletion mutant strains of ins-5, ins-6 and ins-38 genes: *ins-5(tm2560)*, *ins-6(tm2008)*, *ins-6(tm2416)* and *ins-38(tm2632)*. We studied the effect of these deletions on locomotion activity by performing swimming analysis on aging animals using a sophisticated software program developed in the Driscoll lab called CeleST. We also used in vivo spectrofluorimetry to quantitate autofluorescent lipofuscin and advanced glycation end products (Age Pigments), which accumulate as the organism ages. Our preliminary results show that *ins-6* plays a role in promoting vigor in *C. elegans* after mid-life. The readings of age pigment accumulation are not conclusive and further analysis will be made to validate the certainty of these results.

Biography: Marcos J. Ayala Rivera was born and raised in Bayamón, Puerto Rico. Marcos is a junior studying Molecular Cellular Biology at the University of Puerto Rico, Río Piedras Campus. He likes to practice sports and visit the beautiful beaches in Puerto Rico with his friends. He also likes to travel, interact with new people and learn from different cultures. This summer, Marcos is enjoying research in Dr. Driscoll's lab, studying the biological mechanisms associated with ageing using as model organism the small roundworm, *C. elegans*. The RiSE program has given him the opportunity to explore different areas of research and will be a strong tool that will help him decide if research is what he is truly passionate about.

Abstract and Student Biography

Elizabeth Benn-Hirsch **Poster # 5A**
San Jose State University

Mentors:
Andrzej (Andre) Pietrzykowski, M.D, Ph.D. and Andy Mead, Ph.D.
Department of Animal Sciences
Laboratory of Adaptation, Reward, and Addiction (LARA)
Endocrine Research Facility

miR-9 Expression in Alcoholism

Alcoholism is the result of compulsive and uncontrolled drinking of any alcoholic beverage. Consuming large amounts of alcohol causes a rewiring of the brain as a result of complex changes in gene expression. Mature microRNAs (miRNA), small non-coding RNAs about 22 nucleotides long, regulate gene expression. In this study, we examined a specific miRNA, miR-9, and its precursors. MiR-9 is highly expressed in the brain and is thought to regulate neuronal differentiation MiR-9 is known to affect the brain's response to alcohol and developing tolerance. Our aim is to test how acute and chronic alcohol consumption affect miR-9 levels in neurons using striatal cell culture model. Cultures were either untreated or were exposed to 20mM ethanol for 15 minutes followed by a series of withdrawals (time in neurobasal media only without any ethanol) before collection. Other samples were exposed to 50mM ethanol for 6 hrs followed by a series of withdrawal times. All data pointes were examined in triplicate. The results suggest that miR-9 expression is directly affected by alcohol. Dose dependent response to alcohol exposure have different affects on miR-9 expression but both fluctuating in varying amounts and returning back again to normal levels after about a day. These results could help us understand rewiring of the brain occurring during the development of alcoholism.

Biography: Elizabeth Benn-Hirsch was born in Freetown, Sierra Leone (located in West Africa) but raised in Detroit, Michigan. She moved to San Jose, Ca when she was a sophomore in high school. She is currently attending San Jose State University (SJSU) where she is majoring in Biology with a concentration Molecular Biology and minoring in Chemistry and hopes to graduate in December of 2014. She is an active member of the Biology Student Association (BSA) and the RiSE program and research on her home campus. In what little free time she has, Elizabeth likes to catch up on sleep, watch mindless "reality" TV and murder-mystery shows, and shop. This summer, with the help of Rise at Rutgers, Dr. Andre Pietrzykowski and post-doctorate student Andy Mead, she is studying the molecular basis of alcohol tolerance and expression of the microRNA, miR-9, of acute vs. chronic alcohol intake in striatal cell culture. Elizabeth is looking forward to meeting new people and is sure that participating in the RiSE summer REU program will be her gateway to a better future. She plans to attend medical school or do an MD/Ph. D degree after receiving her Bachelors' degree.

Abstract and Student Biography

Ryan Blackman **Poster # 6A**
Northern Arizona University

Mentors:
John P. Hughes, Ph.D.
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Optical follow-up observations of lensing candidates for millimeter sources

The field of observational cosmology has taken great strides forward with the development of telescopes that can perform large area surveys in millimeter wavelengths, such as the South Pole Telescope (SPT) and the Atacama Cosmology Telescope (ACT). These instruments have provided astronomers with a new window to the distant universe, from the Cosmic Microwave Background to more nearby active galaxies and dusty star forming galaxies. Recently it was found that a significant subset of the millimeter sources discovered in the new surveys are magnified by foreground galaxies or galaxy clusters acting as gravitational lenses. Therefore, finding and measuring the properties of these lenses is an important aspect of millimeter observing, and a critical step is to obtain their spectroscopic redshifts. We identified 6 lensing candidates for sources observed in an SPT survey using optical imaging data from the Blanco 4-meter telescope. These were then targeted for spectroscopic observations using the South African Large Telescope (SALT) from late 2011 to early 2013. From these data we were able to determine the redshift of each candidate, obtaining a range of values from $z=0.14$ to $z=0.80$. Carrying on with this effort, we identified several good lensing candidates and up to 30 potential lenses for millimeter sources observed with ACT. This was a visible inspection of imaging data from the deep Stripe 82 region of the Sloan Digital Sky Survey. We are proposing to observe these candidates in the next semester of SALT observations. This project was supported by the National Science Foundation via grant PHY-1263280.

Biography: Ryan was born near San Diego, California. He is a rising senior majoring in physics and astronomy with a minor in mathematics at Northern Arizona University. He has research experience in several different topics, including planetary science, observational astronomy, and applied nuclear physics. This summer he has been working with Professor John P. Hughes on researching galaxies that are acting as gravitational lenses for sources observed in millimeter wavelengths. Ryan plans to attend graduate school for astronomy or planetary science so that he may pursue a career in research.

Abstract and Student Biography

Reena Blade **Poster # 7A**
Hampton University

Mentors:
Vladimir Mishin, PhD.
Department of Toxicology
Rutgers, The State University of New Jersey- EOHSI

Hydrogen peroxide detection using iron (III)tetrasulfonatophthalocyanine as a mimic of horseradish peroxidase

Hydrogen Peroxide is a compound naturally produced in the body that sequentially leads to the formation of harmful reactive oxygen species (ROS). Although this is a natural process, when there is a buildup of ROS biological system damage can result in DNA, lipid or protein damage. It has been speculated that ROS buildup contributes to disease as well: heart failure, cancer, Parkinson's disease, and sickle cell disease. Research has been conducted to attempt to understand the enzyme contributors of hydrogen peroxide and other ROS production. Previous studies have used horseradish peroxidase (HRP) in hydrogen peroxide determination assays, which is a natural enzyme catalyst that can be expensive and unstable. Thus, to replace HRP with a less expensive and more stable enzyme our lab has tested the functionality of the synthetic enzyme catalyst, FeTSPc. This mimetic enzyme was combined with Amplex Red or thiamine hydrochloride, hydrogen peroxide samples of known concentrations and buffers of different pH to determine its ability to act as a catalyst in a hydrogen peroxide detection assay. The data collected shows that FeTSPc works well as a catalyst. It has also been observed that Amplex Red works best as a fluorescence substrate in comparison to thiamine hydrochloride. The concentrations of FeTSPc also had an effect on the hydrogen peroxide detection ability of the assay. At a lower concentration of FeTSPc, 100µM, the fluorescence intensity was greatest. These results support FeTSPc as an inexpensive and stable catalyst to assist in hydrogen peroxide detection. As a result, studies of enzymes that contribute to ROS production can continue and lead to the prevention of their harmful effects.

Biography: Reena Blade is a senior chemistry major at Hampton University in Hampton, Virginia. She is California grown, has participated in prostate cancer research at Georgetown University in Washington, DC and is now spending the summer with RiSE at Rutgers, The State University of New Jersey in New Jersey doing toxicology related research. One may assume she enjoys traveling, but gaining new experiences is the real motivation behind her constant change of scenery. She is especially grateful for the opportunity to be a part of the RiSE program since this experience has helped her choose a narrower path to follow post undergraduate study. As of now, she plans to attend graduate school to gain her PhD in a pharmacy related area in order to contribute to drug discovery.

Abstract and Student Biography

Yssavo Camacho **Poster # 8A**
Lehigh University

Mentors:
Saurabh W. Jha, Ph.D., Mr. Viraj Pandya, Mr. Curtis McCully, and Mr. Brandon Patel
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Spectroscopy of type Ia supernovae with the Southern African Large Telescope

Type Ia supernovae are stellar explosions that are used to measure cosmological distances. These "standard candles" led to the fundamental discovery that we live in an accelerating Universe. Type Ia supernovae are thought to come from unstable white dwarfs that have accreted too much mass from a binary companion. Unfortunately, there are still many unanswered questions regarding the nature of the companion star and the mechanism for the explosion. In order to improve our understanding, we used Rutgers' share of the 11m Southern African Large Telescope (SALT) to obtain optical spectroscopy of a number of type Ia supernovae. We developed and improved a pipeline to reduce and calibrate the spectroscopic data. Our analysis focused on connecting early-time and late-time spectroscopic data with previous observations and testing models of the supernova explosion. This project was supported by the National Science Foundation via grant PHY-1263280.

Biography: Yssavo Camacho was born in Lima, Peru and has been living in Yonkers, New York for the past ten years. She is a currently studying astrophysics at Lehigh University and anticipates graduating with a B.S. in May 2015. This summer, Yssavo is working with Professor Jha studying type Ia supernovae using Rutgers' share of SALT, the Southern African Large Telescope. She is confident that the research experience from this summer has better prepared her for the challenges of graduate school. When she is not studying, Yssavo enjoys dancing, swimming, traveling, and discovering new and delicious dishes.

Abstract and Student Biography

Murchtricia Charles **Poster # 9A**
University of the Virgin Islands

Mentors:
Darrin York, Ph.D and Mr. George Giambasu
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Quantitative modeling of RNA - metal ion interaction

Ribonucleic acid (RNA) is a polynucleotide present in the cells of all life forms. RNA consists of a phosphodiester backbone, sugar and four nucleobases (Adenine, Guanine, Cytosine and Uracil) that code for the sequence- specific structure and chemical activity of RNA. Along with these components, monovalent and divalent cations, most notably Mg (II), are critical to the structure and function of RNA; due to its ability neutralize the negatively charged phosphodiester backbone of RNA to allow for conformational changes necessary for its biological functions. Central to understanding the atomic level details of RNA ions interactions is the quantification and visualization of ions and water distributions around RNA, i.e. the ionic atmosphere. However, theoretical modeling of the ion atmosphere and interactions between RNA and aqueous salts has not receive much attention in the quantitative sense due to lack in computer power and inaccuracies of models. In this study, we are utilizing a wide array of computer software (VMD, AMBER, 3DNA) to carry out large scale simulations of prototype RNA systems in aqueous solutions of MgCl2 and NaCl. We aim to build predictive models based on biological experiments, such as small-angle X-ray scattering (SAXS) and atomic absorption spectroscopy (AAS). The first step is to emulate the biological experiment in a computer simulation and to benchmark the accuracy of existing parameters sets. Step two is to improve the models and test their predictive capabilities.

Biography: Throughout my life I have lived with goals and utilized them as a compass to direct a path for me within my life's journey. My journey has been composed of a strong family foundation, a thirst for education and set expectations for my future aspirations. Within my childhood, I was taught that getting an education should be one's key priority; however as an individual I believe that giving back to the community assists in defining both your outlook and output of future experiences. While maintaining a 3.68 grade point average, I participate in numerous extracurricular activities. I am Co-Captain of the University of the Virgin Islands Dance Team, a participant of S.P.A.R.K.S (Students Promoting Awareness, Responsibility, Knowledge and Service) Youth Group, a tutor of both Mathematics and Chemistry, a volunteer at the Bethlehem Home for the Homeless and an avid reader. I am a yearly volunteer at the Juan F. Luis Hospital, the Relay for Life Foundation, an advocate for Breast Cancer Awareness and the March of Dimes for Babies Foundation and currently the reigning Miss University of the Virgin Islands. Due to my participation in extracurricular activities and my experience with community service, I have had numerous doors of opportunities opened for me. Academically, I am a member of ECS (Emerging Caribbean Scientists) Program and an MARC Scholar. Being member of these programs, I am able to perform tasks that I never believed that I would be capable of. Murchtricia Charles, a student who strongly believes in the saying that, "Only with hard work, determination and a heart of gold can success be obtained." That's me. As a result of my involvement in the community, work ethic and determination to make a difference in my community, I am sure that I am on my way to reach my future aspirations and becoming Dr. Murchtricia Charles, PhD.

Abstract and Student Biography

Olivia Dahl **Poster # 10A**
Dartmouth College

Mentors:
Timothy Otto, Ph.D., Caleb Hudgins, M.S.
Department of Psychology
Rutgers, The State University of New Jersey

Memory as Mediated by Hippocampal ARC Protein

Prior research has shown that activity-regulated cytoskeletal-associated (ARC) protein plays a specific role in the rearrangement of the neuronal cytoskeleton ultimately resulting in long-term potentiation (LTP), characterized by an enhancement of the strength of connections between neurons. Arc-mediated LTP is widely accepted as a potential cellular mechanism involved in memory formation. Developing a better understanding of patterns of ARC protein expression could generate a more nuanced understanding of the locus of cellular changes induced by learning. The present study examined learning-related the patterns of ARC protein expression within the different subfields (DG, CA1, CA3) and regions (dorsal, ventral) of the hippocampus, a brain region known to participate in many forms of memory. This study placed groups of rats in one of four experimental groups: auditory trace fear conditioning, two hours of exposure to conditioning context followed by auditory trace fear conditioning, training context exposure without conditioning, and a home cage control group. Each rat was perfused one hour after training and control animals were sacrificed directly from their home cage. Immunohistochemistry was used to stain hippocampal tissue slices for ARC protein, and the density and distribution of ARC protein expression was assessed in the regions and subfields identified above and compared across the four groups.

Biography: Olivia Dahl was raised with Kuvasok, chickens, and the occasional pet goats. Her father taught her Spanish with an Argentine accent with lesson plans that included reading "Goosebumps" (Escalofrios) out loud in Spanish over breakfast. She went on to learn French and Italian, and has a profound fascination with languages. Olivia is now majoring in both linguistics and neuroscience at Dartmouth College, and neurolinguistics is what she sometimes ruminates on before sleeping. She is bent on understanding how language shapes and limits thought, and she has Benjamin Whorf to thank for these serious considerations, although she does not necessarily completely agree with the Whorfian Hypothesis. Cementing an opinion on the Whorfian Hypothesis will require more experiments, hopefully designed by Olivia. This summer she has had the good fortune to work in Dr. Otto's lab, researching memory in the hippocampus and she has learned from this experience that she enjoys doing research in a lab with interesting, energetic people. Olivia aspires to know everything about neurolinguistics, and hopes to write books and both rival and sit down to dinner with Steven Pinker. She is weighing the pros and cons of getting both and MD and a Ph.D, and will take two years after graduation to iron out the details of her professional life. As far as Olivia's personal life, the future holds at least one Kuvasz, a house full of friends, and Greek yogurt.

Abstract and Student Biography

Kevin P. Dillon **Poster # 11A**
Monmouth University

Mentors:
Lily Y. Young, Ph.D., Dean of International Programs
School of Environmental and Biological Sciences
Rutgers, The State University of New Jersey

Sarah Wolfson, Ph.D. Candidate
Department of Environmental Sciences
Rutgers, The State University of New Jersey

Community comparison of mono- and di- chlorinated and brominated phenol-degrading bacteria

The accumulation of toxic and recalcitrant industrial compounds is a major environmental issue. Many of these compounds, despite being different from natural compounds, can be degraded by enzymes that are already expressed in existing microorganisms. These compounds include organohalides, which can be hazardous to a variety of organisms. This study sought to identify bacteria that are able to dehalogenate organohalides and are present in the Toms, Mullica, and Raritan Rivers of New Jersey. Anaerobic cultures (sparged with Ar gas) were created using water and sediment samples from the sites along with an addition of an electron donor solution, consisting of acetate, lactate, butyrate, and propionate. Each culture was amended with a single halogenated phenol to act as the terminal electron acceptor in respiration. These halogenated phenols included 2 bromophenol (2 BP), 2,6 dibromophenol (2,6 DBP), 2 chlorophenol (2 CP), and 2,6 dichlorophenol (2,6 DCP). Bacteria were monitored for organohalide biodegradation rate and metabolite formation. Water quality analysis of the site samples was performed to quantify the concentrations of nitrate, nitrite, ammonia, phosphate, and pH. Cultures were sampled weekly and subjected to high performance liquid chromatography (HPLC), followed by DNA extraction and amplification of the 16S rRNA gene by polymerase chain reaction (PCR). The microbial community's 16S rRNA genes were then fingerprinted using denaturing gradient gel electrophoresis (DGGE). It is expected that the Toms and Raritan Rivers will have more rapid degradation of organohalides than the Mullica River due to their histories of pollution.

Biography: Kevin Dillon is a rising junior at Monmouth University majoring in Biology with a minor in Chemistry. He plans to graduate in the spring of 2015. Kevin has lived in New Jersey his entire life. He is a co-participant in the International Environmental Sciences REU. Kevin's work is comparing the bacterial communities that are able to degrade chlorinated and brominated organic compounds. In his spare time, Kevin loves to read books and to play his clarinet and other instruments. He hopes to pursue a Ph.D. after completing his undergraduate studies.

Abstract and Student Biography

Nateisha L Drayton
Clemson University

Poster # 12A

Mentors:
Sarah Wolfson, Lily Young, Ph.D
School of Environmental and Biological Sciences

Comparison of dehalogenation rates in brominated phenols

As countries continue to develop around the world, industrial outputs correspondingly increase and pollute our environment. Many global water contaminants contain halogenated compounds, and a few of those that contain bromine atoms are known as flame retardants. Brominated flame retardants are toxic, persistent compounds that have been bioaccumulating in humans and in wildlife; however, their exact effects are currently still being studied. There are microbes that naturally metabolize many chemical contaminants such as these and aid in their reduction in our environment. Thus, research is being conducted to compare the rates at which these microbes biodegrade bromo-substituted phenols. The rate at which debromination occurs should be proportional to the amount of substitution. Monobrominated, dibrominated, tribrominated and pentabrominated phenols were tested using microcosms from three different freshwater sites in New Jersey and then concentration levels are expected to be measured using high performance liquid chromatography.

Biography: Nateisha is a native of Charleston, South Carolina, and is a rising junior currently pursuing a degree in Environmental Engineering at Clemson University. She is currently undecided about post-graduate plans, but hopes that this wonderful summer research experience will help her to decide on continuing to graduate school. Her interests include volunteering, playing intramural softball and singing on the Clemson University Gospel Choir. She also serves as a PEER mentor and Welcome Leader for incoming freshmen. Her future career goals include being an environmental consultant, working with other engineers overseas to develop clean water systems in developing countries and working for the Environmental Protection Agency.

Abstract and Student Biography

Alix M. Duarte **Poster # 13A**
New Jersey City University

Mentors:
Dr. Debu Banerjee, PhD., Nitu Bansal, PhD.
Cancer Institute of New Jersey
Rutgers, The State University of New Jersey

Effect of the chemokines CCL-2, CCL-5 and CXCL-12 on pancreatic cancer cell signaling, mobility and proliferation.

Studies have suggested that factors in tumor cell's microenvironment, such as Carcinoma-Associated Fibroblasts, infiltrated immune cells, and cytokines, play an important role in enhancing cancer progression and malignancy. In this study we sought to determine the role of chemokines, which are small molecules that mediate the interactions between tumor cells and their microenvironment on pancreatic tumor cells (Panc-1). Our aim was to determine the effect that the chemokines CCL-2, CCL5 and CXCL-12/SDF-1 have on human pancreatic tumor cells signaling pathways, proliferation and migration. For all of our assays, Panc-1 cells were cultured without the chemokines, with each chemokine alone or with a combination of all three chemokines. To determine the chemokines effects on signaling pathway activation, we focused on the MAPK signal transduction pathway. Cell lysates were examined for ERK1/2, MEK1/2, p-MEK1/2 and p-ERK1/2 expression by Western blotting. An in-vitro scratch assay and a transwell assay were used to determine the effect of these chemokines on cell migration. We found that CCL-2 and CCL-5 triggered more p-MEK1/2 than CXCL-12/SDF-1. In contrast, CXCL-12 had a greater effect on cell migration than both CCL-2 and CCL-5. However, the combination of all three cytokines had a greater effect of cell migration than CXCL-12 alone. Our data suggest that the chemokines CCL-2, CCL-5, and CXCL-12 differentially affect various aspects of Panc-1 cell behavior.

Biography: Alix Duarte was raised in El Salvador; here she spent the first 16 years of her life with her parents and two sisters. After graduating from Champagnat High School in El Salvador, she had the opportunity to study in South Korea; where after 10 months of Korean language classes, successfully finished her first semester in Food and Nutrition. Nevertheless, before starting her second semester in Chonnam National University, life presented a new opportunity for her and her family and they decided to take it and move to the United States. That is how in February, 2012 she got to New Jersey as a resident and started a new journey with her family, keeping her goal to successfully finish university as a first priority. She is currently a biology major sophomore in New Jersey City University, had the opportunity to collaborate as a secretary in the NJCU AMSA group and hopes to continue to embrace more opportunities that will allow her to grow better leadership skill that can make her reach and help other students, specially in the in the science majors, to get involved in research. She would like to thank the RiSE program for giving her this first opportunity to explore this tough but fascinating aspect of her career that is to do research, and special thanks to her biology professor, Dr. Cindy Arrigo for always guide her and encourage her to get involved in what passionate her, to be more than just a good student.

Abstract and Student Biography

Katrina R. Ellis **Poster # 14A**
Skidmore College

Mentors:
Phong Tien Huynh, PhD. and Paul Takhistov, PhD.
Rutgers, The State University of New Jersey

The effect of water content on the mechanical properties of hydroxypropyl methylcellulose edible films for drug delivery

Mechanical properties of hydroxypropyl methylcellulose (HPMC) films were investigated. HPMC films are used for trans-mucosal drug delivery, and manufacturing of these films begins with a gel that must be dried to the proper consistency so it does not stick to itself and can be packaged, shipped, and stored effectively. To determine the proper drying time, flux of water evaporation was first determined for the HPMC solutions both containing an active pharmaceutical ingredient (API), griseofulvin, and without the API. The curves of polymer concentration vs. flux kinetics were as expected and showed the two phase changes the polymer underwent as it dried. These plots are used as a reference for films placed in humidity chambers. Tensile strength tests run on films that were placed in humidity chambers showed plots that, once analyzed for their Young's Moduli, agreed with expected texture of the films – more elastic for higher humidity values and less elastic for lower. Comparing the texture of the films without API and with API showed that the presence of the API correlated with the tendency for the film to break after stretching for a shorter distance.

Biography: Katrina was born and raised in Charlton, Massachusetts. She studies in Saratoga Springs, NY at Skidmore College and plans to graduate in 2015 with a degree in Chemistry with a Physics minor. She has done research there regarding a new diagnostic test for malaria, and she is also a part of an a cappella group on campus. While at Rutgers this summer, she is working in the Food Science department, under Dr. Paul Takhistov, researching edible films as a drug delivery system. Outside of the lab, she has been reading, exploring, and spending time with other students in the program. She's also a huge Boston sports fan, and loves to watch the games whenever possible.

Abstract and Student Biography

Travis J. Feaker **Poster # 15A**
St. Norbert College

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

Vapor-phase carbonylation of propylene over H-zeolites to produce butanol

The synthesis of Butanol by introducing carbon monoxide to propylene under low pressure in the vapor-phase over solid acid H-zeolites is a modification of the Koch Reaction—using strong acids and high pressure. H-zeolites are equally acidic compared to aqueous acids, but are safer to handle. Methods used in this project can be adapted in order to produce several other petrochemicals using sustainable biomass as the source of their carbon; eventually eliminating dependency on oil, coal and natural gas. Butanol, a derivative of butyric acid, is being investigated as a liquid fuel to directly replace gasoline due to its similar combustion energy and blending percentage with gasoline. It can go directly into current combustion engines without any modifications. The process of synthesizing butanol begins with the production of butyric acid in a heated, closed system of tubing where the gases will be introduced using various valves and flow regulators; a secondary step will be taken to reduce butyric acid to butanol. The products, as well as the catalysts surface, will be analyzed in situ using Infrared Spectroscopy, Gas Chromatography, and Mass Spectroscopy to determine the active sites of the catalysts, intermediates formed, as well as rate, selectivity, and yield. By investigating different catalytic pathways, this will allow for advancements in catalyst design and improve carbon efficiency.

Biography: Travis J. Feaker is a senior Chemistry student at St. Norbert College in his hometown of De Pere, Wisconsin. He is also a member of the prestigious U.S. Dept of Education McNair Scholars graduate school preparation program funded at Ripon College (WI) through their affiliate relationship agreement at St. Norbert College. After completing his undergraduate studies, Travis plans on going to graduate school to study Chemical Engineering with a focus on sustainable energy and green chemistry. Prior to attending St. Norbert College, Travis graduated from West De Pere High School where he was starter on the State Runner-up football team as well as member of the marching band (trumpet, baritone, and tuba). He still actively participates in several music ensembles at St. Norbert when he is not in the laboratory. Travis is also a Resident Assistant and will helping first-year students with their transition into college life and starting their college career on the right foot.

Abstract and Student Biography

Jessica M. González-Delgado **Poster # 16A**
University of Puerto Rico – Río Piedras

Mentors:
Gerald Charles Dismukes, Ph.D., and Graeme P. Gardner, B.S.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Synthesis and characterization of lithium-nickel-cobalt oxides for water oxidation catalysis

Cubic phase lithium-cobalt oxide has become an attractive catalyst for water oxidation. These structures can serve as inorganic analogues of the Mn_4CaO_5 cluster present in PSII, which is responsible for catalyzing light-induced water oxidation. We aim to possibly increase the catalytic activity by doping the cubic phase with nickel, which can be a challenge because there are sparse reports of successful doping and formation of unwanted phases and impurities that could be active catalysts themselves. In this project we synthesized a series of modified-spinel $LiNi_xCo_{1-x}O_2$ using different synthetic routes, and found that stoichiometry, and calcination temperature and time all affect the purity of the final phase. We characterized the catalysts' structure by using PXRD and their catalytic activity by measuring the evolution of dissolved O_2 in water using a Clark electrode.

Biography: I am a senior Chemistry and Mathematics major from the University of Puerto Rico at Río Piedras. How both of these two areas combine to explain life's natural phenomena with a sometimes difficult to explain perfection, is the main reason how I got the curiosity, interest and passion for what I do. I want to dedicate myself as a research scientist and spread my ideas and knowledge through the world.

Abstract and Student Biography

Taneisha M. Gordon **Poster # 17A**
Tuskegee University

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

Soft, inflatable actuators for kite-based energy harvesting

Kite-based energy harvesting systems have become a recent area of interest due to their ability to produce power within the range of 1kW to 5MW (with minimal detrimental environmental effects) depending on the size/mass of the system and available wind energy. Many of these kite-energy harvesting systems use electrically powered rotors to control kite trajectory for optimal power production. These rotor systems are relatively expensive, and are comprised of dense materials. The goal of this study is to investigate an alternative approach for kite trajectory control that incorporates soft, inflatable actuators that will be used to change the aerodynamic performance of a kite. The advantages of soft based actuators are that they can be custom designed; and the materials are more lightweight than conventional rotors and are morphable. Hence, in this paper we will describe the design of a proof-of-concept device, wherein soft, inflatable actuators are attached to a kite and used to control the trajectory of motion through actuation induced with compressed air. Two methods being pursued are the redistribution of mass and the use of flaps to affect aerodynamic performance. The project will conclude by demonstrating that the soft, inflatable actuators can control the movement of the kite during flight.

Biography: Taneisha Gordon is a 5th year Architecture student at Tuskegee University in Tuskegee, Alabama from Macon, Georgia, but currently resides in Stockbridge, Georgia. She currently has a 3.86 GPA and is involved in many organizations on campus including, American Institute of Architecture Students (AIAS), Golden Key International Honour Society, and Tau Sigma Delta Architecture Honor Society. After her journey at Tuskegee University ends in May 2014, she plans to attend graduate school to obtain a Masters in Business Administration and Mechanical Engineering or Industrial Design. Both degrees will help her achieve her goals of creating a product and design she envisions and owning a business in the United States and abroad.

Abstract and Student Biography

Michelle T. Graham **Poster # 18A**
University of Scranton

Mentors:
Nada Boustany, Ph D. and Kamau Pierre, M.S.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey
J
en Hostettler, B.A.
Department of Cell and Developmental Biology
Rutgers, The State University of New Jersey

Quantifying altered subcellular structural dynamics during apoptosis in apoptotic resistant cells

The field of cancer diagnostics has seen tremendous advancement. However, improvements can still be made to address inaccuracy, subjectivity, time consumption, and patient discomfort. For example, when using cytology or biopsy, visual prowess is used to discern what cells look normal or abnormal; these techniques are highly subjective. Therefore, optical light scattering techniques such, as optical coherence microscopy, have been developed to make diagnosis more objective. Light scattering provides quantifiable measurements about a sample's structure, specifically orientation, size, and refractive index of objects in the sample. It has accurately and objectively labeled normal and diseased samples. Unfortunately, there is a missing link between the optical signal and how it relates to the underlying biology of specific genetic pathways; we aim to find this link. Resulting in apoptotic resistant cells, disruption of the BAX and BAK apoptotic pathway is a hallmark of cancer. We investigated how the structural changes and differences between apoptotic resistant and apoptotic competent cells related to light scatter. In this experiment we exposed apoptotic competent (W2) and apoptotic resistant (D3 cancerous) cells to apoptotic inducer, Staurosporin; our novel laser light scattering optical instrumentation captured changes in optical signal in Gabor filtered images over time. These differences in morphological change are detectable by our novel instrumentation and quantifiable via pixel-by-pixel image analysis of Gabor filter images. We expect to be able to use image analysis to isolate key structural changes in the mitochondria, an organelle playing a pivotal role in apoptosis. Our quantifications can be used to decrease subjectivity in cancer diagnosis, improve treatment, monitor treatment, and tailor diagnostic technology to search for key structural changes.

Biography: Michelle Graham is from Succasunna, NJ. Currently she is pursuing a B.S. in Biophysics and minor in Philosophy at the University of Scranton in Pennsylvania. There, she works as a tutor and takes part in the Physics and Mountain Sports Clubs. She is also a proud member of the Women's Rugby Team. This summer at Rutgers, she has had the pleasure of working in the Biomedical Engineering Department with Dr. Nada Boustany. In the future, she plans to attend graduate school and earn a Ph D.

Abstract and Student Biography

Kirsten R. Hall **Poster # 19A**
University of North Carolina at Chapel Hill

Mentors:
Andrew Baker, PhD
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Star formation in local analogs of Lyman Break Galaxies

Lyman Break Galaxies (LBGs) are UV-luminous, highly star-forming galaxies at z~3 that make up a substantial fraction of the high-redshift galaxy population. Because these galaxies are so numerous at high redshift, they provide an important sample for testing galaxy evolution models. Due to the weak dust emission in LBGs and the difficulty in detecting their molecular gas emission, however, long wavelength characterization of LBGs is limited. As a result, knowledge of LBGs' star formation efficiencies and gas masses has suffered. We are testing if the Kennicutt-Schmidt law relating star formation rate surface densities and gas mass surface densities applies at high redshift through the analysis of Lyman Break Galaxy Analogs (LBAs) at z~0.2. The analogs make up a small, low-redshift population that has physical properties such as surface brightness, color, UV/optical morphology, metallicity, mass, and star formation rate that are similar to those of LBGs. These resemblances suggest that the long-wavelength characteristics of LBAs will mirror those of LBGs as well. Using Plateau de Bure Interferometer CO(1-0) data and SINFONI near-infrared observations of Paα emission, we are testing the Kennicutt-Schmidt law for a small sample of LBAs. If this relation holds for the LBAs then it is plausible that it also applies to LBGs at z~3. Confirming or denying this relation for LBGs and their analogs will provide important insight to their evolutionary state. Our observations will allow us to analyze how these results are influenced by metallicity, IR luminosity and other parameters that may help determine an appropriate estimate for the ratio of gas mass to CO luminosity in high-redshift systems. This project was supported by the National Science Foundation via grant AST-0955810.

Biography: Kirsten Hall is from Concord, North Carolina and attends the University of North Carolina at Chapel Hill. She will graduate in December 2013 with a B.S. in Astrophysics. At UNC, Kirsten is a member of the RESOLVE research team organized by Professor Sheila Kannappan, and studies galaxy rotation curves and galaxy evolution. Additionally, she is president of UNC Women in Physics and an active member of the Society of Physics Students. She has spent this summer in the Rutgers Physics and Astronomy REU studying star formation in Lyman Break Galaxy Analogs with Professor Andrew Baker. Kirsten wants to pursue a PhD in astrophysics and will be applying to graduate schools this fall. Her career goals include becoming an observational astronomer, conducting research and engaging in education and public outreach.

Abstract and Student Biography

Mikala R. Hanson **Poster # 20A**
Princeton University

Mentors:
Lara Delmolino, Ph.D., Kim Sloman, Ph.D., Meredith Bamond, M.Ed., Robert Isenhower, Ph.D., Matt Edelstein, M.A., Psy.M., Rebecca Schulman, and Lauren Pepa, M.S.
Douglass Developmental Disabilities Center
Rutgers, The State University of New Jersey

The role of teacher affect on problem behaviors during instruction of a child with autism

Applied Behavioral Analysis (ABA) has been used extensively to reduce the problem behaviors of children with Autism and enhance learning through manipulation of the child's environment. Because various environments may elicit different behaviors in autistic children, in ways that are unique to each individual, it is important to determine the particular environment that is most beneficial for the child. In this case study, we are observing the impact of teacher affect on the problem behaviors of the child during learning tasks in order to identify which affect the child performs better in, which may help to improve the child's learning experience. The frequency of problem behaviors was recorded for 12 sessions—6 teaching mastered skills tasks, and 6 teaching target program tasks—with each of the child's teachers alternating between using high intensity affect or low intensity affect. It was hypothesized that the child would display less problem behaviors and thus perform better with those teachers using high affect during both mastered tasks and target skills tasks. Data was recorded using the Instant Data Software program. It was found that the child's display of problem behaviors varied depending both on the specific teacher and the type of task. On average across teachers, it appeared that the child displayed a higher average frequency of problem behaviors per minute during the target skills condition when being taught using low intensity affect, perhaps as a means of escaping the high demand learning a new skill entails. This trend occurring during low affect use may suggest that possibly teaching in high affect is more ideal when teaching the child new skills. Noting that the variation of display of problem behaviors across teachers could be attributed by the teachers' different interpretation of affect definition, future studies using a more strict operational definition for high affect and low affect along with implementation of treatment integrity measure may be beneficial. Another direction for future study is further examination of the child's problem behaviors during target skills tasks.

Biography: Mikala was born in Brooklyn, NY and currently lives in Tampa, FL. She expects to graduate from Princeton University in June of 2014 with a Bachelor of the Arts degree in Psychology and a Certificate of Proficiency in African American Studies. After graduation, she plans on going to graduate school to earn a Ph. D or Psy. D. in Clinical Psychology in order to pursue her career goal of becoming a Clinical Psychologist working with autistic children and children with ADD/ADHD. She has had previous research experience. Last summer, she was a research assistant at Dr. Marc Karver's Alliance and Suicide Prevention Lab at the University of South Florida. This summer, she is working at the Douglass Developmental Disabilities Center (DDDC) with Dr. Lara Delmolino. Mikala is assisting with many different studies, which include testing interventions to help reduce problem behaviors of the autistic children that attend the DDDC school, and testing interventions that may help increase the children's learning abilities. Outside of academics, Mikala loves to watch movies, and she is a member and choreographer of DiSiac Dance Company, a student-run dance company at Princeton. She is very grateful to be a part of the RiSE program because it has provided her with the amazing opportunity to do research on Autism, a field of primary interest within her ultimate career goal.

Abstract and Student Biography

Jose A. Hawayek **Poster # 21A**
University of Puerto Rico at Mayagüez

Mentors:
Elizabeth Stucky
Department of Chemical and Biochemical Engineering

David I. Shreiber, PhD
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Modulating neuro-inflammatory response in in-vitro model by treatment with encapsulated hMSCs

Traumatic brain injuries are a major cause of death and long term disabilities. According to the CDC, every year at least 1.7 million traumatic brain injuries occur contributing to almost a third of all injury-related deaths in the United States. Costs of traumatic brain injury in 2000 were estimated at $76.5 billion. Primary trauma caused by impact or stroke leads to secondary trauma as a response. In secondary trauma, cells present in wounded areas secrete inflammatory factors that further cell death and promote extensive scar formation; our goal is to reduce these effects. Human Mesenchymal Stem Cells (hMSCs) exposed to an injury environment have shown the ability to sense and respond to specific inflammation factors by secreting anti-inflmmatroy molecules. However, treatment with hMSCs by direct implantation has been ineffective due to stem cell migration and differentiation. Alginate has been used effectively to encapsulate hMSCs and prevent both migration/differentiation while still allowing environment sensing and secretion of cytokines. Previous work has focused on characterization of anti-inflammatory molecules such as TNF-α following injury, as well as the usage of monolayer or encapsulated hMSCs for treatment in nervous cell cultures. In this experiment, both cell and organotypic cultures will be exposed to the endotoxin lipopolysaccharide to simulate the inflammatory component of secondary trauma. Human MSCs will be encapsulated in alginate, then applied to stimulated cell/organotypic cultures, and measure their response via the levels of IL-10 and IL-6 anti-inflammatory molecules secreted. We will focus on the characterization of cytokines IL-6 and IL-10. Human MSCs are expected to increase endogenous anti-inflammatory molecule IL-10 and similarly modulate anti-inflammatory molecule IL-6. The characterization of these interactions will help in the development of an effective treatment for reducing deaths and disabilities due to secondary trauma following primary brain injury.

Biography:

José Hawayek was born and raised in Fajardo, Puerto Rico. He studies in Universidad de Puerto Rico Mayagüez and hopes to graduate in 2013 with a bachelor's degree in both Biology and Industrial Microbiology. He hopes to continue his graduate studies pursuing either an MD/PhD or a PhD and acquiring an MBA as to pursue careers in industry. His RiSE/REU experience has helped him determine which fields to pursue his PhD within and exposed him to many different research strategies and opportunities. His experiences under the tutelage of Elizabeth Stucky Markensohn jointly working between the labs of Dr. David Shreiber and Dr. Martin Yarmush has expanded his understanding of graduate school and of how many simple ideas and principles help engineer new prospects. José is very grateful for the opportunities given and proud to form part of both labs for the summer.

Abstract and Student Biography

Wesley T Hodges **Poster # 22A**
Truman State University

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

The roles of GCN2 versus PERK in mediating hepatic stress response to Asparaginase

Acute Lymphoblastic Leukemia (ALL) is the most commonly diagnosed form of childhood cancer. For nearly 50 years, Asparaginase (ASNase) has been integral in ALL chemotherapy cocktails. ASNase hydrolyzes asparagine, a non-essential amino acid that leukemic lymphoblasts cannot effectively synthesize, causing death to the cancer cells. Patients taking ASNase display numerous side effects including hepatic dysfunction, pancreatitis, and severe coagulopathy; however, the causes of such adverse effects are not well understood. Our goal is to elucidate mechanisms underlying ASNase induced hepatic dysfunction. The body responds to a variety of stressors with an integrated stress response (ISR), which is regulated by four protein kinases that each act to phosphorylate eIF2α (p-eIF2α). We are particularly interested in two eIF2α kinases: GCN2, which responds to amino acid deprivation and PERK, an endoplasmic reticulum (ER) stress mediator and signal transducer for the unfolded protein response (UPR). We hypothesize that liver dysfunction and metabolic complications associated with ASNase are related to deficiencies in the integrated stress response. To address this hypothesis, wild-type, liver specific PERK (LsPERK) knockout (KO), GCN2 KO, and LsPERK/GCN2 KO mice were injected once-daily for 8 d with 0 or 3 IU/g BW of *E. Coli* ASNase. Measurements included changes in bodyweight and composition as well as western blot analysis of p-eIF2α and three ER stress adaptation proteins: BiP, CHOP, and ATF6. Using qRT-PCR, we also analyzed expression of ATF4 and three ER stress responsive genes, BiP, CHOP, and XBP1 splicing. Our results demonstrate that ISR induction was increased in the livers of WT and LsPERK KO mice given ASNase, but not in the GCN2 KO, or double KO mice livers. Consequently, the loss of GCN2 blocks induction of the ISR, while the loss of PERK may not. Contrary to our hypothesis, ASNase did not induce an ER stress response, and in fact decreased XBP1 splicing in wild-type mice. Knocking out GCN2 or PERK had minimal impact on the UPR.

Biography: Wesley Hodges attends Truman State University, a liberal arts college in Kirksville, MO. He is pursuing a B.S. in biology with a minor in chemistry. Originally from Liberty, MO, he obtained an A.A. degree from the Metropolitan Community College of Kansas City where he became a Phi Theta Kappa member. Prior to participating in the RiSE program, Wesley worked on a molecular dynamic research project studying protein-RNA recognition under the direction of Dr. Maria Nagan at Truman State University. Wesley is an active member of two national academic honor fraternities, Beta Beta Beta (biology) and Alpha Chi Sigma (chemistry). At Rutgers, Wesley is working in the lab of Dr. Tracy Anthony and is mentored by Dr. Gabriel Wilson. He is interested in metabolism and molecular nutrition and intends to apply to graduate school during the upcoming fall semester.

Abstract and Student Biography

Jessica K. Huhnke **Poster # 23A**
Trine University

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

Finite element analysis of a novel composite scaffold for bone regeneration

Bone loss and skeletal deficiencies resulting from traumatic injury, abnormal development, or cancer are prevalent concerns worldwide. Approximately 500,000 bone grafting procedures are performed in the United States annually. Current treatments include autographs (transplanting a patient's own tissue) and allographs (transplanting tissue from a cadaver). However, both autographs and allographs have drawbacks such as donor site morbidity and disease transmission. As a result of these disadvantages, the field of tissue engineering is exploring alternative treatments. The Musculoskeletal Tissue Regeneration Laboratory has created a composite synthetic bone scaffold which mimics the structures of trabecular and cortical bone and incorporates both the organic and inorganic components of bone. Currently, the compressive yield strength of the cortical component is significantly less than that of native bone. This study focuses on the incorporation of organic hydroxyapatite (HAP), a derivative of calcium phosphate, in the form of columns into the cortical component of the graft to increase the graft's overall mechanical strength under compressive loading. Various arrangements of the HAP columns were designed and tested in compression using Abaqus finite element analysis (FEA) software. The FEA results concluded the formation of four 0.245 mm x 0.245 mm HAP columns with surrounding cortical bone has a highest compressive yield strength. Physical models of HAP column arrangements with sufficient compressive yield strength were created, incorporated into the cortical component of the scaffold, and tested in compression using an Instron 5869 to verify the FEA results. The incorporation and arrangement of the HAP columns will lead to the development of a mechanically enhanced fabricated cortical scaffold. The full composite bone scaffold is a promising treatment option for bone loss and skeletal deficiencies.

Biography: Jessica Huhnke is a senior majoring in Mechanical Engineering at Trine University in Angola, Indiana. Jessica is a member of Trine University's tennis team and is the vice president of Alpha Sigma Tau Sorority Epsilon Kappa Chapter. Her summer research is in Dr. Joseph Freeman's lab working with synthetic bone scaffolds. Upon completion of her undergraduate degree, Jessica wishes to pursue a Ph.D in Mechanical Engineering. During her free time, Jessica can usually be found at the gym or immersed in a good book.

Abstract and Student Biography

Brittany N. Johnson **Poster # 24A**
City University of New York Hunter College

Mentors:
Kimberly Cook-Chennault, PhD, Wanlin Du, Sankha Banerjee, Uday Sundar
Department of Mechanical & Aerospace Engineering
Rutgers, The State University of New Jersey

Development of barium titante strontium ferrite thick films

In recent years there has been a large growth in interest in developing piezoelectric materials that exhibit high electromechanical characteristics for energy harvesting and material applications in electronic devices, sensors, actuators and memories. Lead based piezoelectric thin films exhibit high performance ferroelectric, dielectric and piezoelectric characteristics, however since there are environmental, social, and health concerns with the production and use of lead, there is a need for a shift to a new safer material. One of the major challenges with finding an alternative to lead based materials is that due to a large coercive field and high conductivity there are difficulties poling the lead free materials composite piezoelectric materials, such as two and three phase barium titanate (BT) - based composites. Previous studies suggest that composite BT-based materials that are combined with other materials such as sodium bismuth titanate or doped with electrically conductive additives such as strontium have larger ferroelectric and dielectric properties than their homogenous counterparts. Hence there is an interest in exploring these materials further. Our aim is to produce BT- strontium ferrite thick films using sol-gel spin coat techniques and to then analyze the properties using XRD (X-ray diffraction), test the dielectric constant and piezoelectric coefficients using a piezometer. We will also use SEM (scanning electron microscope) to get the thickness and morphology of the films.

Biography: Brittany Johnson is doing a double major in math and physics. She has always been interested in green energy technology. Brittany hopes to one day make a real impact on the sustainability of the earth.

Abstract and Student Biography

Stephanie M. Knowlton **Poster # 25A**
University of Connecticut, Storrs

Mentors:
Kathryn E. Drzewiecki and David I. Shreiber, PhD
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Assessment of neurite growth in methacrylated collagen gels with patterned stiffness

Injuries that affect the central or peripheral nervous system, such as spinal cord damage or severe nerve transection, are slow to heal and often result in permanent loss of sensory and/or motor function. One effective regenerative therapy utilizes collagen-filled nerve guidance conduits to guide severed neurites to reconnect. A durotactic gradient is one factor of interest for use in nerve guidance conduits; recent studies have shown that neurite outgrowth is enhanced down a gradient of stiffness compared to up a gradient or in homogenous conditions. However, these studies have been limited to 1-dimensional gradients. We have extended these studies to two dimensional patterns to determine the effect of gradients and patterns of stiffness on neurite outgrowth in three-dimensional culture. We have used a modified collagen gel, collagen methacrylamide (CMA), which can be crosslinked under UV light to varying degrees of stiffness depending on the intensity of the light applied. This allows us to spatially modulate stiffness by applying UV light to the hydrogels through photomasks. CMA was used to encapsulate chick dorsal root ganglia in three dimensions to study how neurite outgrowth is affected in specific patterns of stiffness of the gels. Increasing radial gradients (from compliant to stiff) and decreasing radial gradients (from stiff to compliant) are compared to fully crosslinked and uncrosslinked CMA to determine the effect of stiffness gradients three-dimensional culture. Patterns of stiffness were also tested to determine their ability to directionally enhance neurite outgrowth. The samples were stained with a fluorescent neurofilament tag, imaged using fluorescence microscopy, and then quantified in terms of neurite number, average length, and growth area. Contrary to the hypothesis, in terms of both neurite length and neurite number, neurite outgrowth was enhanced on increasing gradients of stiffness compared to on decreasing gradients. Also contrary to previous findings, neurite growth was enhanced on fully crosslinked gels compared to uncrosslinked gels. A possible explanation for these results is that uncrosslinked methacrylamide groups on CMA adversely affect neurite growth. These discoveries may be incorporated into nerve guidance conduit therapies to help patients suffering from debilitating nervous system injuries regain better function than was previously possible.

Biography: Stephanie is from Tolland, CT and is a junior at the University of Connecticut studying biomedical engineering with a minor in mathematics. She is a sister and service chair for Phi Sigma Rho, a sorority for women in engineering, and is also a member of The Society of Women Engineers. With a passion for tissue engineering, she hopes to eventually earn her PhD. At her home university, she works with cardiac cells to improve cell survival following a heart attack. This summer, Stephanie participated in the Cellular Bioengineering REU program, working on improving nerve regenerative therapies for patients suffering from nervous system injuries.

Abstract and Student Biography

Emily A. Kraus **Poster # 26A**
Syracuse University

Mentors:
Ron Gilman, Ph.D., Katherine Myers, Ph.D., Arun Tadepalli, April White
Department of Physics & Astronomy
Rutgers, The State University of New Jersey

On the nucleon charge distributions

We discuss current issues regarding nucleon charge distributions. For the neutron, we explore whether observations of a negative core in the neutron impact parameter charge distribution can be reconciled with the positive core of the neutron in the three-dimensional Breit-frame charge distribution. For the proton, we describe the proton radius puzzle and study issues in the determination of the charge radius from electron-proton scattering experiments. This project was supported by the National Science Foundation via grant PHY-1263280.

Biography: Emily Kraus is a rising junior at Syracuse University studying physics, mathematics, and biology. Also a Syracuse native, she enjoys ultimate frisbee, playing bass guitar, and spending time with family and friends.

Abstract and Student Biography

Lauren E. Langbein **Poster # 27A**
The College of New Jersey

Mentors:
Mr. Chenchao Gao, Anuja A. George, Ph.D., Nancy C. Walworth, Ph.D.
Department of Pharmacology
Rutgers-Robert Wood Johnson Medical School

Msc1 interacts with the kinetochore to ensure accurate chromosome segregation

Accurate mitotic chromosome segregation depends, in part, upon interactions of fission yeast Multicopy Suppressor of Checkpoint Kinase 1 (Msc1) and kinetochore complex proteins at the centromere. Msc1 is a multidomain protein consisting of three plant homeodomains (PHDs), Jumonji N (JmjN), and Jumonji C (JmjC) domains, indicative of potential involvement in modifying chromatin structure. Recent studies have identified that overexpression of the PHDs of Msc1 is sufficient to rescue growth defects in yeast strains with mutations in two essential components of the kinetochore, Minichromosome Instability 6 and 12 (Mis6 and Mis12). This study sought to determine the ability of the PHDs of Msc1 to rescue growth defects in strains mutated in other components of the kinetochore complexes, including Mis15, Mis16, Mis17, and Mis18. These proteins form functional sub-complexes, with Mis6 forming a complex with Mis15, Mis17, and Sim4, and Mis16 forming a complex with Mis18. Plasmids containing versions of Msc1 with domain deletions or point mutations in the critical cysteine residues of the PHDs were transformed into yeast strains mutated in each kinetochore protein and lacking endogenous Msc1. Spotting assays were performed with the transformants and control strains to assess the ability of the plasmids to rescue the growth defects of the mutant strains. Preliminary results suggest that PHD3 displays the strongest genetic interactions with Mis16 and Mis18, while PHD2 genetically interacts most strongly with Mis17. These results indicate that Msc1 plays a significant role in chromosome segregation by interacting with multiple individual components of the Mis protein complex.

Biography: Born and raised in Wall, New Jersey, Lauren is a rising senior at The College of New Jersey in Ewing. She is pursuing a B.S. in biology with a minor in chemistry, and anticipates graduating in the spring of 2014. Her passion for discovery and love of the laboratory has driven her involvement in research in the RiSE program and at her home institution. She aspires to continue her education through graduate studies in cell and molecular biology. Aside from her academic interests, Lauren enjoys cooking, dancing, drawing, baking, concerts, and spending time with her family, friends, and boyfriend. She is the historian of Beta Beta Beta biological honor society, a DJ and photographer for 91.3FM WTSR, and a member of Synergy Dance Company. She is very grateful for the opportunities she has encountered to develop her personal and professional skills, and looks forward to a career in biological research.

Abstract and Student Biography

Leah Langer **Poster # 28A**
Chatham University

Mentors:
Namrata Bansal, M.S., Nikesh Koirala, M.S., Matthew Brahlek, MS., and Seongshik Oh, Ph.D.
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Thin film topological insulators in a field effect transistor

Topological insulators are materials with insulating bulk and conducting surfaces. Bi_2Se_3 is one such material. However, perfect Bi_2Se_3 topological insulators have yet to be realized because imperfections in thin film growth and intrinsic se-vacancies lead to conduction in the bulk. This project explores the use of gating to eliminate bulk conduction. We demonstrate that back gating in an 8QL Bi_2Se_3 film results in reduced carrier density when negative gate voltage is applied. We also present a study of SiO_2 as a gate insulator for top gating Bi_2Se_3. This project was supported by the National Science Foundation via grant PHY-1263280.

Biography: Leah Langer is a mathematics and physics major at Chatham University in Pittsburgh, PA. Her future plans include graduate studies in physics with a possible focus on fluid mechanics and nonlinear dynamics.

Abstract and Student Biography

Dylan McClung **Poster # 1B**
The College of New Jersey

Mentors:
Siobain Duffy, Ph.D.
Department of Ecology, Evolution, and Natural Resources

Ms. Yee Mey Seah
Department of Microbiology and Molecular Genetics
Rutgers, The State University of New Jersey

Nucleotide substitution biases and model selection in phylogenetic inference of double-stranded DNA and RNA viruses

Nucleotide substitution models are used to infer phylogenetic trees that describe evolutionary relationships. However, phylogenies may be inaccurate if model parameters are not biologically relevant. Substitutions (fixed mutations) are a product of mutation rates, which vary widely among virus species. Biased substitution patterns have been observed in single-stranded viruses. This study investigated the presence of substitution biases in double-stranded (ds)DNA and dsRNA viruses, and analyzed the fit of two substitution models (REVersible, and UNRESTricted) to the viral datasets. REV (6-rate) assumes the same rates of forward and reverse nucleotide substitutions, while UNREST (12-rate) allows all rates to vary. Complete protein-coding gene sequences of dsDNA and dsRNA viruses were downloaded from GenBank. Vaccine strains and laboratory-modified sequences were excluded from analyses, as were detectably recombinant sequences. Maximum likelihood phylogenetic trees were then created from multiple sequence alignments of each dataset using PAUP* and RaxML. Significant substitution biases ($p<0.01$) were determined with the X^2 test, comparing the number of observed substitutions from an inferred ancestor to extant sequences, to the expected changes. The dsDNA BK polyomavirus (VP1 gene) and Human papillomavirus type 6 (L1 gene) lacked significant bias; however, the VP7 gene of the dsRNA Human rotavirus C, showed significant overrepresentation of cytosine to thymine (C→T) substitutions relative to T→C substitutions. The lack of bias in dsDNA viruses may mean that simpler substitution models like REV are sufficient for their phylogenetic reconstruction. Model comparison results showed that UNR did not fit significantly better than REV for either dsDNA or dsRNA viruses.

Biography: Dylan McClung was born in Carlisle, PA but raised in Hamilton, NJ. He is currently a rising junior at the College of New Jersey (TCNJ) where he is majoring in Biology and minoring in Chemistry. He is an active member of the campus community working in the Biology department and tutoring students in science and math courses. Likewise, he is the current Vice President of Beta Beta Beta and is continuing his role as a Community Advisor (CA) for a sophomore residence hall next year. In what little free time he has, Dylan enjoys reading (currently the Game of Thrones series), dancing, and “creeping” on Facebook. This summer, with the help of Dr. Siobain Duffy and graduate student Yee Mey Seah, he is studying nucleotide substitution biases and the molecular evolution of double-stranded DNA and RNA viruses. Dylan is sure that the RiSE program will open up several doors for him. In the meantime, he is contemplating how to pursue his passion for biology after graduation, with a Ph.D. likely to be in his future.

Abstract and Student Biography

Samantha A. Myruski **Poster # 2B**
SUNY Oneonta

Mentors:
Martha Soto, Ph.D., Sailaja Mandalapu, Ph.D.
Department of Pathology
Rutgers-Robert Wood Johnson Medical School

Role of actin regulators in neuronal polarity of *Caenorhabditis elegans*

Components of the WAVE/SCAR complex in Caenorhabditis elegans (C. elegans) are crucial in the formation of branched actin, which is responsible for cell migration. Mutations of the GEX-3 protein, or any other signaling molecules, in the WAVE/SCAR pathway lead to failed initiation of actin nucleation and branched actin formation, causing a Gex (Gut on the exterior) phenotype due to failure of the epidermis to enclose the embryo. Previous studies suggested that *gex-3* has a role in neurons, but we did not know if this was due to a direct role in neurons themselves, or an effect of loss of WAVE complex proteins in the neighboring cells. In order to address this question *gex-3*, a component of the WAVE/SCAR pathway, was tested to see if it has a direct role in the neurons by RNA interference (RNAi). Since neurons do not express the *SID-1* dsRNA channel and are thus not sensitive to RNAi uptake, we used a neuronal specific RNAi strain TU3595 for our experiments. This strain has *sid-1* gene knocked out throughout the worm but is rescued only in the neurons by introducing a wild type copy of *sid-1* under a neuronal specific promoter. This enabled us to see the effect of *gex-3* solely in neurons by feeding the TU3595 strain with *gex-3* RNAi. Our tissue specific RNAi experiments showed neuronal defects in the mechanosensory neurons of both the control (*mec-4*::GFP) and TU3595 strain when *gex-3* was removed by RNAi. My preliminary results show that when the worms are depleted of *gex-3* via RNAi there are enhanced neuronal defects in the TU3595 strain compared to the *mec-4*::GFP control strain. There is a higher percentage of ectopic protrusions and cell body defects of the ALM neuronal cell body and a higher percentage of dorsal/ventral migration defects of the AVM axon in the TU3595. This suggests that *gex-3*plays a direct role in the neurons. This is important because this might help us understand the role of neuronal migration in the organization of the cytoskeleton and the connection to neurological syndromes in human diseases.

Biography: Samantha A. Myruski, born and raised in a small town in Orange County, New York, is an upcoming senior at the State University of New York at Oneonta, with a major in biology and a minor in chemistry. Her research there includes the synthesis of imines, using a green method, and exploring the biological properties, specifically cytotoxicity, of these compounds. She spent her previous summer volunteering on ambulance rides while attending classes in order to receive her EMT-B certification. In the fall she will be a teaching assistant for the rigorous anatomy & physiology course taught at her university. Always found laughing, her outgoing and flamboyant personality is a reflection from her high school days of being a cheerleader. She currently works in a lab at Rutgers headed by Martha Soto, exploring the effects of tissue-specific depletion of GEX proteins on neurons via the use of RNAi. Her future plans include attending graduate school for physical therapy or pharmacy school.

Abstract and Student Biography

Javier J. Olmeda **Poster # 3B**
University of Puerto Rico

Mentors:
Mr. Weijie Chen, and Daniel Seidel, PhD.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Preparation of 2-(prop-2-ynyl)-2-(tetrahydrofuran-3-yl)malonate from tetrahydrofuran-3-ol

C-H bond functionalization provides strategic new opportunities in the synthesis of complex organic compounds. This work explores an alternative mode of reactivity based on Brønsted acid catalyzed hydride transfer (HT), followed by C-C bond formation (HT cyclization) without the use of Platinum(IV) Iodide (PtI_4) as the catalyst. In this work, the reaction is expected to be catalyzed by hydrogen iodide (HI) to form the heterocyclic compound via through-space hydride transfer (HT-cyclization of alkynes). Dimethyl 2-(prop-2-ynyl)-2-(tetrahydrofuran-3-yl)malonate is to be used as starting material. This method enables one-step preparation of complex heterocyclic compounds by α-alkenylation of readily available cyclic ethers and amines. The preparation of the starting material was successful, as evidenced by proton nuclear magnetic resonance spectroscopy.

Biography: Javier Olmeda is a junior chemistry major at the University of Puerto Rico at Aguadilla, PR. He was born and raised in PR, has participated as a volunteer assistant in neurology research at University of Puerto Rico in Rio Piedras, PR and is now spending the summer with RiSE at Rutgers, The State University of New Jersey in New Jersey doing organic chemistry related research. He is grateful for the opportunity to be a part of the RiSE program since this experience has helped him choose a narrower path to follow post undergraduate study. As of now, he plans to attend graduate school to gain his PhD in a pharmacy related area in order to contribute to drug synthesis and analysis.

Abstract and Student Biography

James R. Palmer II **Poster # 4B**
Rutgers, The State University of New Jersey

Mentors:
Kimberly Cook-Chennault, Ph.D., Wanlin Du, Udhay Sundar, and Sankha Banerjee
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Development of zinc oxide nano-generators

Piezoelectric materials are important for charge production and storage with capacitor devices. Zinc Oxide (ZnO) nanowire is piezoelectric and can be grown using a seed layer deposition technique and a hydrothermal process. The current work is looking at the growth, population density, and related electromechanical properties of the ZnO nanowire in relation to substrate roughness and stress reaction/viscosity of sol-gel, which is used as a seed layer. A working hypothesis is that the thicker more viscous gels and rougher substrates will grow a denser population of thicker nanowires thereby decreasing the piezoelectric constant and increasing the dielectric constant. It is thought that the relationship between the electrical properties and the thicker, denser geometries is found in the description of the stress and strain of the structure. The bulkier structure will disperse the mechanical and electrical loads decreasing the amount of compression applicable to the wires. The microstructure and wire dispersion will have been measured with Scanning Electron Microscopy (SEM). The electromechanical properties will be analyzed with a Piezometer and Impedance-meter.

Biography: Born and raised in New Jersey, James has been interested in scientific research ever since the 10th grade. He also enjoys the work he performs in his two majors; Mechanical Engineering and Philosophy. The main topics of interest are energy conversion, philosophy of science, and epistemology.

Abstract and Student Biography

Ariel C Parker **Poster # 5B**
Swarthmore College

Mentors:
Kenneth Irvine, Ph.D., Veronica Codelia, Ph.D., and Benjamin Keepers
Howard Hughes Medical Institute, Waksman Institute of Microbiology, and Department of Molecular Biology and Biochemistry
Rutgers, The State University of New Jersey

Localization of Zyxin and Ajuba proteins in cultured mammalian cells under mechanical tension and cell density conditions

The Hippo signaling pathway, conserved from Drosophila to mammals, controls cell proliferation. In mammals, upstream pathways converge on YAP, a transcriptional co-activator for genes involved in promoting cell growth; an active Hippo pathway inhibits YAP activity. Extracellular cues such as mechanical tension and cell contact have been shown to affect the pathway and the localization of its protein components. It is known that mechanotransduction affects the localization of Zyxin, a LIM domain protein and a component of the Fat branch of the Hippo pathway. Also, cell density is known to affect the Hippo pathway: increasing cell density causes activation of the pathway and the phosphorylation of YAP, leading to the inhibition of cell proliferation. Therefore, the localizations of six other LIM domain proteins (specifically in the Zyxin and Ajuba protein families) in cultured mammalian cells under variable mechanical stretch and cell density conditions were studied. The LIM domain proteins analyzed include Ajuba, LIMD1, and WTIP of the Ajuba family and Zyxin, LPP, and TRIP6 of the Zyxin family. Stable transfected MCF10A cell lines were derived using plasmids encoding these proteins. Transient transfections of MCF10A with plasmids were used to study the effects of cell density and of mechanical tension on the localization of the proteins. In one of the mechanical tension experiments (performed to see the effects of the extracellular matrix's stiffness on the protein localization), LIMD1 was localized near the cell junctions in the soft ECM conditions, and aggregated outside of the nucleus in the hard ECM conditions. Similar experiments are planned for other proteins of interest.

Biography: A native of Philadelphia, Ariel Parker is a rising junior at Swarthmore College, with a major in Biology. After graduation from Swarthmore, she hopes to attend graduate school in the biological sciences. This summer, she worked in the lab of Dr. Kenneth Irvine at the Waksman Institute; her work focused on localizing Zyxin and Ajuba family proteins of the Hippo pathway proteins in cultured mammalian cells and also localizing Jub (an Ajuba family protein) in fruit fly tissues across developmental stages. Ariel is very grateful for her experience in the lab, her support from HHMI, her friends in the RiSE program, and this summer experience.

Abstract and Student Biography

Isamar Pastrana Otero **Poster # 6B**
University of Puerto Rico at Mayagüez

Mentors:
Gerardo-Gallegari, Ph. D., German-Drazer, Ph. D.
Department of Mechanical and Aerospace Engineering and Solids Mechanics Laboratory
Rutgers, The State University of New Jersey

Swelling dynamics in pharmaceutical tablets

The purpose of this project is to study the effect of compaction force from 8 kN to 40 kN (equivalent to a compaction pressure of 100 to 500Mpa) on dissolution test outcomes for 45% Avicel (matrix), 45% lactose (matrix), 9% APAP (drug, or active ingredient) and 1% magnesium stearate (lubricant) pharmaceutical tablets. The dissolution test is a standard technique that provides in vitro drug release information for both quality control purposes (to assess batch-to-batch consistency of solid oral dosage forms such as tablets) and drug development (to predict in vivo release profile). Swelling behavior, disintegration behavior, porosity and permeability are affected by compaction force which influences dissolution dynamics. Lactose swells in aqueous solution and Avicel promotes tablet disintegration which accelerates drug dissolution. The pharmaceutical tablets were prepared with the Presster™ of Metropolitan Computing Corporation, an automatic tablet producer which fabricates tablets to desired mass and volume, while measuring the compaction force. Our work is focused on a controlled release system to describe swelling and disintegration behavior of tablets with a mix of different excipients. First of all physical properties of the tablet were determined and then a combination of visual and gravimetric techniques were used to study liquid penetration and swelling behavior of the tablets in a controlled situation. Each experiment started when the bottom of a tablet was put in contact with a distilled water bath. The liquid penetrated from underneath and the tablet swelled. Swelling dynamics was assessed by measuring the cross-sectional area and by calculating the volume (assuming axial symmetry) through image analysis. Preliminary results suggest that while the compaction forces increase the volume increase in agreement with previous results in confined versus free swelling studies. Future studies will be focused on relating diverse Avicel and lactose formulations with swelling dynamics.

Biography: Isamar Pastrana Otero was born in Manatí, Puerto Rico. Currently she is junior in Chemical Engineering at the University of Puerto Rico at Mayagüez. She expects to graduate in May 2015. For the summer, she is working with German Drazer, Ph. D., under the mentorship of Gerardo Gallegari, Ph. D. as member of the Structured Organic Particulate System (C-SOPS) on RiSE. Her project is about the swelling dynamics in pharmaceutical tablets. In the future, Isamar wants to pursue graduated studies in chemical engineering focused in the pharmaceutical industry. In her free time, Isamar likes go to the movie theater, cook and see T. V. series. Isamar likes the quote “It is not in doing what you like, but in liking what you do that is the secret of happiness.” by James M. Barrie.

Abstract and Student Biography

Carlos A. Paz **Poster # 7B**
San Diego State University

Mentors:
Eric Lam, Ph.D. and Mr. Kenny Acosta
Department of Plant Biology and Pathology
Rutgers, The State University of New Jersey

Determining methionine content in 5 genera of duckweed through ethionine assay and biosensor using cystathionine-gamma-synthase deficient *E. coli*.

Duckweed research has recently focused on developing it as a valuable crop, with uses focusing on wastewater remediation, fermentation to fuel ethanol, and production of animal feed. A good feedstock for animal feed will have not only high protein content, but an appropriate balance of amino acids that matches as closely as possible the nutritional needs of the target animal. However, plant-based proteins and feeds are traditionally low in essential amino acids such as methionine (met), requiring the addition of exogenous amino acids. Here, we find and report the optimal strains of duckweed for animal feed by quantifying those strains which produce the most protein and the most methionine. In the first part of the process, an ethionine-resistance assay shows the genus Wolffia to contain the highest levels of soluble methionine, confirming preliminary data. The second part is a biosensor assay consisting of an *E.coli* bacterial biosensor which cannot synthesize methionine due to the silencing of the gene for the met-precursor cystathionine-gamma-synthase, resulting in a dependence on environmental methionine for growth. The biosensor's growth in each sample of duckweed is limited by the amount of methionine which is produced by the sample, so total growth is directly translatable to met-content through optical density measurements.

Biography: Carlos Paz is a chemistry/biochemistry junior at San Diego State University. He is an American Chemical Society Scholar since summer 2012. He works at the Dinsdale Metagenomics Lab at SDSU since fall 2012. In summer 2012, he participated in the Bridges to the Baccalaureate program, a post-graduate preparatory internship at SDSU. He volunteers at the local East County YMCA, primarily in their annual fund-raising campaign. Carlos Paz lives in San Diego, CA with his wife Stella and their two dogs, Stinker and Caramello.

Abstract and Student Biography

Stephen L. Randall **Poster # 8B**
University of Maryland

Mentors:
Richard Gray, PhD, Sunil Somalwar, PhD, Matthew Walker, PhD
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

High-energy searches for supersymmetry at CMS

Supersymmetry (SUSY) is a proposed extension of the Standard Model in which all known particles are given "super-partners" with opposite statistics. In addition to offering a mechanism for grand unification, SUSY presents possible dark matter candidates and a solution to the hierarchy problem. To date, no experimental evidence for SUSY has ever been observed. In this presentation we give an overview of high-energy searches for SUSY at the Large Hadron Collider, a calculation of a particular misreconstruction rate relevant to multilepton signals, and some new results from searches for R-parity violating SUSY. The data used, with an integrated luminosity of 20.6 fb^{-1}, was collected by the CMS collaboration in 2012 at $\sqrt{s} = 8$ TeV. This project was supported by the National Science Foundation via grant PHY-1263280.

Biography: Stephen Randall is currently an undergraduate at the University of Maryland studying physics, mathematics, and computer science. A rising junior, he plans to graduate in 2015 and pursue a PhD in high-energy theoretical physics. This summer Stephen worked in Dr. Sunil Somalwar's lab searching for supersymmetry at the LHC, specifically looking at charge-flip rates in CMS and various R-parity violating models. At UMD he is supported by the Banneker-Key and Goldwater scholarships, and conducts research on off-shell supersymmetry with Dr. S. James Gates. Other research interests include phenomenology, foundations of quantum field theory, extended supersymmetry, and higher-dimensional supergravity.

Abstract and Student Biography

Jordana P. Rosenberg
Duke University

Mentors:
Stavroula Sofou, Ph.D.
Department of Chemical Engineering, Rutgers, The State University of New Jersey
Ms. Michelle Sempkowski
Department of Biomedical Engineering, Rutgers, The State University of New Jersey

Effect of liposome composition, targeting, and incubation time on penetration into multicellular spheroids

Chemotherapeutic drugs are powerhouses, strong enough to destroy cancer cells; howeer, they don't spare the healthy tissues either, leading to highly undesirable side effects when administered to patients. Further, these toxic side effects limit the amount of chemotherapeutic that can be used for treatment. Over the past thirty years, scientists have been working to develop liposomal drug delivery systems that work to increase accumulation of the drug in the tumor interstitium, while minimizing uptake by the liver and spleen. More recently, there has been a drive towards multiresponsive liposomes, those that respond to an environmental stimulus. However, although liposomal delivery helps overcome the large-scale challenges of cancer treatment as outlined above, engineers are still trying to maximize liposome penetration into the tumorspace to ensure that even cells located at the center of the tumor get treated by the drug. Our lab has been working to develop targeted liposomes that bind to tumor cells and release their contents in response to the varying pH levels in the tumor microenvironment. The project aims to determine the effect of liposome composition, targeting and incubation time on penetration of liposomes into multicellular spheroids; Specifically we will compare one type of pH-sensitive liposomes used in our lab (PCPA) and the FDA-approved Doxil liposomes (DSPC/cholesterol), one hour and six hour incubation times to allow for liposome penetration and peptide-targeted and non-targeted liposomes. We hope to see that our targeted responsive liposomes penetrate further into spheroids after a six-hour incubation period.

Biography: Jordana Rosenberg was born in East Brunswick, New Jersey. She now attends Duke University and anticipates graduating in the spring of 2015 with a degree in biomedical engineering with a concentration in cellular, molecular and tissue engineering and a minor in art history. After college, she intends to continue her education and pursue a Ph.D in biomedical engineering. This summer she has had the privilege of working in the lab of Dr. Stavroula Sofou, studying liposomal drug delivery. Outside of academics, Jordana has a passion for traveling, serves as a member of Delta Gamma fraternity and is involved in several organizations to help freshmen acclimate to the transition into college.

Abstract and Student Biography

Karina N. Ruiz-Esteves **Poster # 9B**
University of Puerto Rico at Mayagüez

Mentors:
Davide Comoletti, DVM/Ph.D and Ms. Eva N. Rubio-Marrero
Department of Neuroscience and Cell Biology
Child Health Institute of New Jersey

Role of Palmitoylation in Proteins Associated to Autism Spectrum Disorder

Neuroligin-4 (NLGN4) and Fibronectin and Leucine-rich Repeat Transmembrane protein (FLRT3) are postsynaptic cell adhesion molecules that mediate the formation and maintenance of synapses between neurons. They contain one to three conserved cysteine residues in their intracellular domain, which could serve as possible palmitoylation sites, a post-translational modification that has been shown to alter protein function and subcellular localization. A recent study revealed that a subset of autistic patients carry a non-synonymous single point mutation in NLGN4 gene that introduces a cysteine at position R704 (R704C) that can be a new palmitoylation site near the cell membrane. In this research we aim to study if cysteines in these proteins are palmitoylated and how the palmitoylation affects the stability and expression of both NLGN 4 and FLRT3 in hippocampal neurons. Using the Biotin-BMCC Palmitoylation Assay method to test for palmitoylation it was confirmed that both proteins were palmitoylated. Transfection of HEK 293 cells and hippocampal neurons with WT and NLGN4 mutants was performed to confirm expression and test for changes in protein localization at synapse. Using confocal microscope, transfected neurons showed a change in morphology when comparing WT and other NLGN4 mutants. These results suggest that palmitoylation may regulate function and localization of NLGN4 in neurons. Although it has been suggested that NLGN4 mutations could lead to autism, there is no conclusive evidence in this field. Studying palmitoylation effects on neuronal synapses and identifying differences in expressed proteins can not only provide new insights into ASD and other neurodevelopmental syndromes, but also serve as possible target for pharmacological manipulation and the development of new ways of treatment.

Biography: Karina N. Ruiz-Esteves is a rising junior at the University of Puerto Rico at Mayagüez. After finishing her B.S. in Biology, her professional goal is to obtain an MD/PhD. As part of her preparation for this competitive program, Karina has participated at the Summer Medical and Dental Education Program at Case Western Reserve University and at the Internal Medicine and Cardiovascular Surgery Internship at Mayagüez Medical Center. Back at her college, she demonstrates her passion for research, using spectroscopic techniques to study amyloid fibrils. At the 2013 RiSE summer program, she worked at Dr. Comoletti's lab studying palmitoylated proteins associated with Autism Spectrum Disorder. Karina has great leadership qualities, which demonstrates as active member of SACNAS, Historian of the National Honor Society of Biology (Beta Beta Beta), volunteer of the American Red Cross, and member of the MARC program. She enjoys reading, listening to music and spending time with her family. For Karina, RiSE at Rutgers was not only one more research experience; it definitely helped her to define her goals, learn about new opportunities, and moreover, improve her academic and professional skills.

Abstract and Student Biography

Marissa N. Saladin **Poster # 10B**
Aquinas College

Mentors:
Dr. Sagar Khare and Manasi Pethe
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

A structure-based predictive model for the substrate specificity of the tobacco etch virus (TEV) protease

The substrate specificity of proteases underpins their diverse and crucial biological roles, and provides a basis for the design of inhibitors that are commonly used as ant-viral drugs. Further more, proteases designed to target specific substrate sequences will be attractive therapeutic leads for specifically degrading any given disease-associated protein. We used the TEV protease, a commonly used laboratory reagent for the removal of affinity tags from recombinantly-expressed proteins, as a platform system to develop a structure-based predictive model for protease specificity. The enzyme functions as a highly specific cysteine protease and recognizes the canonical sequence Glu-Asn-Leu-Tyr-Phe-Gln-(Gly/Ser), with the cleavage occurring between the Gln-Gly or the Gln-Ser peptide bond. However, similar sequences can also be cleaved, and lists of cleavable and uncleavable substrate sequences have been experimentally determined. We used the Rosetta macromolecular modeling program to generate structural models of 70 cleaved and 342 uncleaved sequences, and used the components of the energy interaction between the protease and peptides to train support vector machines for developing a predictive classifier. On an independent test set, a preliminary classifier was able to predict cleaved sequences with 84.45% accuracy. Refinement and further testing of the model to recapitulate the specificities of variant proteases is ongoing. These studies may lead to the development of a new structure-based protocol for the design of proteases with novel specificities, which will serve as leads for a new class of therapeutic drugs.

Biography: Marissa Saladin is a rising senior at Aquinas College in Grand Rapids, Michigan. She is currently pursuing a B.S. in Chemistry and Mathematics and is expected to graduate in the spring of 2014. Marissa is hoping to attend graduate school for a Ph.D. in Chemistry. She is currently the president of her ACS Student Chapter (Aquinas Chemistry Society) and an ACS Scholar. This summer, Marissa has been working with Dr. Sagar Khare and Manasi Pethe on creating a computational model for protease specificity.

Abstract and Student Biography

Monica Salazar **Poster # 11B**
University of Puerto Rico at Río Piedras

Mentors:
Stacy A. Bonos, Ph.D.
Laura Cortese, Graduate Assistant
Hilary Mayton, Ph.D. Research associate in Department of Plant Biology and Pathology
Rutgers, The State University of New Jersey

Breeding for improved ethanol yield in switchgrass

Switchgrass (*Panicum virgatum*) was first considered as a potential bioenergy feedstock only a few decades ago. This low maintenance, North America native, perennial, fast-growing grass can be harvested and converted to ethanol or burned to generate heat and/or electricity. Ethanol is an alcohol that could substitute fossil fuels. The most commonly used source for ethanol production is corn. Cellulose and other complex sugars are the primary ingredients in to the process of producing ethanol using switchgrass. The production of ethanol would mitigate the fossil fuel and energy crisis. For this reason, looking for sustainable crop to produce ethanol is of vital importance. Very little research has been done regarding the effects of the environment on switchgrass bioenergy traits in the northeastern US. The objectives of this investigation are to determine to what degree variations in cellulose, hemicellulose and lignin in the plant are due to genetics and to what degree to environmental factors, and to identify cultivars best suited for use as a bioenergy feedstock in the northeastern US. Thirty switchgrass genotypes were planted at three locations in New Jersey, (one on prime quality soil and two marginal soils) in a randomized complete block design with 5 replications. Leaf and stem tissue was collected from each replicate of each genotype in both 2009 and 2010. Tissue samples were dried and then ground using a Wiley Mill with a 1ml screen. Fiber analysis was conducted using two different methods: wet chemistry and NIR (Near Infrared Spectroscopy). Percent lignin, cellulose and hemicellulose were calculated and data was analyzed using SAS (Statistical Analysis Software). This analysis will be used to determine what factors influence the percentages of lignin, cellulose and hemicellulose in switchgrass genotypes. My goal is to gather data that will be useful for switchgrass breeding efforts to improve ethanol yield from switchgrass and further the knowledge base of the use of switchgrass for bioenergy.

Biography: I was born and raised in Puerto Rico. Ever since I was a child I was infatuated with nature. I enjoyed most in high school the basics of science like biology and chemistry but especially environmental sciences. After graduating, I applied to the University of Puerto Rico, Rio Piedras campus, which accepted me. Soon after starting my freshman year, I joined various environmental student clubs and started committing to my country's most crucial environmental crisis like use of energy and waste management. In January 2012, I participated in the Composting and Recycling Internship sponsored by Syracuse University. I am currently still working with them. As a junior, I have taken enough classes to know this is the career for me. To further develop my knowledge and skill in the scientific area, I prepare to take on any challenge.

Abstract and Student Biography

Daniel S. Seara **Poster # 12B**
New York University

Mentors:
Stephen Tse, Ph.D., William Mozet
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Few-layer graphene synthesis using pulsed laser deposition

Graphene research has surged in recent years due to its incredible properties, such as ballistic electron transport and high tensile strength to weight ratio, suggesting staggering potential applications. Efforts to produce graphene have naturally followed. Using an Nd:YAG laser of 266 nm to ablate highly ordered pyrolytic graphite (HOPG), graphene is fabricated on polished copper substrates for varying times (T = 900ºC, P = 10^{-5} Torr, E = 50 mJ/pulse). The graphene is examined using Raman spectroscopy with a focus on studying the number of layers grown as a function of the time of deposition using peak intensity ratios. It has been determined that the number of graphene layers decreases with decreasing deposition time while the disorderedness of the graphene crystals remain unaffected. This study advances the current state of knowledge on graphene synthesis, aiding in further efforts to not only create graphene, but also study its properties and seemingly countless potential applications.

Biography: Daniel Seara is a New Jersey native from the town of Kearny. He is currently attending New York University where he is pursuing an individualized degree in physics and philosophy and will graduate in May 2014. This summer, he had his first research experience in the mechanical engineering department at Rutgers, The State University of New Jersey working under Stephen Tse, Ph.D. working on few-layer graphene synthesis using pulsed laser deposition. While disappointed that he is not yet a rock star, plan B is to work as an acoustic engineer after completing the appropriate Ph.D. program in either acoustical physics or engineering. He enjoys getting lost on long car trips and exploring whatever he happens to find around him. His curiosity and wonder will undoubtedly contribute to his success in his future endeavors, both professional and personal.

Abstract and Student Biography

Genesis Serrano **Poster # 13B**
University of Puerto Rico at Rio Piedras

Mentors:
Andrzej Pietrzykowski, M.D.,PhD. Yongping Wang, PhD., and Lies Tejeda
Laboratory of Adaptation, Reward, and Addiction
Department of Animal Sciences
Rutgers, The State University of New Jersey

Determination of single nucleotide polymorphism associations in miR-9 region with alcoholism in humans

Alcoholism is a complex multi-genetic disease affecting a person's risk of developing addiction. MicroRNAs (miRNAs) are a class of small non-coding RNAs that regulate expression of genes at post-transcriptional level. In this study we wanted to determine the association of single nucleotide polymorphisms (SNPs) in mir-9 regions with alcoholism in humans' samples. Humans have three *miR-9* genes that are located at different chromosome loci on chromosome 1, 5 and 15 respectively. Interestingly, two out of three miR-9 genes are located near or within the alcoholism susceptible loci. SNP in a miRNA may change gene expression and as a consequence their functionality. The identification of genes that appear important in alcoholism susceptibility provides an opportunity to better understand the nature of alcoholism and for developing innovative therapy. We used DNA samples from the prefrontal cortex region to search for alcoholism related SNP in regions related to *mir-9*. Each sample was amplified by performing nested PCR. For the analysis of DNA sequences and SNPs determination we used a software platform that organizes and assembles the DNA sequences and by contrasting the samples against a main reference sequence. Our results predict a correlation between *mir-9* expression levels and the predominance of the minor allele through the SNPs. The data shows a higher frequency of the minor allele in human brains in which *mir-9* expression is lower. The result suggests that SNPs in *mir-9* regions might cause a predisposition to the development of tolerance to alcohol.

Biography: She is the daughter of two hard working and loving parents and the oldest of three siblings. She was born and raised in Camuy, Puerto Rico. Genesis is a rising senior at the University of Puerto Rico, Rio Piedras Campus where she is majoring in Cell and Molecular Biology. Since middle school, she is actively participating in science school fairs demonstrating her engagement and enthusiasm for science. Currently she is member of the American Society of Biochemistry & Molecular Biology, Golden Key Honor Society and National Society of Collegiate Scholars. In her free time Genesis enjoys reading, going to movies or to the beach. Her plans after graduating are to pursue a doctoral degree in biomedical research. This summer she is doing research at the Laboratory of Addiction, Reward and Adaption and with the mentoring of Dr. Andrzej Pietrzykoswi she is studying miRNA-9 genetics in alcoholism

Abstract and Student Biography

Ligin M. Solamen **Poster # 14B**
Loyola University Chicago

Mentors:
Vipul Baxi, Mark Pierce, PhD
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Non-invasive imaging camera for quantification of metabolic properties of tissue

On average, there are over 15,000 individuals each year on the waiting list for a liver, and about 2,000 of the donated livers are discarded thereby reducing the already depleted pool of transplantable livers. Macrosteatosis, dislocation of the hepatocyte nucleus by large lipid droplets, is the major reason these livers are rejected for transplantation. Liver defatting methods have been developed to address the issue of increasing macrosteatotic livers being discarded. This method has proven effective in reducing lipid concentration, but current evaluations of the liver undergoing this process requires biopsies to quantify lipid concentration. The biopsies could further damage the liver and are time consuming. Our goal is to develop a non-invasive imaging system that will examine the donor liver quickly before and after the defatting process and reveal information about its contents, specifically lipid concentrations. The system will gauge whether the liver needs to be further processed or if it is suitable to reenter the transplantation pool. The imaging device consists of three components: a projector that sends light in the visible light spectrum to the tissue, a camera that collects the remaining light from the sample, and a computer that is able to do image analysis. Through the method of modulated imaging, we will be able to obtain absorption and scattering values of the tissue. Absorption and scattering values can then inform us about the concentration of lipid in the tissue. The system has been characterized and is currently being tested and calibrated with phantoms, mock tissue that resembles the optical properties of real tissue. After calibration and validation of the system, we hope to examine and quantify the properties of liver tissue.

Biography: Ligin was born in Kerala, India and moved to Chicago, Illinois at the age of 7. She is a rising senior at Loyola University Chicago studying bioinformatics and biophysics. She conducts computational biochemistry research at Loyola and is very involved with her school and church. This summer she has the pleasure to work with Dr. Mark Pierce participating in biomedical optics research. The RiSE/REU in Cellular Bioengineering has solidified her decision to pursue a graduate degree in Biomedical Engineering. She is very grateful for this incredible experience and thankful to everyone she has worked with this summer.

Abstract and Student Biography

David W. Sroczynski **Poster # 15B**
Cornell University

Mentors:
Alex Neimark, Ph.D., Richard Cimino, and Aleksey Vishnyakov, Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Characterization of fluid behavior in adsorptive nanopores through Monte Carlo simulation

Nanoporous materials can be used to separate fluid molecules based on size as well as strength of adsorption to the solid surface. Macroscopic fluid dynamics and thermodynamics do not apply to these confined systems, but Monte Carlo simulations can be used in the development of analytical equations to define this behavior. In this project, Monte Carlo code was developed to analyze nitrogen behavior in carbon and silica nanopores with a diameter between 3.6 and 7.2 nm. Fluid-fluid and solid-fluid interactions were approximated with the standard Lennard-Jones potential and 10-4-3 Lennard Jones potential, respectively. Several experimental adsorption isotherms were verified, and we observed key features including monolayer formation, rapid capillary condensation, high pressure liquid-like state formation, and adsorption-desorption hysteresis. The liquid-like state was achieved at pressures between 0.2 and 0.5 relative to the saturated vapor pressure. The simulation is now being further developed to explore behavior of more complicated systems, including electrolyte solutions. This data could be used in conjunction with molecular dynamics simulations and physical experiments in the development of analytical equations.

Biography: David Sroczynski was born and raised in Ramsey, NJ. He has attended Cornell University and expects to graduate in the Spring of 2014 with a Bachelor's degree in chemical engineering. He is also interested in computer science and materials science. This summer he has worked in Professor Andrew Niemark's research lab, where he has used Monte Carlo simulations to explore the behavior of fluids in adsorptive nanopores. At Cornell, he has been involved in multiple teaching assistant roles in physics, chemistry, and computer science. Although he is still considering several career paths in different fields, he likes the idea of pursuing a Ph.D. on the road to a position as a research professor. His hobbies include skiing, tennis, basketball, and reading.

Abstract and Student Biography

Julius L Taylor **Poster # 16B**
Tuskegee University

Mentors:
Leora Nusblat, M.S.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Charles M. Roth, Ph.D.
Department of Biomedical and Chemical Engineering
Rutgers, The State University of New Jersey

The effect of temozolomide and STAT3 silencing on glioma stem cells

Glioblastoma multiforme (GBM) is an aggressive brain tumor that despite surgery, radiation, and other forms of therapy, carries a poor prognosis of one year. One form of therapy, temozolomide attacks tumor cells but leaves behind cancer stem cells (CSCs) that have the ability to reform tumors. Since STAT3 is crucial to the formation of neurosphere-initiating tumor cells, we predict that a combined treatment with temozolomide and STAT3 siRNA (silencing) would be more potent. Stem cells will be isolated from a GBM cell line and primary specimens. Cell viability, proliferation capacity, migration and collagen degradation abilities of the CSCs are expected to be further impaired in the combined treatment. Silencing will be confirmed by western blotting and as an alternative method, real-time PCR amplification. In addition, it is predicted that the presence of M2 macrophages will maintain the stemness properties of these cells based on immunofluorescence staining. We believe a combination treatment will be more effective and will serve as a stepping-stone to a better method of treating brain cancer.

Biography: Julius Taylor was born in Montgomery, Alabama on April 14, 1992. He is a rising senior in the Tuskegee University Chemical Engineering program. During his senior year at Tuskegee, Julius will pursue the biochemical engineering option in order to pursue a medicinal path. Julius is a former intern for International Paper (Prattville, AL) and has done research on biofuel machinery with Dr. Qinghua He (Tuskegee University). During the summer, Julius has been working with Dr. Charles Roth and Leora Nusblat on testing the effect of Temozolomide and STAT3 siRNA (combination treatment) on Glioblastoma (brain tumor) cells.

Abstract and Student Biography

Daniel G. Tekverk **Poster # 17B**
Marist College

Mentors:
Jack Zheng, David I. Shreiber, PhD., Jeffrey D. Zahn, PhD.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Hao Lin, PhD., Jerry W. Shan, PhD.
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Investigation of molecular delivery enhancement through microscale electroporation pulse manipulation

The transition from macroscale to microscale electroporation (μEP) has the potential to improve the ability to transfer analytes, such as drugs and DNA, into individual cells, as opposed to an entire population. While much research has been done studying and refining the microfluidic devices that are critical to μEP, little attention has been given to optimizing the electrical pulse parameters. This work uses theory driven methods to perform preliminary studies on the effects of pulse duration and relaxation time on the delivery efficiency of molecules into cells. Propidium iodide (PI), a nucleic acid binding fluorescent dye, was transferred into 3T3 fibroblasts to determine delivery efficiency. Pulses of varying duration and amplitude are generated using a function generator. Delivery of PI into the cell is determined using fluorescence microscopy and analyzed using Matlab. Results show that there is a positive correlation between PI delivery and the duration of the electric field. Adding a second pulse of the same duration has been shown to improve the delivery into the cell by an average of 41% by the end of pulse application. However, the effect of the relaxation time between pulses has not yet been determined. Future work includes developing schemes with more than two pulses, adjusting the shapes of the pulses, and incorporating pulses with alternating polarity into current schemes to determine their effect on delivery efficiency.

Biography: Daniel is a chemistry/biochemistry major at Marist College. After graduating, he plans to attend a PhD program in biochemistry.

Abstract and Student Biography

Gabriell J. Thorne **Poster # 18B**
Elizabeth City State University

Mentors:
Lauren Aleksunes, PharmD, PhD., Xia Wen PhD, Longqin Hu, PhD.
Department of Pharmacology and Toxicology, Department of Medicinal Chemistry
Ernest Mario School of Pharmacy
Rutgers, The State University of New Jersey

Activation of Nrf2 signaling and protection from chemical injury by the investigational drug LH601A in cultured human kidney cells

Nuclear factor (erythroid-derived 2)-like 2 (Nrf2) is an important signaling pathway that prevents injury and disease. Nrf2 is bound to Keap1 (Kelch-like erythroid-cell-derived protein 1) and is targeted for proteasomal degradation in the cytoplasm, making its function somewhat limited under normal conditions. In response to injury or chemical activation, Nrf2 plays a key role in activating antioxidant, cell stress, metabolism and other protective genes. Activation of these genes protects tissues from oxidative stress and aids in removing potentially toxic chemicals and cellular intermediates. We hypothesize that the Keap1 direct inhibitor LH601A will activate Nrf2 signaling in cultured human kidney cells and protect against chemical injury. To test this hypothesis, we developed two research goals: 1) Confirm Nrf2 signaling in the human embryonic kidney 293 cell line using positive controls such as sulforaphane (SFN) and Oltipraz (OPZ) which have been shown to induce Nrf2 signaling though indirect mechanisms; and 2) Test the efficacy of LH601A in activating Nrf2 target genes and protein (Nqo1 and Ho-1) in human kidney cells. Western Blots were performed to determine the relative expression of Nrf2 target proteins between control and SFN- and OPZ-treated kidney cells. In addition, RNA was isolated to perform quantitative PCR. Cytotoxicity screens demonstrated that 5μM of SFN and 10μM of OPZ are not toxic and can be used for pharmacological activation of Nrf2. There is a significance difference between SFN at 5μM on trial 2 compared to the control. The LH601A studies are ongoing. The investigational drug should activate Nrf2 signaling and induce target genes, similar to SFN. Since Nrf2 activation can protect tissues from oxidative stress and injury, the investigational drug LH601A may induce Nrf2 in kidney cells, activating the expression of protective genes, and thereby protect against kidney disease.

Biography: "Do not be afraid; do not be discouraged. Be strong and courageous" Joshua 10:25. I try to live by this quote daily. I am a rising senior majoring in Pharmaceutical Sciences at the prestigious Elizabeth City State University in North Carolina. Although academics are my first priority, I have still made time for extracurricular activities. I am an Orientation Leader, Student Government Association Chief of Staff 2013-2014, MARC Scholar, Commencement Ambassador, Community Relations Committee member, and Student Affairs Planning Council Committee member. My academic accomplishments include: UNC at Chapel Hill Science Enrichment Preparation Alumni, Louis Stokes Alliances for Minority Participation Program Alumni, UNC at Chapel Hill LEAD Program participant and Health Professions Scholar, Loma Linda University's UTP program, TMCF Center for Disease Control Ambassador. I am currently working in Dr. Lauren Aleksunes' lab and her colleague Dr Xia Wen. They have been very helpful this summer. Their kind words, patience, and diligence while working with me have helped me to gain confidence and improve my skills while working on my projects in the laboratory. I am confident that my experience this summer will help me throughout my journey. My career goals are to work in the areas of retail pharmacy and clinical trials research. I intend to obtain a PharmD joined with a PhD, which will prepare me to advance in the field of pharmacy.

Abstract and Student Biography

Kumar L. Tiger **Poster # 19B**
California State University, Dominguez Hills

Mentors:
Renea Faulknor, Melissa Przyborowski, and François Berthiaume, PhD.,
Department of Biomedical Engineering Department
Rutgers, The State University of New Jersey

Cryopreservation of alginate sheets containing mesenchymal stromal cells for the treatment of chronic wounds

The prevalence of chronic wounds affects 6.5 million of the U.S. population and treatments have cost U.S. the healthcare system $25 billion annually. Furthermore the number of patients with chronic wounds is expected to increase due to an aging population and diseases that impair healing such as diabetes. In a chronic wound there is a delay in the resolution of inflammation that is preventing proper wound healing. Alginate is a polysaccharide that is an inexpensive, biodegradable, and biocompatible FDA-approved material for wound dressings. Previously, our lab developed alginate sheets with entrapped Mesenchymal Stromal Cells (MSCs), which add to the ability aligante to absorb wound fluid by decreasing the pro-inflammatory cytokines in the wound. To further supplement the alginate bandages previously made, we aim to increase the accessibility and storage of the bandages. We conducted a series of experiments focused on cryopreserving alginate sheets without embedded MSCs. The concentration of a cryoprotectant was varied to evaluate which parameters would result in sheets that are stable after being cryopreserved. Furthermore, we manipulated the cooling rate when freezing the sheets. However, the most critical step was to optimize a slow thawing procedure after cryopreservation for the sheets to retain their stability. Our results show that alginate sheets retain their properties after this protocol and it would be suitable to attempt with MSCs embedded. The successful application of these alginate bandages would potentially save the healthcare industry billions of dollars, eliminate invasive procedures, and require fewer treatments.

Biography: From California State University, Dominguez Hills in Carson, California, Kumar is studying in molecular and cellular biology. He has have done research in ecology, genetics, and translational medicine and most recently at Rutgers biomedical engineering with Dr. Berthiaume. He is a curious individual who is adventurous, enjoys traveling, and living an active lifestyle. In addition he also dedicates much of his time to being involved in leadership positions in clubs, research, and community service. You can expect him to apply to graduate school for a PhD this upcoming fall 2013 in the programs translational research, molecular medicine, and cellular and molecular biology. To him graduate study will provide him with a unique perspective unseen in other fields and it has been his dream to continue his career as a scientist. Later on with his acquired skills he will pursue a career in both academia and industry with the ambition of increasing expanding the longevity and youth of humans.

Abstract and Student Biography

Jill I. Tracey **Poster # 20B**
Ramapo College of New Jersey

Mentors:
Bozena Michniak-Kohn, Ph.D., Ms. Krizia M. Karry
Laboratory for Drug Delivery - LDD
New Jersey Center for Biomaterials
Rutgers The State University of New Jersey

Development and assessment of fast-dissolving oral films embedded with naproxen and acetaminophen for the treatment of rheumatoid arthritis

Fast dissolving oral films are a novel method for drug delivery that could prove to be an ideal alternative to traditional solid dosage forms. These polymeric strips dissolve in the oral cavity bypassing the first-pass metabolism in the body. Furthermore, due to the improved onset of action required drug dosages are lower than those for conventional tablets and capsules. In this project, films were embedded with hydrophilic acetaminophen and hydrophobic naproxen for dual drug delivery in a convenient dosage form for the treatment of rheumatoid arthritis. The effect of the concentrations of: (1) polymer, (2) plasticizer, (3) surfactant and (4) alkalizing agent, on the two responses, mean dissolution time and film % weight gain, were assessed via full factorial 2-level experimental designs. After the optimal composition of the acetaminophen film formulation was determined, a second previously optimized formulation containing naproxen was combined with the former. Finally, films were characterized for: % elongation and tensile strength, drug distribution via Terahertz Spectroscopy and in-vitro dissolution performance with USP Dissolution Apparatus I.

Biography: Jill Tracey is a rising senior at Ramapo College of New Jersey, majoring in chemistry with a minor in mathematics and also a minor in physics. Jill is a resident of Stillwater NJ. At RCNJ she has done research with Dr. Stephen Anderson researching organo-metalic catalysts in organic synthesis, and plans on continuing this research in the up coming year. She also will be conducting research on the chemistry relating to swimming pools as part of her Honors Senior Project next year. At Rutgers she is a member of the RiSE program, co-sponsered by REU-SOPS, and is working in Dr. Bozena Michniak's Lab for Drug Delievery, in the New Jersey Center for Biomaterials. In the LDD she is working with Ms. Krizia M. Karry on developing fast-dissolving oral films. She would like to thank Dr. Bozena Michniak, Ms. Krizia M. Karry, the RiSE/REU program and fellows, and the entire LDD group for an informative, interesting, and exciting research opportunity this summer.

Abstract and Student Biography

Natasha L. Vélez **Poster # 21B**
University of Puerto Rico at Mayagüez

Mentors:
Rodolfo Romañach, PhD., Eduardo Hernández
Department of Chemistry
University of Puerto Rico at Mayagüez Campus

Fernando Muzzio, PhD., Pallavi Pawar, Yifan Wang
Department of Chemical Engineering
Rutgers, The State University of New Jersey

NIR Spectroscopy as a non-destructive tool to predict dissolution from acetaminophen tablets

The development of Near Infrared Spectroscopy (NIR) as a non-destructive tool to predict dissolution profiles from a series of acetaminophen (APAP) tablets is reported. The method takes into consideration process and material parameters that affect dissolution, such as shear conditions. A series of tablets from a 90% lactose – 9% APAP – 1% MgSt powder formulation were prepared at a fixed compaction force of 24 kN and under four different shear levels (0 revolutions, 160 revolutions, 640 revolutions and 2560 revolutions). Dissolution tests were performed in a phosphate buffer solution with a pH of 5.8 and operated at 37°C for 300 minutes in a Vankel VK7010 USP II dissolution apparatus. From these tests results, a dissolution profile was created. NIR diffuse reflectance and transmittance spectra were recorder with a Bruker MPA spectrometer and OPUS 6.5 Software. The Unscrambler X Software was used to execute a Baseline Correction to the resulted NIR spectra. NIR diffuse reflectance spectral data, in combination with the dissolution test results, was used to build a calibration model to predict dissolution through a multivariate analysis using the Partial Least Square (PLS) regression algorithm and Cross Validation. SIMCA 13.0 Software was used for this purpose. Correlation coefficients (R^2), obtained from the correlation of the Cross Validation prediction and the reference method values for the four shear levels (0, 160, 640 and 2560 revolutions), were 0.9992, 0.9990, 0.9992 and 0.9998 respectively. NIR Spectroscopy, in combination with multivariate techniques, can be an excellent method to predict dissolution of tablets at a given time.

Biography: Natasha Vélez was born in Bronx, New York on June 9, 1991. She was raised in Salinas, Puerto Rico, where she spent her first 18 years. At present, she is in her senior year pursuing a B.S in Chemistry at the University of Puerto Rico at Mayagüez, where also collaborates as an undergraduate researcher at the Analytical and Pharmaceutical Laboratory of Dr. Rodolfo Romañach. Currently, Natasha is part of the NSF AIR Project team and, also, having her first summer research experience with RiSE under the Structure Organic Particulate Systems (SOPS) Program. Through this program, she has been enjoying the opportunity of collaborating in a research project related to the prediction of dissolution for pharmaceutical tablets by nondestructive technique, at the labs of the Pharmaceutical Engineering Program, directed by Dr. Fernando J. Muzzio. One of her principal professional goals is continuing graduate studies related to Industrial Pharmacy or Pharmaceutical Engineering, knowing that this summer experience will encourage her to pursue it.

Abstract and Student Biography

Tatiana Vélez **Poster # 22B**
University of Puerto Rico at Mayagüez

Mentors:
Bozena Michniak-Kohn, PhD and Mr. Francisco Palma
Laboratory for Drug Delivery (LDD)
New Jersey Center for Biomaterials
Rutgers, The State University of NJ

Effect of plasticizers on the physical & permeability properties of chitosan-gelatin edible films

Unplasticized protein-polysaccharide edible films are brittle and difficult to handle. Addition of plasticizers permits mobility of protein chains, thus providing optimized flexibility and transparency of the film. For the purpose of determining the best plasticizer according to barrier and mechanical properties, gelatin-chitosan edible films were fabricated using various types of plasticizer. The optimal plasticizers should have defined mechanical properties without causing significant increases in water vapor permeability of the film. Gelatin-chitosan edible films were manufactured with glycerol, sorbitol, polyethylene glycol (PEG400) and triacetin as plasticizers. Water vapor permeability (WVP), tensile strength, elongation percent and modulus were measured. Gelatin-chitosan edible films made with triacetin and PEG showed the lowest WVP value and PEG also demonstrated higher tensile strength measurements, while glycerol provided the lowest tensile strength and modulus values. The consideration of the combined measured properties suggests that PEG400 may be the best choice of plasticizer for chitosan-gelatin edible films.

Biography: Tatiana was born in San German, Puerto Rico on October 27th, 1993. She is currently a rising senior in the University of Puerto Rico Mayaguez. She is expecting graduation by the end of Spring 2014, with a Bachelor of Science (BS) degree in Chemistry and plans on continuing graduate education. She has previous experience in Analytical and Pharmaceutical Chemistry in tablet calibration models. Through the RiSE program, she's been working with Dr. Michniak on the mechanical and barrier properties of chitosan-gelatin edible films. She's currently Corporate Manager in the ACS-RUM chapter.

Abstract and Student Biography

Ryan K. Whitcomb **Poster # 23B**
Colorado State University

Mentors:
Mr. Ryan Thorpe, Sylvie Rangan, Ph.D., Robert A. Bartynski, Ph.D.
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Angle-Resolved X-Ray Photoemission Spectroscopy of epitaxial iron (II) fluoride thin films upon exposure to atomic lithium

For the use of promising new technologies such as electric cars and smart power grids to become more widespread, batteries must be developed with the ability to store larger amounts of energy. Increases in energy density are often accomplished by substituting different compounds into already successful commercial battery architectures. As one of the most common types of portable power cells, conventional lithium ion batteries rely upon intercalation to store charge in the cathode:

$$Li^+ + e^- + CoO_2 \rightarrow LiCoO_2$$

This process can be improved by replacing lithium cobalt oxide with a conversion reaction material, whose structure and composition are instead chemically altered by lithiation. In particular, a cathode composed of FeF_2 can react with lithium ions to produce metallic iron, storing an additional electron per formula unit:[1]

$$2Li^+ + 2e^- + FeF_2 \rightarrow 2LiF + Fe$$

However, the mechanism by which this reaction progresses is not well understood, so it is important to investigate the chemical phase and morphological changes caused by the lithiation process in a model system. This has been accomplished by working with well-characterized samples outside of the electrolytic environment of a typical battery, thereby isolating the fundamental properties of the reacting materials. My poster describes the spectroscopic analysis of epitaxial iron (II) fluoride (110) thin films in ultrahigh vacuum, before and after a series of lithium exposures. Angle-Resolved X-Ray Photoemission Spectroscopy (ARXPS) is used to determine the chemical concentrations of the material as a function of depth in the film. Evidence suggests that the reaction front proceeds uniformly downwards from the surface of the film, but with the presence of a barrier to full conversion of the fluoride. Funding for this project is provided by the National Science Foundation grant PHY1263280.

[1] Rangan, S.; Thorpe, R.; Bartynski, R. A.; Sina, M.; Cosandey, F.; Celik, O.; Mastrogiovanni, D. D. T. J. Phys. Chem. C 2012, 116, 10498-10503.

Biography: Ryan Whitcomb is a double major in chemistry and physics at Colorado State University in Fort Collins, Colorado. At this institution, he is the Undergraduate Representative of the physics department and an officer of the Society of Women in Physics. He has also done nearly three years of research in projects involving a mixture of both physical chemistry and condensed matter physics. After finishing his fifth year of undergraduate study next spring, Ryan plans to go to graduate school to obtain a doctoral degree in chemical physics. In the Physics and Astronomy summer REU program at Rutgers, he has worked for Dr. Robert Bartynski on the analysis of FeF_2 as a conversion reaction battery material by Angle-Resolved X-Ray Photoemission Spectroscopy (ARXPS).

Abstract and Student Biography

Reginald J. Wilbourn **Poster # 24B**
Morehouse College

Mentors:
Dana Barrasso, Rohit Ramachandran, PhD.
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Order reduction for discrete element models, using neural networks for use in population balance models.

The purpose of this project is to simplify complex models of powder processes, specifically granulation, using neural networks. By modeling granulation, we can implement the FDA's "Quality by Design" concept. With a through understanding of a process, we can maximize its efficiency and robustness. This study uses two specific techniques to model granulation—population balance modeling (PBM) and discrete element modeling (DEM). PBM uses rate equations to calculate granule size distributions, and DEM uses Newton's laws of motion to track particles as they move and collide. In this study, a PBM was used to generate a set of particle size distributions, which were used in DEM to calculate collision rates between particles of different sizes. Ideally, DEM and PBM models would be coupled into a hybrid model. Because DEM simulations are very time consuming, a reduced order model is more practical for coupling purposes. By training a neural network with the DEM results data, we can obtain collision frequencies that will tell us how often different sized particles aggregate with each other. This neural network will be coupled with the PBM to generate more accurate size distributions over time. Creating very highly detailed models of granulation will be beneficial for optimizing the granulation process. This research will provide valuable information regarding the development of a process before it is implemented.

Biography: Reginald Wilbourn was born in Memphis, Tennessee. He was raised in Stockbridge, Georgia, where he lived for most of his years. He is currently pursuing his Bachelor of Science degree in Mathematics. As part of the Dual Degree Program at Morehouse College, he plans on transferring to the Georgia Institute of Technology, studying Civil Engineering. After completion with the program, he plans to go to graduate school and obtain a master's or PhD in Architecture. During this summer, he has been working under Dr. Rohit Ramachandran with mentor, Dana Barrasso in a project related to powder processes and tablet manufacturing. As his first research experience, he hopes that RiSE will help him better decide if research is in his future.

Abstract and Student Biography

Marc A. Wonders **Poster # 25B**
Washington & Lee University

Mentors:
Amit Lath, Ph.D., David Kolchmeyer, Dan Duggan, Ph.D
Department of Physics
Rutgers, The State University of New Jersey

Search for light stops with pair-produced dijet resonances

One of the proposed solutions to a number of outstanding problems in our collective knowledge of physics is supersymmetry. In supersymmetry, each known particle is given a heavier partner particle, its superpartner, that differs in spin by ½. This means each boson is given a fermion superpartner and each fermion is given a boson superpartner. Different versions of supersymmetry can solve the hierarchy problem and establish grand unification. Although no supersymmetric particles have been discovered to date, their ability to solve the aforementioned problems keeps scientists interested in the theory. We are searching for light stops, the superpartner of the top quark. In the search for light stops, we are specifically looking at events that produce four jets, pursuing the possibility that a collision produces two stop squarks which then each decay into two jets. Our main method in this search is to produce upper limits of the cross section of the production of stop squarks. We can ultimately discount the existence of stop squarks if we can improve these limits to the point where the upper limit of the cross section is too small to allow for stop squarks to solve the problems which motivated our search for them in the first place such as the hierarchy problem. Support for this project is provided by the National Science Foundation in the form of grant PHY-1263280.

Biography: Marc Wonders was born in Akron, Ohio on November 6, 1992. Marc is currently studying both Physics and Business at Washington and Lee University, where he is a rising junior. He plans to graduate in June 2015 with a double major in Physics and Business Administration. This summer he is working with Dr. Amit Lath on a project in high energy particle physics concerning the search for the stop squark.

Abstract and Student Biography

Leslie E. Wynn **Poster # 26B**
Austin College

Mentors:
Lisa C. Klein, Ph.D.
Department of Materials Science
Rutgers, The State University of New Jersey

Influence of fruit-based dyes on dye-sensitized solar cells (DSSCs)

Dye-Sensitized Solar Cells (DSSCs) are a green form of photovoltaic cells, meaning they are able to convert solar rays into electrical energy without emitting CO_2 and thus minimally impact global warming. Moreover, they are prepared from inexpensive and relatively abundant materials, notably titania (TiO_2). Therefore there are environmental and economic benefits to optimizing the design of DSSCs. In this study we aim to investigate the effect of various fruit dyes on the efficiency of the DSSC and determine the effects of various light sources on their efficiency. Typical DSSCs consist of two photoactive glass electrodes, a small layer of semiconductive material, an electrolyte, and a dye. Fruit dyes provide electrons that are excited by sunlight and transferred to the glass to produce a current. For this experiment DSSCs were constructed using dyes from blueberries, blackberries, and a 1:1 mixture of blueberry and blackberry dyes. The output voltage of the DSSCs was measured after the cells had been exposed to light from various light sources, including ultraviolet (UV) light, light from an incandescent bulb, and the ambient light of the lab. The relative performance of the cells was compared using their output voltage. It was found that cells produced with blueberry-based dyes performed 11% better than those prepared with blackberry-based dyes and 14% better than those prepared from a mixture of the two dyes. Additionally, the cells performed 36% better after being in ultraviolet light when compared to being in incandescent light and 20% better in UV light than in ambient light.

Biography: Leslie Wynn is a chemistry major and computer science minor at Austin College in Sherman, Texas. She is currently the captain of the dance team, a member of the Computer Science and Robotics club, the Austin College Chemical Society, the American Chemical Society, and the community service organization known as the Service Station. Leslie has a passion for research and has experience with dye-sensitized solar cells (DSSCs), both in constructing platinum based dyes for the cells and in construction of the cells. After completing her degree at Austin College, Leslie aspires to attend engineering school for chemical engineering, or graduate school for chemistry.

Abstract and Student Biography

Heather N. Zaccaro **Poster # 27B**
Georgetown University

Mentors:
Michael R. Greenberg, Ph.D. and Dona Schneider, Ph.D., M.P.H.
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey

Modeling affective responses to Hurricane Sandy on an emotional-cognitive scale

n October 2012, Hurricane Sandy devastated the East Coast causing more than $50 billion in damages[1]. Understanding the public's affective responses to disaster and how these relate to demographics, worldviews, and behaviors can improve future preparedness. In early 2013, a telephone survey of 875 New Jersey residents collected information about redevelopment priorities, concern for global climate change (GCC), and trust in institutions. Respondents also specified the strongest emotion associated with Hurricane Sandy. These free responses were categorized according to semantic meaning then further classified into three categories: highly emotional, a balance of both emotional and cognitive, and highly cognitive. Multinomial logistic regression was performed using the statistical software IBM SPSS 20 with this emotional-cognitive scale as the dependent variable. Many significant predictors in the model varied either directly or inversely with the emotional-cognitive scale ($p<.05$). Compared to the highly cognitive individuals, respondents on the emotional end of the scale tended to be female (odds ratio [OR]=1.79) and were more concerned about GCC (OR=2.08). Additionally, these individuals did not deny the role of human activity in causing GCC (OR=.55). Conversely, those on the cognitive end of the scale were half as likely to support the relocation of infrastructure away from vulnerable areas or to trust the scientific community regarding GCC. Other variables, rather than varying with the scale, distinguished the balanced, central group from either end of the emotional-cognitive spectrum. This population, in contrast to the highly cognitive respondents, was more distrustful of federal government (OR=1.98) and tended to identify as Democrat (OR=2.07). They were also more likely to consider themselves at personal risk from GCC (OR=1.55) and prioritized the redevelopment of devastated areas (OR=1.65). Our results reveal that there are clear trends influencing affective responses. Further research can help improve our understanding of the public's behavior during disaster scenarios.

1. NOAA National Weather Service. Hurricane/Post-Tropical Cyclone Sandy: October 22-29, 2012, US Department of Commerce Service Assessment. 2013: Silver Spring, MD.

Biography: Heather Zaccaro is a rising junior studying International Health and Sociology at Georgetown University. Though she goes to school in Washington, D.C., she was born and raised here in New Jersey. Outside of academics, she loves to read, knit, and play the drums with the GU Pep Band. Here at Rutgers she is performing research under two professors from the Bloustein School of Planning and Public Policy. Under Dr. Schneider, she is learning more about the discipline of epidemiology and working with population data on the HIV/AIDS epidemic in New Jersey. Her research with Dr. Greenberg involves statistical modeling of affective or emotional responses of New Jersey residents to the recently devastating Hurricane Sandy.