RISE at Rutgers/UMDNJ
Research In Science and Engineering

Summer Research Symposium

August 1, 2012

Sponsored by:

Rutgers Graduate School-New Brunswick

UMDNJ Graduate School of Biomedical Sciences at Robert Wood Johnson Medical School

2012 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, August 1, 2012

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

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

Sylvester "Jim" Gates, Jr., Ph.D.
John S. Toll Professor of Physics, University of Maryland, College Park
Member of President's Council of Advisors on Science & Technology (PCAST)

"Uncovering the Codes for Reality"

10:45 – 11:30 AM	**Student Research Posters-A**	**BCC International Lounge**
11:30 – 11:45 AM	**Break**	
11:45 – 12:30 PM	**Student Research Posters-B**	**BCC International Lounge**
12:45 PM	**Buffet Luncheon**	**Busch Faculty Dining Hall**

Sponsored by:

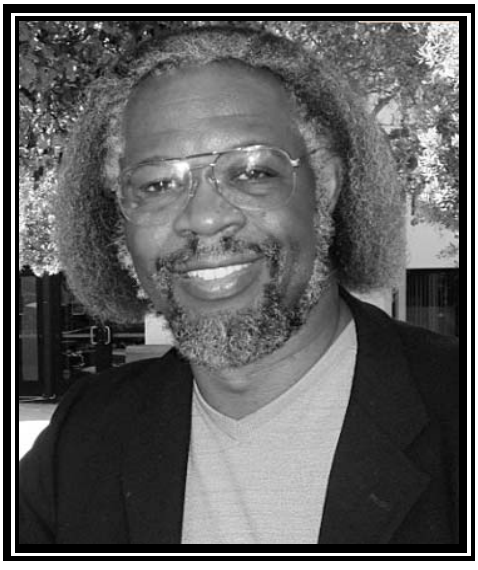
RiSE (Research in Science and Engineering) at Rutgers/UMDNJ
and affiliated NSF-sponsored summer programs at Rutgers:

REU in Cellular Bioengineering

REU in Structured Organic Particulate Systems (SOPS)

With selected participation from:
REU in International Environmental Sciences
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER



SYLVESTER "JIM" GATES, JR., PH.D.

"Uncovering the Codes for Reality"

Sylvester James (Jim) Gates, Jr., is the John S. Toll Professor of Physics at the University of Maryland and director of its Center for String and Particle Theory. Known for his work on supersymmetry, supergravity, and superstring theory, Dr. Gates uses mathematical models to explore the elementary particles and fundamental forces of nature.

Dr. Gates completed both his undergraduate and graduate studies at the Massachusetts Institute of Technology, earning two bachelor's degrees (in mathematics and physics) in 1973 and a Ph.D. in physics (focused on elementary particle physics and quantum field theory) in 1977. His doctoral thesis was the first thesis at MIT to deal with supersymmetry, a topic that has dominated theoretical physics since that time. Before joining the faculty of the University of Maryland in 1984, Dr. Gates held postdoctoral appointments as a Harvard University Society of Fellows Junior Fellow and as a Research Fellow at the California Institute of Technology. He currently serves as a member of the Maryland State Board of Education and the U. S. President's Council of Advisors on Science and Technology.

During his career, Dr. Gates has received a number of honors for his teaching, including the 1999 College Science Teacher of the Year from the Washington Academy of Sciences, the 2002 Distinguished Scholar-Teacher from the University of Maryland, and the 2003 Klopsteg Award from the American Association of Physics Teachers. In 2006, the American Association for the Advancement of Science honored him with the Public Understanding of Science Award.

He has been featured extensively in many science documentaries on physics, most notably *The Elegant Universe* in 2003. In 2006, he completed a DVD lecture series titled *Superstring Theory: The DNA of Reality* for The Teaching Company to make the complexities of unification theory comprehensible to laypeople. During the 2008 World Science Festival, Dr. Gates narrated a ballet, *The Elegant Universe*, with an on-line resource presentation of the art forms (called Adinkras) connected to his scientific research. The NOVA/PBS fall 2011 presentation of the science documentary *The Fabric of the Cosmos* prominently features Dr. Gates.

SUMMER PROGRAMS

RiSE (Research in Science and Engineering) at Rutgers/UMDNJ:

RiSE seeks to extend the pathway to graduate study and careers in the sciences, math and engineering for 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 UMDNJ Graduate School of Biomedical Sciences at RWJMS, RISE is hosting 35 scholars this summer. These students, selected from over 450 applicants, represent 28 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM and social/behavioral sciences 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

Funded through the NSF Research Experiences for Undergraduates (REU) site program, the REU in Cellular Bioengineering (http://celleng.rutgers.edu, NSF EEC-0851831) is in its third 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 REU-SOPS, the REU-CB participants have been exposed to a wide range of professional development activities and been integrated into an active living-learning community.

REU - SOPS

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 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 3 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.

REU in Discrete Mathematics and Theoretical Computer Science (DIMACS)

The REU in Discrete Mathematics and Theoretical Computer Science (DIMACS), funded by NSF, supports rising college seniors for intensive 8-week research projects in mathematics, computer science, and operations research. The program also sponsors a summer exchange program with Charles University in Prague, Czech Republic. RiSE Scholars whose research interests intersect with DIMACS are eligible to participate in selected components of the REU, include the a 2-week add-on experience in Prague.

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

University of Medicine & Dentistry of New Jersey
Graduate School of Biomedical Sciences at Robert Wood Johnson Medical School

~External Support~

Federation of American Societies for Experimental Biology
(FASEB/MARC Program)

New Jersey Space Grant Consortium

NIH MARC Program

NSF Innovation in Institutional Integration (I3) Program

NSF Research Experiences for Undergraduates (REU) Program

NIH Summer Undergraduate Research Fellowship Program

U.S. Department of Education McNair Scholars Program

U.S. Department of Education HSI-STEM Program (awarded to New Jersey City University)

~Special Thanks~

Our research programs would not be possible without the support of the dedicated faculty members at Rutgers and UMDNJ-GSBS at RWJMS 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. Charles Roth and Ms. Linda Johnson for collecting and organizing the Summer Research Symposium booklet.

GUEST SPEAKERS

The Devil in the Details: Record Keeping and Laboratory Data
Terri Goss Kinzy, Ph.D.
Associate Dean, UMDNJ Graduate School of Biomedical Sciences at RWJMS; Professor, Molecular Genetics, Microbiology & Immunology, UMDNJ-Robert Wood Johnson Medical School

Selling Yourself and Your Project: The Elevator Pitch
Susan Engelhardt
Executive Director, Center for Innovative Ventures of Emerging Technologies, Rutgers

Graduate School: How to Get In, Get Funding and Meet Success
Jeffrey Zahn, Ph.D., Associate Professor, Biomedical Engineering, Rutgers
Monal Mehta, PhD candidate, Cellular and Molecular Pharmacology, Rutgers-UMDNJ
Roselin Rosario-Meléndez, PhD candidate, Chemistry and Chemical Biology, Rutgers
Elizabeth Stucky, PhD candidate, Chemical and Biochemical Engineering, Rutgers
Margot Zevon, PhD candidate, Biomedical Engineering, Rutgers

CV/Resume Workshop
Sue Pye
Career Management Specialist, Rutgers Career Services

Make a Future Where You Can Make a Difference
Lyndon Mitnaul, Ph.D.
Research Fellow, Merck Research Laboratories

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

Rebecca Baerga, Ph.D.
Director Preclinical Operations, Niikipharma, Inc.

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

Tanya Borsuk, Ph.D.
Easton Associates

Tom Brieva, Ph.D
Sr. Principal Engineer, Cell Process Development, Celgene Cellular Therapeutics

Danielle Jacobs, Ph.D.
Assistant Professor of Chemistry, Rider 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, UMDNJ-Robert Wood Johnson Medical School

REU in Cellular Bioengineering (REU-CB)

Charles M. Roth, Ph.D., Director
Professor, Dept. of Chemical & Biochemical Engineering, and Dept. of Biomedical Engineering, Rutgers

REU in Structured Organic Particulate Systems (REU-SOPS)

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

Douglas Hausner, Ph.D., Associate Director
Intellectual Property and Industry Partnership Manager, NSF ERC for Structured Organic Particulates

Administrative Staff

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

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

Teaching Fellows

Ms. Roselin Rosario, PhD Candidate in Dept. of Chemistry & Chemical Biology

Ms. Ramaydalis Keddis, PhD Candidate in Dept. of Environmental Sciences

Resident Advisors

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

Ms. Megan Radler, Research Associate in Genetics

SUMMER RESEARCH PROGRAM PARTICIPANTS

Michelle Banas[1]
Orlando Barbosa[1,2]
Joseph Batts[1,4]
Stephen Bien-Aime[1,3]
Connor Bilchak[2]
Mary Carter[1]
Andrea Casuras[1]
Kevin Chavez[1]
Katterin Colon[1,5]
Jonathan Colon[1,3]
Joshua Erndt-Marino[2]
Amber Fairley[1]
Bintou Fisiru[1,3]
Erica Harris[2]
Derek Holyoak[1,2]
Finterly Hu[1,4]
Nicole Keenan[2]
Joan Kuchie[1]
Modupe Kuti[1,3]
Nilsa La Cunza[1,2]
Alejandra Laureano[1]
Crystal LeBlanc[1]
Michael Little[1,5]
Jordan Martinez[1]
Jose Martinez[1]
Desiree Matias-Lopez[1]
Bridget Mendoza[1]
Coleen Nemes[1]
Kevin Ortiz[1,3]
Maria Pietri-Babon[1,4]
Andres Ramirez[1]
Ixti-Nitzlin Sanchez[1,6*]
Imani Sanders[1,2]
Shelby Swiggum[1]
Patricia Sylvestre[1]
Stephanie Tse[1]
Taylor Vega[1]
Samjit Walia[1,3]
Elizabeth Wilson[1]
Justin Womack[1,2]
Isaiah Woodson[1]

*8- week participant departing before final Symposium

SPONSORING PROGRAMS

[1]Research in Science & Engineering (RiSE) at Rutgers/UMDNJ
[2]NSF REU in Cellular Bioengineering
[3]NSF REU in Structured Organic Particulate Systems
[4]NSF REU in International Environmental Sciences
[5]Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program
[6]Discrete Mathematics and Computer Sciences

POSTER PRESENTATIONS

SESSION A
10:45AM – 11:30AM

Poster	Name	Title
1A	Michelle Banas	**Role of Fas ligand-receptor interaction in neuronal apoptosis**
2A	Stephen Bien-Aime	**Crystallization growth rate of melted droplets of ibuprofen and polyethylene glycol 3350**
3A	Connor Bilchak	**Effects of BCAA supplementation on oxidative stress following burn injury model in rats**
4A	Andrea Casuras	**A method to detect "happy" organic volatiles in human perspiration**
5A	Kevin Chavez	**Imatinib mesylate (Gleevec) in combination with CSAA: Cancer Inhibition through the manipulation of cellular metabolism**
6A	Jonathan Colon	**TB1 – B2: Characterization of blend uniformity and drug concentration using NIR spectroscopy in a continuous mixing process**
7A	Amber Fairley	**Aging-associated defects in DNA damage repair affects reprogramming into induced pluripotent stem cells**
8A	Erica Harris	**Surface topography influences stem cell morphology and lineage commitment**
9A	Finterly Hu	**The Biotransformation of Halogenated Compounds in New Jersey River Sediment**
10A	Joan Kuchie	**Elucidating the loss of the pre-coat gene by observed selection pressures of the DNA-B genes**

POSTER PRESENTATIONS

SESSION A
10:45AM – 11:30AM

Poster	Name	Title
11A	Nilsa La Cunza	**Identification of regulatory factors that control the development of interneurons**
12A	Crystal LeBlanc	**Evaluating the effects of the BTB-zinc finger protein Promyelocytic Leukemia Zinc Finger on BW5147 lymphoma cells**
13A	Jordan Martinez	**Characterization of the 23 *C. elegans* RhoGAPs and their GTPase specificity**
14A	Desiree Matias-Lopez	**Asymmetric hydroamination of unactivated alkenes with simple amines**
15A	Coleen Nemes	**Fabrication and characterization of silver nanoparticle arrays for organic photovoltaic cells**
16A	Joseph Batts	**Biogeography of biotransformation of halogenated organic contaminants in temperate, sub-arctic, and tropical environments**
17A	Imani Sanders	**Development of an in vitro model of the peritoneum to analyze the growth of adhesions**
18A	Patricia Sylvestre	**Using Law of Life Essays to Identify Indicators of Anxiety in School-Age Children**
19A	Stephanie Tse	**Synthesis, characterization and *in vitro* degradation studies of ampicillin-based poly(anhydride-amide)**
20A	Samjit Walia	**Determination of Numeical Integration Techniques for 3D Population Balance Models Describing Continuous Multicomponent Wet Granulation Processes**

POSTER PRESENTATIONS

SESSION B
11:45AM – 12:30PM

Poster	Name	Title
1B	Maria Pietri-Babon	**A comparison of the dehalogenation rates of the persistent organic pollutants hexachlorobenzene and hexabromobenzene**
2B	Orlando Barbosa	**Characterization of Reactive-Like Astrocytes on Different Surfaces**
3B	Mary Carter	**Identification of novel factors that interact with Selenoprotein P 3'untranslated region (3'UTR) and determination of contributes of processivity**
4B	Katterin Colon	**Activation of inflammatory pathways by dichlorodiphenyltrichloroethane (DDT) and its derivatives: Potential link to neuroinflammation in Alzheimer's disease**
5B	Joshua Erndt-Marino	**Mesenchymal stem cell attenuation of inhibitory molecules expressed by reactive astrocytes**
6B	Bintou Fisiru	**Dissolution of Polymer Films in Simulated Saliva**
7B	Derek Holyoak	**Theory-based double-pulsed electroporation microdevice for effective cellular manipulation**
8B	Nicole Keenan	**3D in vitro analysis of proliferant effect on ligament healing process**
9B	Modupe Kuti	**Measuring the viscosity of calcium alginate particles at different shear rates and concentrations**
10B	Alejandra Laureano	**Valproic Acid regulates astrocyte proliferation, cell cycle machinery and histone acetylation**

POSTER PRESENTATIONS

SESSION B
11:45AM – 12:30PM

Poster	Name	Title
11B	Michael Little	**Regulation of liver and kidney efflux transporters during inflammation**
12B	Jose Martinez	**Synthesis of 3,5-di(di-t-butylphosphinomethyl)aminobenzene Iridium Pincer Catalyst**
13B	Bridget Mendoza	**Investigating male fertility within caenorhabditis species**
14B	Kevin Ortiz	**Temperature Profile Determination for a Roller-Compacted Ribbon using a Thermal Camera**
15B	Andres Ramirez	**Exploring the link between emotion dysregulation and emotional reactivity**
16B	Shelby Swiggum	**The role of acetylcholine in learning and neurogenesis**
17B	Taylor Vega	**Behavioral and Histological Consequences in Adult after the intrauterine HuD depletion**
18B	Elizabeth Wilson	**Mechanism of VGF's antidepressant effects**
19B	Justin Womack	**Association of anti-PSMA liposomes to endothelial cell analogues for targeted antivascular chemotherapy**
20B	Isaiah Woodson	**Fabrication and Analysis of Thick Film Composite Piezoelectric Materials**

ABSTRACTS

Poster Session ~A~

1A Michelle Banas
The College of New Jersey

Mentors: Federico Sesti, Ph.D., and Edith Berenice Hernandez Enriquez, Ph.D.
Department of Neuroscience & Cell Biology
University of Medicine and Dentistry of New Jersey

Role of Fas ligand-receptor interaction in neuronal apoptosis

Potassium (K^+) channels are a family of ion channels that are found in both excitable and non-excitable cells. They are involved in the functioning of the nervous system to modulate action potentials and release neurotransmitters. Oxidation of potassium channels by reactive oxygen species (ROS) is known to be involved in the aging and neurodegeneration of cells in invertebrate and mouse models of Alzheimer's disease. Oxidation of potassium channels causes apoptosis through mechanisms not completely understood. The working model which is being tested predicts that potassium channel oxidation causes cell death by activating death receptors at the plasma membrane. A series of experiments were conducted to determine the role of the Fas ligand-receptor. To this end, caspase-8, a molecule involved in the Fas signaling cascade, was inhibited under oxidative stress. N2A, mouse neuroblastoma cells were transfected with the Kv2.1 potassium channel. Cells were pretreated with the cell permeable inhibitor for caspase-8, IETD-CHO, with a range of doses from 10 to 25μM. Then, an oxidant, 2,2'-Dithiodipyridine (DTDP) was applied. The cells were incubated with annexin-V solution (contained annexin, propydium iodide, and staining buffer) to each treatment of cells. Annexin-V was used to determine apoptosis, and propidium iodide was used to distinguish necrotic cells. The cells were mounted on slides and viewed under a microscope. Cells positive to annexin-V staining were counted. N2A cells treated with a range of doses from 10 to 25μM did not show a decrease in apoptosis compared to the controls. The data collected show that the Fas signaling cascade does not have a role in neuronal apoptosis induced by oxidation of Kv2.1. This suggests that another apoptotic cell signaling cascade different than the Fas ligand-receptor should be involved in cell death induced by oxidation of Kv2.1. This information allows for a better understanding of apoptotic pathways in cells, thus aging and neurodegenerative diseases.

2A Stephen Bien-Aime
Ramapo College of New Jersey

Mentors: Paul Takhistov, PhD.
Associate Professor, Department of Food Science
Rutgers, the State University of New Jersey

Mr. Phong Tien Huynh, Graduate Research Assistant
Department of Food Science
Rutgers, the State University of New Jersey

Crystallization growth rate of melted droplets of ibuprofen and polyethylene glycol 3350

The purpose of this project was to explore the crystallization growth rate of poorly water-soluble drug ibuprofen and water-soluble carrier polyethylene glycol 3350. This study involved three different approaches to which crystal growth rates were measured: simultaneous printing of melted droplets of ibuprofen and PEG 3350 on hydrophilic microscopic slides resulting in coalescence of the droplets; printing of premixed concentrations of ibuprofen and PEG 3350 on hydrophilic slides; and printing of melted droplets of PEG 3350 on top of ibuprofen droplets on hydrophilic microscopic slides resulting also in droplet coalescence. A much higher crystal growth rate was found to be occurring for melted droplets of ibuprofen and PEG 3350 that were printed next to teach other. In addition, experiments using differential scanning calorimetry (DSC) were run to investigate the heat of fusion of the mixtures. It has been found that compounds exhibiting strong crystallinity behavior generate higher heat of fusions. This work provides valuable insights into preferable means of combining ibuprofen and PEG 3350 in order to achieve desired crystal growth rates, contributing therefore to the personalized medicine field of study.

3A Connor Bilchak
Manhattan College

Mentors: Ioannis Androulakis, Ph.D
Biomedical Engineering Department
Rutgers University

John Mattick, M.S.
Chemical and Biochemical Engineering department
Rutgers University

Effects of BCAA supplementation on oxidative stress following burn injury model in rats

Sepsis, a systemic bacterial infection characterized by a severe and pervasive inflammatory response, is the most common cause of death in non-coronary ICU patients, and while treatment options have improved in recent years, they focus more on mitigating the damage inflicted by the inflammatory response and subsequent peripheral tissue catabolism. Past works have elucidated the underlying pathophysiology and mechanisms that drive this response and implicated branch chain amino acids (BCAA) as a potential treatment for liver cirrhosis. However, the effects of BCAA supplementation on sepsis and acute inflammation, as well as its potential to act as a healing factor for such injuries, have yet to be evaluated. We are attempting to determine if BCAA will serve as a suitable nutritional supplement during the pro-inflammatory stage. We developed an animal model in which rats were fed a BCAA cocktail at regular 8-hour intervals, with glycine feeding as a control, subjected to a 20% total body surface area burn, sacrificed at pre-determined time points and liver samples collected. The samples were then measured for total reductive power to determine the effect of BCAAs on oxidative species produced during the hepatic hypermetabolic state. Future works will assess the validity of BCAAs as a treatment for sepsis and acute inflammation. If BCAA supplementation can be shown to mitigate catabolic damage and deleterious body mass wasting, it may be widely applied in clinical ICUs, saving thousands of lives each year.

4A Andrea Casuras
Ursinus College

Mentors: Dr. Lawrence Williams and Huan Wang
Department of Chemistry
Rutgers University

A method to detect "happy" organic volatiles in human perspiration

Chemosensitivity is the ability of a smell to stimulate neurotransmitters in order to evoke a certain reaction. It has been known that animals communicate emotions through chemosensing, but the notion that humans are able to behave this way has been strongly resisted. Nevertheless, previous studies have shown that humans can sense anxiety and fear in other humans sweat. In addition, a recent study has suggested that humans can perceive happiness in others based on smell. The existence of such a "happy" chemical has profound implications. The addition of a mood altering chemical will change the way we view perfumes and will spark further involvement of the FDA in the perfume industry. Our hypothesis is that a suitably sensitive method for the detection of trace volatiles will allow us to identify the components and relative quantities of "happy" chemicals in human perspiration. That is if there actually is a "happy" chemical producing happiness feeling and not a lack of chemicals released when one is anxious or fearful. In order to detect trace amounts of chemicals, an analytical method with very low detection limit for volatile organic compounds needs to be developed. Here, we perform headspace analysis of Sunflowers Perfume using gas chromatograph as a control in order to determine the feasibility of detecting organic volatiles in very low concentration.

5A Kevin Chavez
Stony Brook University

Mentors: Shengkan "Victor" Jin, Ph.D. and Yong Zhang, Ph.D.
Department of Pharmacology
University of Medicine and Dentistry of New Jersey

Imatinib mesylate (Gleevec) in combination with CSAA: Cancer Inhibition through the manipulation of cellular metabolism

Recent research has shown that cancer cells undergo a shift in metabolism to aerobic glycolysis in a phenomenon termed the Warburg affect. It is expected that by manipulating the metabolic pathway of cancer cells, the development of drugs that can target these cells without harming healthy cells will be possible. We hypothesized that Imatinib mesylate, a tyrosine kinase inhibitor, and CSAA, a mitochondrial uncoupling chemical compound, will have a synergistic effect in killing breast cancer cells. Imatinib, through the inhibition of the corresponding tyrosine kinase receptors and/or tyrosine kinases, inhibits glucose uptake and consequently cell proliferation. We reasoned that when Imatinib is combined with CSAA the cancer cells will be deprived of energy due to a decrease in both glucose levels and mitochondrial ATP-production. The hypothesis was tested by performing clonal assays with the Imatinib, CSAA, and Imatinib plus CSAA treated-breast cancer cell lines MCF-7 and T47D. Inhibition assays was also performed for quick/non-quantitative results. We found that when combined, Imatinib and CSAA, at concentrations of 6.0μM and 0.3μM respectively, exhibited a 10-fold increase in MCF-7 cell inhibition as compared to each drug alone. The drug combination did not have a significant effect on T47D cells. The growth inhibitory effect of the combination of Imatinib and CSAA shows high efficacy in the treatment of certain breast cancer cells.

6A Jonathan Colon
University of Puerto Rico

Mentors: Juan Osorio and Fernando Muzzio,Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers University

TB1 – B2: Characterization of blend uniformity and drug concentration using NIR spectroscopy in a continuous mixing process

A non-invasive NIR spectroscopic method was used to obtain on-line spectra of a continuous mixing process for pharmaceutical blends and study the mixing performance and flow behavior. Partial least squares (PLS) calibration models were constructed to predict the active pharmaceutical ingredient (API) concentration within the blend in real time. A design of experiments (DOE) was developed ranging the API, which is acetaminophen (APAP), concentration from 0 to 15% (w/w). Mixing performance was characterized by the relative standard deviation (RSD) of samples collected at the output of the blender and flow behavior was analyzed with the residence time distribution (RTD). Mixing performance was observed to produce RSD's between 5-9% which was highly affected by the APAP concentration. As APAP concentration increased, its cohesive properties made the powder to adhere to the NIR window thus affecting the spectral data acquisition. Residence time distributions showed that as flow rate and rotation rate increased the mean residence time decreased. As a result, intermediate flow rates and rotation rates showed the best mixing performance.

7A Amber Fairley
Grambling State University

Mentors: Chi-Wei Lu, Ph.D. and Percy Yeung, Ph.D.
Department of Obstetrics & Gynecology
University of Dentistry and Medicine of New Jersey– Child Health Institute of New Jersey

Aging-associated defects in DNA damage repair affects reprogramming into induced pluripotent stem cells

Adult cells are able to be reprogrammed back to an embryonic stem (ES) cell like state through induced pluripotent stem (iPS) cell formation, by ectopic expression of four ES cell-specific transcription factors, Oct3/4, Sox2, Klf4, and c-Myc first reported by Dr. Shinya Yamanaka of Kyoto University, Japan 2007. When human adult fibroblasts are successfully reprogrammed into iPS cells, they share similar characteristics with human ES cells. Somatic cells reprogramming into iPS cells requires continuous proliferation, which predispose the cells to increased risk of DNA damage. Breast cancer susceptibility protein 1, *BRCA1,* is a DNA damage repair response protein which marks double-stranded breaks in DNA for repair. The objective of our study was to determine whether aging-associated defects in DNA damage repair reduce iPS cell formation efficiency. Since cell proliferation is required for the generation of iPS cells, we hypothesized that differences in DNA damage repair in cells derived from young and old patients will affect the iPS formation efficiency. To test this hypothesis, Oct3/4, Sox2, Klf4, and c-Myc were transduced into two adult human fibroblasts populations; AG3 and AG7 representing adult human fibroblast from a young (17 years) and an old (84 years old) patient . The fibroblasts were examined for DNA damage response by monitoring the level of DNA double strand breaks, marked by levels of γ–H2AX. While irradiation-induced double strand breaks were repaired at a comparable kinetics in both young and old cells, significant differences in repairing DNA double strand breaks induced by iPS facters were observed between the young and the old cells during the early stages of reprogramming. DNA damage repair response was compared in AG3 and AG7 cell populations subjected to γ–irradiation, and iPS factors with γ-H2AX and BRCA1 were detected by western blotting. By comparing the efficiency of iPS cell formation scored by alkaline phosphatase and TRA-1-60 staining, we found that young fibroblasts with better DNA damage repair exhibited higher iPS formation efficiency. Consistent with this observation, suppression of a major component of the homologous recombination pathway protein, BRCA1, resulted in suppression of iPS formation. Understanding the role of DNA damage repair response and formation efficiency in iPS cells will be beneficial to the potential application of regenerative medicine in aging patients with degenerative conditions**.**

8A Erica Harris
University of Maryland- College Park

Mentors: Prabhas Moghe, Ph.D. and Mr. Sebastián Vega
Department of Biomedical Engineering
Rutgers University

Surface topography influences stem cell morphology and lineage commitment

One major issue in tissue regeneration therapies is the inability to attain homogeneous populations of mature cells derived from undifferentiated stem cell cultures. Current research shows that cell shape influences function, yet there is little understanding of how cellular morphology is implicated by surface topography. Therefore, this has motivated us to: **1)** determine protein structures that are sensitive to changes in surface topography, and **2)** link the expression and co-localization of these proteins to long-term stem cell lineage commitment. To do so, we optimized a method of polymer phase separation of poly(DTE carbonate) (DTE) and polystyrene (PS), allowing us to generate various topographies on which human mesenchymal stem cells (hMSCs) were cultured (Sanjeeva Murthy, PhD, NJCBM). hMSCs were subcultured onto these surfaces for 72 hours in mixed adipogenic/osteogenic induction media prior to phalloidin staining (cytoskeletal actin) and immunolabeling with antibodies specific for two focal adhesion complex (FAC) proteins. These proteins were then visualized using a confocal microscope, and topography-induced differences in cell shape, actin stress fiber formation, and organization of FAC proteins were analyzed. To assess topography-dependent lineage commitment, cells were cultured under the same conditions for two weeks and stained with Fast Blue (bone marker), AdipoRed (fat marker), and Hoescht (nuclear marker). Differentiation analysis showed that hMSCs on 40:60 and 60:40 DTE:PS ratios exhibited the highest degree of osteogenic lineage commitment. Additionally, hMSCs cultured on these topographies were more elongated, had more pronounced stress fibers, and larger FAC puncta when compared to the other conditions. More exaggerated results were seen with topographies made with DTE copolymerized with 15% polyethylene glycol (PEG), a non-fouling polymer, in lieu of DTE. Our findings suggest that the characteristics of these films influence early morphological features and long-term osteogenic differentiation. The ability to steer intracellular adhesion signaling and cellular organization in scaffolds could in turn improve the kinetics and degree of lineage restriction in transplantable microenvironments.

9A Finterly Hu
School of Environmental and Biological Sciences, Rutgers University

Mentors: Dr. Lily Young, Ph.D
Department of Environmental Sciences and Environmental Microbiology

Maria D. Rivera
Biotechnology Center for Agriculture & the Environment
School of Environmental and Biological Sciences, Rutgers University

The Biotransformation of Halogenated Compounds in New Jersey River Sediment

An estimated total of 20-25 million tons Electronic waste (E-waste) are produced yearly and E-waste is disposed of in landfills where chemicals leach into and contaminate the environment. The composition of E-waste is complex causing it to persist and bioaccumulate in the environment. The implementation of microbial technology using halo respiring anaerobes is the most promising in remediating contaminated sites. This project sought to study the dehalogenation activity of and to characterize microbial communities in three similarly contaminated sites that differ in climate around the world. We collected sediment and water samples from three sites and used widespread contaminants: 246-tribromophenol (246-TBP), 246-trichlorophenol (246-TCP), tetrabrombisphenol A (TBBPA), and tetrachlorobisphenol A (TCBPA)as experimental substrates to compare the dehalogenation of chlorinated compounds and brominated compounds and study the effect of a halo primer 2-bromophenol on dehalogenation activity. Microcosms, representative systems that simulate the conditions of the natural environment, were set up. Samples were taken from the microcosms weekly and analyzed using the Shimadzu *High-performance liquid chromatography* (HPLC) and *Denaturing Gradient Gel Electrophoresis (*DGGE).

10A Joan Kuchie
New Jersey City University

Mentors: Siobain Duffy, Ph.D. and Eric Ho, Ph.D.
Department of Ecology, Evolution and Natural Resources
Rutgers University

Elucidating the loss of the pre-coat gene by observed selection pressures of the DNA-B genes

Geminiviruses infect plants and cause millions of dollars in crop damage annually (Anderson, Polston, 1997). Begomoviruses are a whitefly-transmitted genus of the family Geminiviridae which uniquely contains viruses with both monopartite (DNA-A) and bipartite (DNA-A and DNA-B) genomes. Begomoviruses limit crop production in both the New World (North, Central and South America) and Old World (the remaining continents), but are thought to have originated in the Old World. One of the causes of the evolutionary divide between Old World and New World Begomoviruses is the loss of the pre-coat protein (PCP) gene in the New World viruses. The working hypothesis is that the functions of PCP are compensated by other proteins in the DNA-B component, which presumably leads to increased selective pressure on the DNA-B genes in the new world. The strength of selection acting on each Begomovirus gene was analyzed bioinformatically. Codon and peptide alignments were prepared in MEGA5. Selection pressures were calculated by Single-Likelyhood Ancestor Counting (SLAC) in DataMonkey, and the dN/dS values obtained were analyzed using the Kolmogorov-Smirnov test (D). The two major DNA-A genes (coat protein and replication-associated protein) showed equal selection pressures in new and old world viruses, while the DNA-B genes (movement protein and nuclear shuttle protein) showed greater purifying selection in the new world. This suggests greater functional constraint on the DNA-B proteins, likely due to their compensation for the loss of PCP. Further research in understanding the functions that compensate for the loss of PCP, could help in elucidating the evolution of the Begomovirus.

11A Nilsa La Cunza
New Jersey Institute of Technology

Mentors: Ying Li
Li Cai, Ph.D
Department of Biomedical Engineering
Rutgers University

Identification of regulatory factors that control the development of interneurons.

Interneurons in the central nervous system (CNS) have the ability to receive and transmit nerve impulses between neurons thus they are important because they act as a link between sensory and motor neurons. To expand our grasp of the developmental regulation of neural stem cells towards progenitor cells and interneurons, we studied the contributing transcription factors on different differentiated stages. Using genome-wide analysis on the expression profile of mouse tissue with/without key regulatory factors that are important towards neural development, specifically interneurons, we were able to explore a broader range of protein factors that have potential function during interneuron development. Microarray data of 10 key factors were downloaded from the GEO database and analyzed with dChip. Comparisons of samples were performed according to their respective factor, developmental stage and type of tissue in order to yield a list of genes that display differentiated activities. Resultant genes were further analyzed based on their function and their relationship to neural development was determined. The insight gained from this research will provide an extended list of factors that can be further researched for their application to neural development; therefore, this could lead to the therapeutic manipulation of interneuron firing patterns and induced regeneration of interneurons which will target brain pathologies.

12A Crystal LeBlanc
Belmont University

Mentors: Dr. Derek Sant'Angelo, Ph.D. and Dr. Courtni Newsome, Ph.D.
Child Health Institute
Robert Wood Johnson Medical School, UMDNJ

Evaluating the effects of the BTB-zinc finger protein Promyelocytic Leukemia Zinc Finger on BW5147 lymphoma cells

Invariant Natural Killer T (iNKT) cells are a subset of innate-like lymphocytes that act as the first line of defense against infections. iNKT cells are unlike conventional T cells in various ways, including the production of multiple cytokines, especially IL-4 and IFN-γ, upon activation and their rapid response to antigen stimulation. Studies have shown that the transcription factor promyelocytic leukemia zinc finger (PLZF) controls the development and features of these cells. However, in the absence of PLZF, iNKT cells behave similarly to conventional T cells. This study aimed to determine whether inducing cells that do not normally express PLZF to express it will cause them to function like iNKT cells. BW5147 cells were transfected with FLAG PLZF and grown in media containing the antibiotic G418 in order to select cells that were transfected. Western blots and Reverse Transcriptase PCR were performed to verify the presence of FLAG-PLZF and PLZF protein and RNA, respectively. The cells were then activated by PMA/Ionomycin, a T-cell receptor independent pathway. Finally, cytometric bead array assays were performed to determine if the transfected cells make the cytokines IL-4 and IFN-γ similarly to iNKT cells. The cells that express PLZF are expected to make IL-4 and IFN-γ. This data would indicate that if cells that do not normally express PLZF and behave like iNKT cells are forced to express PLZF, they will be induced to function like iNKT cells. This would suggest that PLZF acts alone in exerting its effects on iNKT cells.

13A Jordan Martinez
The College of New Jersey

Mentors: Martha Soto, Ph.D. and Andre Wallace, Ph.D.
Department of Pathology and Laboratory Medicine
UMDNJ-Robert Wood Johnson Medical School

Characterization of the 23 *C. elegans* RhoGAPs and their GTPase specificity.

GTPases are very important proteins that play a key role in signal transduction. These proteins are regulated by Guanine nucleotide exchange factors (GEFs) and GTPase-activating proteins (GAPs) to ensure that the GTPase cycles through its GTP-bound and GDP-bound state. In most cases, GEFs turn on signaling by catalyzing the exchange of GDP for GTP whereas GAPs terminate signaling by promoting the hydrolysis of GTP. *C. elegans* are known to have three main GTPases (Rac1/CED-10, Rho-1 and CDC-42) and so far, there have been 23 RhoGAPs identified. The excess number of RhoGAPs suggests that each RhoGAP may play a specialized role in regulating an individual GTPase. A few of the 23 RhoGAPs have been classified as Rho-1 and CDC-42 specific, but none have been classified as CED-10 specific during embryonic development. Therefore, we aim to identify a CED-10 specific RhoGAP functioning during *C. elegans* embryonic development. CED-10 functions upstream of the WAVE/SCAR complex to modulate the actin cytoskeleton during embryogenesis. In *C. elegans*, mutation of any component of the WAVE/SCAR complex results in the "Gut on the exterior" or "Gex" phenotype which occurs due to failure of the embryo to enclose. The WAVE/SCAR complex has been linked to several diseases, which includes different types of cancer. The identification of proteins that regulate this complex can improve our understanding of these diseases and help provide therapeutic targets. To test the GTPase specificity of the 23 *C. elegans* RhoGAPs, three strains of nematodes carrying hypomorphic (reduced function) mutations for two of the three GTPases were fed bacterial RNAi corresponding to particular RhoGAPs and embryonic lethality was measured. We hypothesize that if a RhoGAP is functioning with a specific GTPase, there will be a suppression in the embryonic lethality that is normally observed in the absence of RNAi. Among the RhoGAPs tested, 15 have increased the embryonic lethality and therefore are not candidates for being CED-10 specific. However, RGA-2, SRGP-1 and RGA-1 emerged as likely CED-10-specific GAPs because of their ability to either suppress or cause no change in embryonic lethality.

14A Desiree Matias-Lopez
University of Puerto Rico, Rio Piedras

Mentors: Kai Hultzsch, Ph.D., Mr. Hiep Nguyen
Department of Chemistry & Chemical Biology
Rutgers University

Asymmetric hydroamination of unactivated alkenes with simple amines

The large number of amine-containing compounds in biological systems and pharmaceutical applications has given importance to the development of amine synthesis. Hydroamination reactions, in which a primary amine is added to a C-C double bond, are the most efficient ways to carry out amine syntheses. However, catalyst most be used to enhance the activity and stereoselectivity of hydroamination reactions. A *tert*-butyldiphenylsilyl-substituted binaphtholate yttrium complex was synthesized and, among other chiral rare earth metal complexes, was used as a catalyst for the hydroamination reactions. A series of intermolecular hydroaminations have been performed with a variety of terminal olefins and primary amines. The hydroamination reactions were performed at 150˚C or 170˚C. Proton and Carbon nuclear magnetic resonance (^{1}H-NMR and ^{13}C-NMR) spectroscopy were performed to study the progression of the reactions. To determine the enantiomeric excess, Mosher's acid chloride and ^{19}F-NMR spectroscopy were used. The reactions were carried out to obtain high reaction conversion yields and the enantiomeric excesses will be reported. The results obtained in this study will help to create a comparison between the different catalysts and to understand better the reactivity of intermolecular hydroaminations.

15A Coleen Nemes
Marist College

Mentors: Deirdre O'Carroll, Ph. D[a,b]., Christopher Petoukhoff[b]
Department of Materials Science and Engineering[a]
Department of Chemistry and Chemical Biology & Institute for Advanced Material and Nanotechnology[b]
Rutgers University

Fabrication and characterization of silver nanoparticle arrays for organic photovoltaic cells

Inorganic solar cells have high efficiencies (~28% for a single junction GaAs solar cell) and long lifetimes (25+ years), however they are ridged and costly to manufacture. Contrastingly, organic solar cells, or organic photovoltaics (OPVs), are flexible and have the potential to be inexpensively manufactured; however, they have low lifetime (less than 1 year) and efficiency (10%). With increased efficiency and lifetime, OPVs have the potential to become an inexpensive and practical source of renewable energy, allowing for a decrease in fossil fuel use and harmful carbon emissions. It has previously been shown that metallic nanoparticles, which exhibit surface plasmon resonances, increase the absorption efficiency when added to organic semiconductor thin films. Our objective is to fabricate arrays of silver nanoparticles by thermally evaporating metal through nanoporous alumina membranes and, subsequently, to study their optical properties. The reflecting and scattering properties of silver nanoparticle arrays have been characterized using bright-field reflectance and dark-field imaging spectroscopy, respectively. It has been found that regions of silver nanoparticles arrays on silicon show changes in dark-field imaging spectra with change in the visible color of scattered light. This indicates that these nanoparticles can be used to tune light scattering wavelength, a property that could be beneficial for enhancing light absorption at specific wavelengths in the active organic layer of OPVs.

16A Joseph Batts
Clemson University

Mentors:
Dr. Lily Young, Dr. Max Haggblom, Dr. Weilin Huang, Ms. Maria Rivera, Mr. Adam Mumford

Biogeography of biotransformation of halogenated organic contaminants in temperate, sub-arctic, and tropical envrionments

Microbial dehalogenations are processes by which halogen atoms are removed from organics by microbes. The most common sources of halogenated compounds are through production and use by humans as waste byproducts, pesticides, flame retardants, etc. These chemicals often have toxicological and environmental impacts that are undesirable and often dangerous. Using 2,4,6-tribromophenol, 2,4,6-trichlorophenol, tetrabromobisphenol-A, and tetrachlorobisphenol-A added into microcosms of sediment and river water from various locations around the globe a comparison of various microbial dehalogenation ability can be developed. The New Jersey group used materials from the Hackensack, Mullica, and Raritan rivers. The sub-arctic group in Finland used several rivers there and the tropical group in China used rivers there as well as samples from e-waste sites.

17A Imani Sanders
University of Maryland – College Park

Mentors: Noshir Langrana, Ph.D. and Devendra Verma, Ph.D.
Department of Biomedical Engineering
Rutgers University

Development of an in vitro model of the peritoneum to analyze the growth of adhesions

After enduring abdominal surgery, 93% of patients develop adhesions in the peritoneal cavity. These fibrous bridges attach to other tissues and organs and cause extreme pain to patients. While some pharmaceuticals decrease the severity of adhesions, there is no guaranteed method of preventing adhesions. The lack of knowledge about how adhesions form is the main reason why there is no prevention method. We propose to create a 3-dimensional in vitro model of the peritoneum to gain a comprehensive understanding of the biological cues that promote adhesion formation. Our model will emulate a human's peritoneum by consisting of an initial layer of collagen gel infused with fibroblasts, a key component of fibrotic response. Then, mesothelial cells will be plated on top of the collagen. A biopsy punch will be performed to simulate a surgical incision or trauma to the mesothelial layer. Lastly, fibrin gel will be implanted in this cavity, analogous to the exposed area following a surgery. The fibrin gel will be infused with macrophages, a key component of inflammatory response. By observing the reaction of the mesothelial cells, fibroblasts, and macrophages, we plan to define each component's contribution to adhesion formation. During different increments of the healing process, pictures of our in vitro model will be processed using immunofluorescence microscopy. Our data will be quantified by measuring the number of cells that migrate to the open area. The ultimate purpose of this in vitro model is to test biological effects of several biomaterials that are capable of physically blocking tissues from attaching to each other after injury.

18A Patricia Sylvestre
SUNY Binghamton

Mentors: Maurice Elias, Ph. D., Gwyne White, and Cesalie Stepney
Department of Psychology
Rutgers University

Using Law of Life Essays to Identify Indicators of Anxiety in School-Age Children

Children with anxiety disorders contain considerable impairment in their academic, familial, and social functioning. Several screening measures to identify anxiety disorders in youth exist, but these are formal approaches that are difficult to integrate into school routines and tend to be validated only with Caucasian individuals. In this study, we examined the analysis of students' essays as a possible indicator of anxiety. The sample consisted of predominately African American and Latino 5th grade students participating in the Law of Life intervention program. Anxious students were defined as passing either the liberal and conservative criteria for displaying anxiety on both the Piers-Harris Self-Concept Scale and SSRS Teacher Rating Scale of Students' Social Competence. Linguistic Inquiry and Word Count Software was used to identify indicators of anxiety in these students' writing. After using Logistic Regression and Chi Square analysis, results indicated that students who used more death related words, negative emotional expression words, and anxiety related words in their writing exhibited greater indications of anxiety. Furthermore, results showed that female students contained more indicators of anxiety in their writing than male students. Interestingly, essays that contained more support words exhibited fewer indications of anxiety than essays with fewer support words. Findings provide empirical support to show that Laws of Life Essays can be used to detect signs of anxiety unobtrusively within students' writing assignments. It further suggests that the Laws of Life essay writing process may be useful in alleviating anxiety in children by promoting positive social-emotional and character development.

19A Stephanie Tse
Bryn Mawr College

Mentors: Dr. Kathryn Uhrich, Ph.D., and Nicholas Stebbins, B.S.
Department of Chemistry and Chemical Biology
Rutgers University

Synthesis, characterization and *in vitro* degradation studies of ampicillin-based poly(anhydride-amide)

Ampicillin-based poly(anhydride-amides) (A-PAAs) are novel, biodegradable polymers which have ampicillin chemically incorporated into a polymer backbone. Offering a sustained, controlled release of biocompatible and bioactive compounds from the hydrolytic cleavage of bonds in the polymer, A-PAA has the potential to be used as coatings for stainless steel implants to prevent infections caused by biofilm formations on the implant surface. Biofilms develop over time, thus it is important to determine how long A-PAA coatings will remain on stainless steel coupons. Following the synthesis and characterization of the A-PAAs, the *in vitro* degradation profile was monitored using high performance liquid chromatography (HPLC) and UV-vis spectroscopy to determine the amount of time needed to completely degrade A-PAA. To make coatings, A-PAA is solvent cast onto stainless steel coupons, dried for two hours under heat (80 ^{0}C) and vacuum, and then incubated in phosphate buffered saline (PBS, pH 7.4 at 37 ^{0}C) mimicking physiological conditions. The degradation media was replaced by fresh PBS at specified intervals and samples were monitored with UV-vis. Using HPLC, A-PAA degradation was found to release ampicillin diacid, and not free ampicillin, thus implicating that anhydride bonds were hydrolytically cleaved and that amide bonds were still present after the incubation in PBS. Approximately, 90% of A-PAA had degraded into ampicillin diacid within one hour, complete degradation occurred within four hours. Future work will include testing for bioactivity of ampicillin diacid and making a copolymer to delay release of ampicillin diacid. Additionally, a different method of casting the coating onto steel coupons will be tested for effects on polymer degradation.

20A Samjit Walia
The Cooper Union for the Advancement of Science and Art

Mentor(s) : Dana Barrasso
Rohit Ramachandran, Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers University

Determination of Numerical Integration Techniques for 3D Population Balance Models Describing Continuous Multicomponent Wet Granulation Processes

Currently the pharmaceutical industry manufactures drug tablets using batch granulation processes which are insufficient in controlling granule size and composition distributions. Transitioning towards a continuous granulation processes would result in large economical benefits and increased quality control throughout the granulation process in tablet manufacturing. Thus, research was conducted to study and model continuous granulation processes using population balance equations (PBEs) in MATLAB and analysis was conducted to determine which numerical integration techniques efficiently simulated the model close to real time. The partial differential PBEs were reduced to ordinary differential equations (ODEs) and simulated as 3D, 2D and 1D models. Explicit, implicit, adaptive and predictor corrector integrating methods were implemented to solve the ODEs and were evaluated based on their accuracy, stability and computational efficiency subject to varying forms of the rate constant kernel, initial powder distributions and liquid spray additions. It was determined that a novel integration technique was necessary to simulate the model which had the minimal computation time associated with the explicit Euler method and the error control inherent in the adaptive predictor-corrector Runge-Kutta Fehlberg method. Thus, a tailored adaptive Euler technique was developed which exhibited increased stability when the above mentioned model parameters were varied.

ABSTRACTS

Poster Session ~B~

1B Maria Pietri-Babon
University of Puerto Rico- Mayagüez

Mentors: Dr. Lily Young, Ph. D.
Hang Dam, Ph. D. student; Maria Rivera, Teaching Laboratory
Department of Environmental Sciences
Rutgers University

A comparison of the dehalogenation rates of the persistent organic pollutants hexachlorobenzene and hexabromobenzene

Halogenated organic compounds are among the major persistent pollutants in the environment. Also known as organohalides, these compounds undergo a major reaction carried out by natural microorganisms in anaerobic environments called reductive dehalogenation. The products of this reaction are less toxic, more susceptible to microbial attack and less likely to bioaccumulate in the environment. The growing evidence of local and global environmental contamination over time has raised the need to find vital resources of clean air and clean water in order to solve pollution problems. Bioremediation is one of the promising approaches to solve contamination, since it takes advantage of the ability of microorganisms in historical contaminated sites that can survive contaminated conditions and utilize contaminants for living. This ability of these particular microorganisms is hypothesized to be ubiquitous. For this reason, biotransformation reactions will be investigated at an international scale throughout three different environments: New Jersey, United States; Guangzhou, China and Lahti, Finland. The aim of this research is to determine whether chlorinated and brominated compounds have different reactivities, when considering dehalogenation as one of the most important transformations that are taking place in bioremediation processes. This study was conducted by setting up different microcosms with sediment from the Raritan, Mullica and Hackensack Rivers of New Jersey, and comparing the dehalogenation reactions of hexachlorobenzene (HCB) and hexabromobenzene (HBB). A sediment slurry was prepared in serum bottles under anaerobic conditions to which the different compounds were added. Sampling was carried out every two weeks in order to perform chemical and molecular analyses. Considering that with decreasing electronegativity the propensity to break the chemical bond between carbon and a halogen increases, the concentration of the polybrominated compounds is expected to decrease with a faster rate as the extent of dehalogenation increases.

2B Orlando Barbosa
University of Puerto Rico – Mayagüez

Mentors:
Dr. David Shreiber
Department of Biomedical Engineering
Rutgers University, NJ

Dr. Ijaz Ahmed
Department of Biomedical Engineering
Rutgers University, NJ

Characterization of Reactive-Like Astrocytes on Different Surfaces

Reactive gliosis occurs in response to all forms of CNS injury and disease. Astrcocytes are stimulated to become reactive by external signals released into the injury or diseased environment. These reactive astrocytes help maintain homeostasis by segregating uninjured tissue from injured tissue. However, in many instances such as spinal cord injury, this can prevent the regeneration of new tissue and limit functional improvement. Therefore, the ability to control reactive gliosis in an injury environment may allow improved recovery. In a previous study by our collaborating laboratory, reactive gliosis appeared to be decreased when electrospun polyamide nanofibers were implanted in an in vivo model of spinal cord injury. In a follow-up study, we found that normal primary astrocytes in vitro demonstrate different morphological, ultra-structural, and expression features on these nanofibers vs. other substrates. In this study, we performed some of the same in vitro characterization, but we used astrocytes that are induced to be reactive with the dibutyl cAMP. These reactive astrocytes are seeded on glass coated with PLL, bare Aclar, Aclar coated with PLL, or nanofibers in culture. Antibodies against Glial Fibrillary Acidic Protein, Tubulin, Actin, CDC-42, among others, were used to stain the cultures on the surfaces and observe the variations among them. The fewest number of cells attached to the Aclar surface. The cells that did attach were stellate but thinner than the cells on the other surfaces. Glass-PLL and Aclar-PLL had higher cell counts, and cells were broader and more clustered than they were on the Aclar surface. The highest cell count was observed on the nanofiber surface. Further analysis of immunostaining results is planned to relate the expression of proteins consistent with reactive gliosis to the different substrates. Our collaborating laboratory will also perform atomic force microscopy on these samples to investigate ultra-structural differences. The difference in the behavior of astrocytes on polyamide nanofibers could allow improved control of the post-injury environment.

3B Mary Carter
Montclair State University

Mentors: Paul R. Copeland, Ph.D. and Sumangala Shetty, PhD.
Department of Molecular Genetics, Microbiology & Immunology
UMDNJ- Robert Wood Johnson Medical School

Identification of novel factors that interact with Selenoprotein P 3'untranslated region (3'UTR) and determination of contributes of processivity.

Selenoprotein P (SelP) is an extracellular glycoprotein that contains Selenium in the form of the 21st amino acid, Selenocysteine. There are twenty five known selenoproteins that are synthesized in the human body, and SelP is the most utilized. Biosynthesis of selenocysteine is unique because it is encoded by RNA stop codon "UGA" and is dependent on the selenocysteine insertion sequence (SECIS). The process of Selenocysteine incorporation in translation requires other dedicated factors that include the Selenocysteine specific elongation factor that carries Selenocysteine tRNA ($tRNA^{sec}$) and the SECIS binding protein (SBP2). SelP is known to have the most selenium atoms per structure. SelP has two SECIS elements located at the 3' untranslated region (3'UTR) of the transcript. This study sought to further test the hypothesis that there is another RNA binding protein that contribute to the biosynthesis of selenocysteine though the 3'UTR transcript. The 5'UTR and coding region of SelP mRNA was substituted with a firefly luciferase construct containing an in-frame UGA codon at position 258. In one construct, the 3'UTR had the full length SelP construct (Luc56) containing both SECIS elements. The other construct of the 3'UTR had the first 83 nucleotides deleted (Δ83) due to its high conservatory (Luc4). Both plasmid constructs had a bacteriophage MS2 tag at the C terminus of the 3'UTR. McArdle Rat Liver Hepatoma cells were transfected with 1.2 µg of Luc56 and 0.1 µg Green Fluorescent Protein (GFP), 1.2 µg of Luc4 and 0.1 µg GFP, and 0.1µg GFP alone (Attractene). With the compliance of the MS2 tag, cell lysates were purified using a glutathione column prospectively associated with GST-MS2GP fusion protein which bond to the MS2 tag on the constructs. Protein expression was analyzed by one dimensional gel electrophoresis. Determining the main factors in selenoprotein synthesis will give light to the mechanism of selenocysteine biosynthesis and its importance in the human metabolism.

4B Katterin Colon
New Jersey City University

Mentors: Jason Richardson, M.S., Ph.D.
Department of Environmental & Occupational Medicine
UMDNJ-Robert Wood Johnson Medical School

Richard Von Stein, Ph.D.
Department of Environmental & Occupational Medicine
UMDNJ-Robert Wood Johnson Medical School

Activation of inflammatory pathways by dichlorodiphenyltrichloroethane (DDT) and its derivatives: Potential link to neuroinflammation in Alzheimer's disease.

Alzheimer's disease (AD) is the most prevalent neurodegenerative disease, affecting about 26 million of people worldwide. Although genetic factors appear to play a primary role in AD, few genes have been identified that contribute to more than a small percentage of AD cases. Previous and ongoing work in our laboratory has found that increased serum levels of p,p'-DDE, a metabolite of the organochlorine pesticide DDT is associated with increased risk of AD. However, it is not clear how DDE or DDT may contribute to AD pathogenesis. AD is characterized pathologically by the presence of neurofibrillary tangles, amyloid plaques, and widespread neuroinflammation. This neuroinflammation is associated with the activated phenotype of microglial cells and elevated levels of proinflammatory mediators, such as the generation and secretion of cytokines. Here, we report that exposure of mice to 3 mg/kg of DDT every 3 days for 30 days increases mRNA expression of TNF α by 60% in the hippocampus, but not the cortex. These data suggest that DDT exposure causes neuroinflammation preferentially in the brain region that is among the first to degenerate in AD. Further studies are ongoing to determine the mechanism by which DDT increases TNFα using both *in vitro* and *in vivo* models.

5B Joshua Erndt-Marino
The College of New Jersey

Mentors: David Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers University

Mrs. Elizabeth Stucky
Department of Chemical and Biochemical Engineering
Rutgers University

Mesenchymal stem cell attenuation of inhibitory molecules expressed by reactive astrocytes

Cerebral stroke is the leading cause of serious long-term disability in the United States affecting nearly 795,000 people per year. There is little to no treatment currently available for people who suffer from the wide array of disabilities caused by ischemic stroke. The body's attempt to heal itself after stroke results in the activation of the inflammatory response, which can also cause further cell death and inhibit neural repair. Cellular transplantation of mesenchymal stem cells for treatment of cerebral ischemia has been shown both *in vivo* and *in vitro* to provide neuroprotection and improve regeneration. However, there are concerns with direct implantation because free MSCs lack the ability to survive and localize around the injured area for an extended period of time. Alginate encapsulated mesenchymal stem cells (eMSCs) are used in our lab to immobilize the MSCs as well as to protect them from the toxic microenvironment. We are evaluating the ability of eMSCs to attenuate the inflammatory response of lipopolysaccharide (LPS) stimulated astrocytes. Preliminary results indicate that eMSCs reduce tumor necrosis factor alpha (TNF-a) levels in primary astrocyte cultures stimulated by LPS. We are also evaluating eMSC treatment in an astrocyte culture model of experimental ischemia, induced by oxygen-glucose deprivation. In future studies, we would like to examine the effect of eMSCs on other neuronal cell types to gain a more complete understanding of their mechanism of function. MSC treatments for stroke thus far are still far from complete, but their use as a biotherapeutic agent may be implemented to benefit thousands of stroke victims in the future.

6B Bintou Fisiru
University of Pennsylvania

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

Dissolution of Polymer Films in Simulated Saliva

Conventional pharmaceutical solid dosage forms are changing in response to untoward issues with many of the current drug delivery methods. In particular, polymer films have emerged as a promising drug delivery system. Such films are advantageous relative to other oral delivery forms, such as tablets and capsules, because they have a larger surface area that allows for faster dissolution and, thereby, increased bioavailability. To predict how polymer films perform in the mouth, it is necessary to simulate the in-vivo conditions where absorption occurs, in this case, the saliva. Simulating human saliva is very difficult because it is a mixture of different fluids produced from different glands in the mouth. We will be testing five (5) published simulated saliva formulations. We will collect human saliva samples from the people who work in the laboratory, with their permission. We will measure griseofulvin, naproxen, nicotine, and caffeine solubility in the simulated saliva in order to determine which simulated saliva most closely resembles human salivas. These drugs were picked because they will be embedded in the oral films to be developed later on.

7B Derek Holyoak
University of Connecticut

Mentors: Jack Zheng and Jeffrey D. Zahn, Ph.D.
Department of Biomedical Engineering
Rutgers University

Theory-based double-pulsed electroporation microdevice for effective cellular manipulation

To date, electroporation protocols have been developed without fully understanding the transport mechanisms by which the desired material moves into the cell. There is an inherent tradeoff between cellular viability and transfection rates during electroporation, where most protocols sacrifice viability for increased molecular delivery. We want to better understand the transport mechanisms in attempt to improve both cellular viability and transfection efficiency. It is hypothesized that during electroporation, material does not simply enter the cell by diffusion, and it has been shown that, in fact, material enters the cell at a much faster rate, implying that another force is responsible for delivery. We hypothesize that electrophoresis plays a major role in material delivery rate. Based on this hypothesis, a double-pulsed (instead of a single-pulsed) electric field will be applied to the cell using a microfluidic device. The first pulse will initiate opening of the membrane via electroporation, and the second lower field pulse will be used for material transport. This strategy will help preserve cell viability by only exposing the cells to a high electric field for a short period of time to initiate electroporation, while using the lower field second pulse to allow a large amount of material transport into the cell via electrophoresis. A high-speed camera is used to visualize fluorescent material moving into the cell via epifluorescence microscopy. MATLAB is used to analyze the images in order to quantify both the time required and the amount of material that travels into the cell. Using this theory-based device, a desired material should be able to be delivered into a single cell at a time with high viability and transfection rates. In the future, we hope to see this device and methodology enhance many clinical and research applications, such as gene therapy and stem cell research.

8B Nicole Keenan
Alfred University

Mentors: Joseph Freeman, Ph.D.
Department of Biomedical Engineering
Rutgers University

Mr. Emmanuel Ekwueme
Department of Biomedical Engineering
Rutgers University

3D *in vitro* analysis of proliferant effect on ligament healing process

Sprained ligaments are among the most common sports injuries. Rest or surgical interventions are currently the most popular treatments, but risks associated with surgery and the chance of reinjury are serious issues. Researchers are currently investigating alternative methods for ligament repair. One such method, proliferative therapy, or prolotherapy, utilizes a proliferant solution to initiate the healing cascade at the site of the tissue damage. We previously studied the effect of proliferants in a 2D environment and determined an optimal dosage. In this study, we are investigating the effectiveness of prolotherapy in a 3D *in vitro* environment. We have designed an alginate-based hydrogel to act as a mock extracellular matrix (ECM). Two different proliferants were examined, dextrose and P2G (phenol, glycerin, and glucose) under three conditions: rat patellar tendon (PT) fibroblasts alone in hydrogel (control), PT fibroblasts in hydrogel with P2G, and PT fibroblasts in hydrogel with dextrose. Samples were observed at four different time points for cell proliferation and PT collagen production. Hydrogels were examined after 1, 4, 7, and 10 days. We expect that the results will be parallel with the 2D study, showing that the proliferant will cause an initial decrease in cell number followed by increased cell proliferation and collagen production. Further studies include studying the effects of the proliferant on a larger animal, such as a rabbit or a pig.

9B Modupe Kuti
New York University

Mentors: Nina Shapley, Ph.D and Ms. Kun Yu
Department of Chemical and Biochemical Engineering
Rutgers University

Measuring the viscosity of calcium alginate particles at different shear rates and concentrations

Alginate is a nontoxic biopolymer, which has the ability to absorb high concentrations of heavy metals from aqueous solutions. In this research, calcium-alginate gel particles of a size less than 38 microns were synthesized using a combination of three solutions: an oil solution, alginate solution and calcium-chloride solution. These calcium-alginate particles could be incorporated into a packed bed column to serve in an industrial setting such as heavy metal removal in industrial wastewaters. The process of packing the column will affect the flow of the aqueous solutions through the alginate particles and therefore the adsorption of metal ions on to the alginate particles. Using a flow of particles suspended in a fluid to pack the column will offer some control over the resulting packing. Hence, the flow properties of the alginate particles in the suspension must be characterized. In this study, the viscosities of suspensions containing various volume fractions of alginate particles ranging from 0%-50% were tested in the parallel-plate rheometer order to understand the flow properties of alginate in a suspension. The shear rates were also varied from ~0.01 to 100 (1/s) to test how the viscosity changed with the shear rate in order to be able to predict how the alginate suspensions would behave when packed into a column system using a flow. As seen in any system with suspended particles or droplets, the viscosity is seen to increase as the volume fraction of alginate particles in the suspension is increased. The viscosity is predicted to be roughly constant as the shear rate is varied though due to the alginate gel beads ability to be deformed, shear thinning due to particle elongation could be seen as the shear rate is increased. With the study of the flow properties of the calcium-alginate particles, a column system could now be designed in order to optimize the rate at which the calcium-alginate particles will adsorb heavy metals from an industrial effluent system.

10B Alejandra S. Laureano
University of Puerto Rico-Rio Piedras

Mentors: Emanuel DiCicco-Bloom, M.D.,Ph.D. and Dr. Hee Jae Lee P.h.D
Department Neuroscience and Cell Biology
Robert Wood Johnson Medical School

Valproic Acid regulates astrocyte proliferation, cell cycle machinery and histone acetylation

Valproic Acid (VPA) is a drug used for treating epilepsy, bipolar disease and migraines. The use of VPA during pregnancy can have teratogenic effects that injure the brain in patterns that reflect the particular embryonic stage of exposure, causing major malformations, as well as cognitive impairments. In previous studies, we found that VPA affects the cortical neuronal precursors, regulating their cell cycle kinetics. To define a wider spectrum of VPA effects, we now examine another major cortical population, the glial cells, specifically astocytes, which support neuronal cell development and function. We chose to examine glial cells from the frontal cerebral cortex of postnatal day 2 rat pups, which stage is most similar to the development of glial cells in humans. In other systems, VPA has been found to affect gene transcription by inhibiting enzymes, histone deacetylases (HDACs), which modify the activities of histones that regulate DNA promoters. To define effects on astrocytes, glial cells were isolated and enriched for astrocytes using culture and selective adhesion methods, resulting in >95% purity for marker Glial Fibrillary Acidic Protein (GFAP). Cell cycle regulation was assessed using thymidine incorporation as a measure of DNA synthesis, and western techniques to assay proteins levels of cyclin E, as well as acetyl-histone H3, a marker for changes in gene regulators affected by VPA. VPA treatment increased astrocyte proliferation two fold, increasing DNA synthesis as well as the proportion of cells entering mitotic S phase. VPA treatment also elicited two-fold increases in the levels of acetyl Histone H3 versus controls, raising the possibility that VPA affects gene transcription by inhibiting astrocyte HDACs, as observed in other cell populations. Preliminary results also suggest that VPA treatment alters levels of cell cycle regulator, cyclin E, which might play a role in the changes in DNA synthesis we observe. In sum, these results suggest that VPA may have detrimental effects on astrocyte cell cycle machinery in culture. If similar observations are found in vivo, these studies will suggest another locus of VPA action that may contribute to different cognitive impairments observed in children exposed during gestation.

11B Michael Little
Montclair State University

Mentors: Lauren Aleksunes, Ph.D., and Xia Wen Ph.D.
Environmental & Occupational Health Science Institute
Rutgers University

Regulation of liver and kidney efflux transporters during inflammation

The purpose of this project was to determine the effect of inflammation on the cellular expression of efflux transporters in the livers and kidneys of mice. Altered expression of transporters may change the excretion and toxicity of cancer drugs such as cisplatin. This is important because cisplatin is known to cause kidney injury. Efflux transporters of interest include P-glycoprotein, Mrp1-6, Mate1, and Bcrp. Adult male C57BL/6 mice (n=4) were injected with saline vehicle or lipopolysaccharide (LPS 5 mg/kg) to induce inflammation. Tissues were collected 24 hours after injection to study the effects of LPS on efflux transporter expression in the liver and kidneys. Samples were homogenized in Sucrose-Tris buffer. A Bradford Assay was performed to calculate protein concentrations of the samples. Protein samples were loaded onto SDS PAGE gels to be analyzed by western blot analysis with primary antibodies raised against each transporter. For each transporter, band intensities were assessed as a semi-quantitative measure of protein expression. No significant changes in expression levels of transporters in the kidneys and livers of LPS-treated mice were detected. Further dose- and time-response studies are needed to better characterize the cellular expression of transporter proteins in response to inflammation.

12B Jose Martinez
Cornell College

Mentors: Alan Goldman, Ph.D. Michael Haibach, Changjian Guan
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Synthesis of 3,5-di(di-t-butylphosphinomethyl)aminobenzene Iridium Pincer Catalyst

The classical Fischer-Tropsch (FT) process for conversion of syngas to hydrocarbons calls for the use of a metal catalyst combined with a support. Development of a robust alkane dehydrogenation catalyst is highly desirable for the potential to upgrade the FT product stream, leading to more efficient production of transportation fuels. Such a catalyst though will need to withstand the flow of fuel in a flow reactor. A pincer-iridium catalyst with a dimethylamino substituent in the para position has been investigated due to its acid/base interaction on aluminum oxide support, and showed good stability and recyclability. A stronger acid/base interaction between the pincer catalyst and substrate would lead to a catalyst with greater durability and lifespan. Synthesis of the new pincer ligand, 3,5-di(di-t-butylphosphinomethyl)aminobenzene (NH_2-PCP), is expected to lead to a stronger acid/base reaction with aluminum oxide. We report a synthesis of NH_2-PCP in four high yielding steps from commercially available material, without the need for intermediate purifications. Work is underway on forming the (NH_2-PCP)Ir catalyst species.

13B Bridget Mendoza
Northern Arizona University

Mentors: Chris Baldi, PhD, Andrew Singson, Professor
Waksman Institute
Robert Wood Johnson Medical School

Investigating male fertility within *caenorhabditis* species

Infertility currently affects 15% of couples and, in more than half of these cases, male factors are responsible for the couple's inability to conceive (Poongothai et. al., 2009). Furthermore, recent research has linked advanced paternal age to several neurocognitive disorders such as autism, schizophrenia, and dyslexia (Saha et. al., 2009). Despite these findings, male fertility has received very little attention and the effects of male age on fertility have yet to be revealed. Thus, the current study aimed to elucidate the relationship between male aging and fertility using several nematode species within the genus *caenorhabditis.* Preliminary work in the lab of Dr. Andrew Singson revealed that *C. elegans* males display a surprisingly short reproductive span, lasting only 4-6 days even though the organism can survive up to 3 weeks. To determine whether this characteristic is unique to *C. elegans*, the fertile period of males from related nematode species (*C. remanei, C. briggsae, C. brenneri, and C. japonica)* was observed. Males ranging from one to five days old were mated with a healthy female that has just reached sexual maturity. The number of eggs produced from each mating event was counted and graphed as a function of male age. It was noted if and when males experience reduced fertility, which was manifested by the cessation or decline in egg production. If the reproductive span of related nematodes is terminated significantly earlier than their lifespan, this may indicate that there are selective pressures to favor a truncated fertility period and similar phenomena could eventually be investigated in human males.

14B Kevin Ortiz
Mentor: Peter Lee
PI: Alberto Cuitiño

Temperature Profile Determination for a Roller-Compacted Ribbon using a Thermal Camera

In order to make plausible the transition from a batch to continuous process it is important to study the variations of the system of interest. This first step is the foundation of the quality by design methodology since it enables future studies to correlate such variations to the properties of the final dosage form. This study shows that density differences in compacted ribbons are related to the temperature profile of the ribbon. We consider only one ribbon condition: powder (MCC) without lubrication. The compacted ribbon is visualized in three different sections: left, middle, and right section. The temperature longitudinal heterogeneities for each section were recorded quantitatively with a thermal camera following an off-line modality. Subsequently the photos were analyzed using Matlab to transform the pixels into temperatures. From the preliminary analysis we can show that these temperature differences through the ribbon are significant, ranging between 2-3°C when the middle section is compared to the adjacent sections. This study reveals that in the middle section where the material is denser (Akseli at. al) the temperature is higher.

15B Andres Ramirez
Cornell University

Mentor: Edward Selby, Ph. D.
Ms. Amy Kranzler
Department of Psychology
Rutgers University

Exploring the link between emotion dysregulation and emotional reactivity.

Emotion dysregulation is a factor shared by many psychiatric disorders; however, the link between emotion dysregulation and emotional reactivity remains at issue. Examining this relationship is integral to understanding how difficulties in emotion regulation may contribute to mental illnesses and health-risk behaviors. The present study explores the relationship between the Difficulties in Emotion Regulation Scale (DERS) and participants' self-reported emotional responses to an emotion induction task. We hypothesized that individuals with greater general and domain-specific emotion regulation difficulties would be more reactive to an emotion induction than individuals with lower scores on the DERS and its subscales. To test our hypotheses, subjects were administered the DERS and then completed the Positive Affect and Negative Affect Scale (PANAS) prior to and immediately following an upsetting writing task. A repeated-measures multivariate analysis of covariance (RM-MANCOVA) revealed that individuals with high scores on the DERS and its subscales reacted with significantly greater negative affect and reduced positive affect to the writing task than those who were better able to self-regulate. Consistent with our hypothesis, results indicated that emotion dysregulation is closely related to the intensity with which individuals respond to a distressing writing task. Future research should investigate specific facets of emotion dysregulation and how they relate to other emotion induction tasks.

16B Shelby Swiggum
Ripon College

Mentors: Tracey Shors, Ph. D., Megan Anderson, Lily Bowles
Department of Psychology
Rutgers University

The role of acetylcholine in learning and neurogenesis.

Difficult associative learning tasks enhance neurogenesis, the process of neuron formation, in the hippocampus of adult mammals. However, the exact process by which learning enhances neurogenesis has yet to be determined. Acetylcholine (Ach) is a neurotransmitter that has been implicated in both learning and neurogenesis. In this study, the role of Ach in neurogenesis was assessed by examining how a decrease in the release of Ach in the hippocampus bilaterally or unilaterally affects the number of newly-generated cells in the hippocampus of rats. To decrease Ach levels, septohippocampal cholinergic projections were lesioned bilaterally or unilaterally using 192 Immunoglobulin Saporin injections. It was determined that animals with bilateral lesions generated similar amounts of BrdU-labeled new neurons to sham-lesioned animals. A subset of animals with bilateral lesions was trained with trace eyeblink conditioning, a task known to enhance the survival of new neurons. These animals were unable to learn the task which resulted in prevention of the enhanced survival. Interestingly, animals with unilateral lesions were able to learn the trace eyeblink conditioning task. We found that both the lesioned and sham hemisphere had increased numbers of BrdU-labeled cells when trained with trace eyeblink conditioning compared to animals that were trained on delay (a task that does not influence neurogenesis). The enhanced survival was not due to any changes in the proliferation or baseline survival. Additionally, there was no difference between the hemispheres in either of these groups suggesting that when animals can learn, neurogenesis is enhanced with or without Ach. Therefore, Ach appears to have no direct role in proliferation, baseline survival, or enhanced survival as a result of learning. Rather, the presence of Ach in the hippocampus impacts whether an animal can learn difficult tasks, which in turn influences neurogenesis.

17B Taylor Vega
University of California, Berkeley

Faculty Mentors:
George Wagner, Ph.D.
Department of Psychology
Rutgers University

Mladen-Roko Rasin, M.D,Ph.D,
Department of Neuroscience and Molecular and Cellular Biology
Robert Wood Johnson Medical School

Near-peer mentor:
Erik DeBoer, graduate student
Department of Neuroscience and Molecular and Cellular Biology
Robert Wood Johnson Medical School

Behavioral and Histological Consequences in Adult after the intrauterine *HuD* depletion

The neocortex is a central nervous system structure unique to mammals and is responsible for higher cognitive function, complex motor behaviors, and is associated with learning and the long-term memory. Underlying these functions are projection neurons and interneurons placed in six-layers that differ between functionally distinct neocortical regions. These layers are generated from neural stem cells in a sequential and precise fashion, while simultaneously forming specific axonal projection and intricate dendritic connections. Thus, understanding the molecular and cellular mechanisms underlying the development of neocortical complexity and differentiation between layers and regions is critical not only to provide insight to the biological basis of neocortical formation, but it could also shed light on the origin of distinct neurodevelopmental disorders associated with the neocortex that have lifelong consequences, such as Autism Spectrum Disorder. In particular, disruption in the posttranscriptional mRNA processing may be the origin of these neurodevelopmental diseases with lifelong consequences. RNA binding proteins (RBP) play a crucial role in the posttranscriptional mRNA processing allowing cells to rapidly coordinate functional gene expression. In this study, we analyzed the lifelong behavioral and structural consequences of the intrauterine depletion of an RNA binding protein, *Hu antigen D* (*HuD*), on the adult mouse behavior and neocortex structure. We used behavioral assays, such as the Morris Water Maze, Elevated Plus Maze, and Behavioral Spectrometer on adult mice to determine the behavioral and cognitive consequences of knocking out *HuD*. Mice lacking HuD were less able to spatially orient themselves in the Morris water maze challenge. They exhibited a decreased motility and activity in a behavioral spectrum, and also demonstrated lower levels of anxiety by exploring the open portion of the elevated plus maze for more time than their wild type counterparts. Subsequent analysis will assess the molecular corollaries to these findings, through immunohistochemistry of neocortical projection neuron subtypes, interneuron markers and synaptic marker analyses. Finally, findings from the immunohistochemical analyses will be followed by the involvement of HuD in the metabolism of RNA. Western blot analysis of microdissected neocortical regions will be coupled to qRT-PCR to elucidate a disconnect in the transcript levels versus translated protein. This work has the potential to unlock the molecular mechanism behind neurogenesis and could provide the foundational knowledge needed for translational research.

18B Elizabeth Wilson
Lafayette College

Mentor: Janet Alder, PhD, and Smita Thakker-Varia, PhD
Department of Neuroscience and Cell Biology
UMDNJ Robert Wood Johnson

Mechanism of VGF's antidepressant effects.

One mechanism by which antidepressants are thought to work is by increasing neurogenesis in the dentate gyrus. Furthermore, a neuropeptide, VGF (nonacronymic) enhances proliferation of neural stem cells through increasing synaptic transmission and also reduces depression and mania signs in mouse models. In this study we have investigated the mechanism by which VGF enhances proliferation to gain insight into its effects as an antidepressant agent. It was previously shown that VGF activates metabotropic glutamate and NMDA receptors in hippocampal neurons causing the phosphorylation of PKD and CaMKII, respectively. First, to determine whether Neural Progenitor Cells (NPCs) contain receptors necessary for synaptic activity, NPCs were stained for TrkB, mGluR5, NMDA, and AMPA receptors using immunohistochemistry. Our findings indicate that NPCs do express these receptors, suggesting that NPCs can participate in synaptic transmission. Next, to determine if NPCs treated with VGF have increased activation of PKD and CaMKII, the level of phosphorylation of these signaling molecules in NPCs following VGF treatment was measured by Western blot. This study then aimed to determine if the phosphorylation of CaMKII and PKD is necessary for VGF-induced proliferation. NPCs were cultured and exposed to CaMKII and PKD inhibitors, KN93 and GF100, respectively. Immunohistochemistry was used to label dividing cells that are BrdU positive. Results show that KN93 and GF100 inhibit VGF-induced proliferation suggesting that VGF-induced proliferation may require the phosphorylation of CaMKII and PKD. Lastly, to explore the effect of VGF on baseline neurogenesis in vivo, VGF+/- and VGF +/+ mice were injected with EdU and EdU staining was measured in the dentate gyrus. Data reveals that VGF+/- mice have fewer EdU positive cells suggesting that VGF is required for baseline neurogenesis. In sum, this study has begun to reveal the mechanism by which VGF enhances neurogenesis in NPCs, which may have therapeutic implications for major depressive disorder and bipolar disorder.

19B Justin Womack
University of Wisconsin-Madison

Mentors: Ms. Ana Gomez
Stavroula Sofou, Ph.D.
Department of Biomedical Engineering
Rutgers University

Association of anti-PSMA liposomes to endothelial cell analogues for targeted antivascular chemotherapy

Cancer still accounts for one in every four deaths in the United States of America every year and 13 percent of worldwide deaths. One of the reasons for the high death rate is the limited effectiveness of conventional drug delivery methods, resulting in reduced accumulation of therapeutics at tumor sites and high uptake by healthy sites. We have created and optimized liposomal nanocarriers to improve their accumulation at tumor endothelial cells, as well as the nanocarriers' ability to allocate and release therapeutics within these cells. In our experiment, aptamer conjugated liposomes ability to release therapeutics after binding and internalization is examined, *in vitro*, while varying the size of the liposomes. The liposomes were prepared to encapsulate doxorubicin and were conjugated to anti-PSMA aptamers. The aptamer conjugated liposomes were then incubated for five hours with MatLu and LNCaP cells expressing variable levels of PSMA. The amounts of drug (doxorubicin) that bind and become internalized within the cells were quantified by measuring doxorubicin fluorescence. Results are expected to show that the smaller sized liposomes will bind better than bigger ones. No internalization of the cells is expected at this time. By comparing the effectiveness of these aptamer conjugated liposomes with other ligand conjugated liposomes, we are one step closer to optimizing liposomal nanocarriers for use in antivascular chemotherapy.

20B Isaiah Woodson
Louisiana State University

Mentors: Kimberly Cook-Chennault, Ph.D., Mr. Sankha Banerjee, and Mr. Udhay Sundar
Department of Mechanical and Aerospace Engineering
Rutgers University

Fabrication and Analysis of Thick Film Composite Piezoelectric Materials

Capacitors, a key component in power systems used for powering portable electronic devices such as computers and cell phones, are used for storing energy, smoothing the output of power supplies, blocking direct current while allowing alternative current to pass, as well as for many other purposes. Capacitors are composed of at least two electrical conductors, separated by a dielectric material. Piezoelectric materials are known to be effective dielectrics in capacitors. Capacitance is a function of material composition, processing, thickness and amount of the dielectric material. Surface morphology also plays a role in the performance of thin film capacitors currently under investigation by many workers. Uniform film thickness is essential for maintaining stable dielectric properties. Workers have concluded that composite films containing micron-sized particles can have particle agglomeration that leads to random percolation pockets and inconsistent dielectric properties across the surface of the film. Hence, in this work, we investigate the influence of piezoelectric particle size and morphology on two and three phase composite piezoelectric materials. In particular, we explore the use of nano-sized barium-titanate particles in three phase composite piezoelectric films, and compare their performance to similar films made with micron sized BaTiO3 particles. BaTiO3, epoxy, and aluminum are initially mixed at specific volume fractions to produce a sol gel. Then the gel is spin coated on a conductive metal substrate at a maximum speed of 1000 RPM for 1 minute. The films are cured at 75^{o}C for 8 hours, poled for 15 minutes each. Films are compared based on capacitance and strain coefficients, d33 and d31.

BIOGRAPHIES

Michelle Banas

Michelle Banas is a rising senior at The College of New Jersey. She is a Biology major and has a Psychology minor. She plans to attend medical school or pursue a MD/PhD degree in Fall 2013. At TCNJ, she works in a lab studying diatoms and pollution in local bodies of water. At RiSE, she works in Dr. Sesti's lab studying apoptosis of neural cells as a result of oxidation of potassium channels. In her free time she loves to cook, go to concerts, and spend time with her friends and family. She is a sister and the Activities Chairman of Sigma Kappa Sorority, Kappa Upsilon Chapter at TCNJ. Michelle loves meeting new people and looks forward to spending lots of time with everyone she met at RiSE even after the program is over.

Orlando Barbosa

Born and raised in the Caribbean island of Puerto Rico. Currently, he is studying chemical engineering at the University of Puerto Rico in Mayagüez campus. He is also an active member of the American Institute of Chemical Engineers (AIChE) in the chapter in his university. This passionate young man enjoys his studies and loves sports. He plays baseball since he was six years old and other sports such as basketball and swimming. Orlando is a hard working person who does not like to leave his job half way done and love helping others. The summer of 2011 he participated as a voluntary leader in CAMPAR 2011, which it was a camp for handicapped adults to enjoy a week of games and activities they are not used to do while they are in their houses the rest of the year.

Joseph Batts

Joseph Batts has lived in various towns in South Carolina his whole life. Currently attending Clemson University; he hopes to graduate in May of 2013 with a BS in Environmental Engineering. He is currently doing research in another REU program at Rutgers which was invited to have some participation in the RISE programs. The project focuses on microbial dehalogenation from a global perspective with partner groups in Finland and China as well as in New Jersey. The project is headed by Dr. Lily Young and the groups in Finland and China are supervised by Dr. Max Haggblom and Dr. Weilin Huang, respectively. Joseph also has some research experience working with disinfection byproducts at his home university in Clemson, South Carolina. He hopes to go to graduate school after graduating and would one day like to get his Ph.D.

Stephen Bien-Aime

Stéphan Bien-Aimé was born in Boston, MA. He was raised in a family of seven in Port-au-Prince, Haiti, for nineteen years. After graduating from high school in Port-au-Prince, Stéphan came in the US to pursue his studies at Ramapo College of New Jersey, where he is a rising senior majoring in chemistry. Last summer, Stéphan participated in an internship at Goddard Space Flight Center (GSFC), NASA, in Maryland. Having lived a wonderful research experience at GSFC, Stéphan is doing research

in his home college and has applied to the RISE internship program for the 2012 summer. He is currently working on the crystallization growth rate measurements of melted droplets of ibuprofen and polyethylene glycol 3350 under the supervision of Dr. Paul Takhistov, in the Food Science Department at Rutgers University of New Jersey. Back when he was living in Haiti, Stéphan was a literacy teacher in his high school for two years. He was also a blood donor to the Haitian Red Cross. Coming from a country which lacks some basic sanitary needs and comforts, Stéphan learned not to take for granted the advantages and opportunities that open up to him. Ultimately, Stéphan wants to give back to Haiti and to world what has been invested in him over the years.

Connor Bilchak

Connor Bilchak was born in Poughkeepsie, New York. He currently resides in the Mid-Hudson Valley region in New York and attends Manhattan College in New York City. He hopes to graduate in 2014 with a B.S. in chemical engineering and minors in both chemistry and mathematics. He hopes to further his education by pursuing a doctorate degree in chemical/biomedical engineering with the prospect of becoming a professor. He is an active member in both the American institute of chemical engineers and the International society of pharmaceutical engineers. This summer, he was privileged to join Ioannis Androulakis's research team, under the mentorship of John Mattick, in their work on nutritional supplementation as a mitigation factor for Severe Inflammatory Response Syndrome. Bilchak enjoys writing and performing his own music, and learning new and varying types of instruments. In his spare time, he enjoys playing Frisbee, table tennis, darts, and working with computers.

Mary Carter

Mary Carter is a rising senior at Montclair State University majoring in Molecular Biology with a minor in Chemistry. Her research is in the University of Medicine and Dentistry, New Jersey/Robert Wood Johnson Medical School in understanding the molecular biology of selenocysteine incorporation during protein synthesis with Dr. Paul Copeland. At her home institution, she has been an active participant in the Louis Stokes Alliance for Minority Participation Program and the Biology Club since 2009. Mary is in pursuit of a PhD in the biological sciences after graduation in the spring of 2013 and hopes to continue work with Dr. Paul Copeland at UMDNJ/RWJMS. In addition to her education, Mary hopes to publish a book somewhere in between pursuing her doctorate. She is most grateful of her research advisor Dr. Vega (of MSU) for introducing academic research to her. Her opportunity in the RiSE Program has been rewarding in the assurance that she will consider a PhD in the biological sciences.

Andrea Casuras

Andrea Casuras was born in Waterford, NY on September 15, 1991. She is currently attending Ursinus College, dual majoring in Chemistry and Music. After graduating in 2013, she plans to attend graduate school to obtain her Ph.D in Organic Synthetic Chemistry. While Andrea has done previous research characterizing model complexes of hydrogenase enzymes, she is very excited to be working in Dr.

William's lab on a completely different project. This summer she is developing a method to detect trace amounts of organic volatiles in sweat in hopes of one day identifying and characterizing the chemicals that make people happy. Working in the Williams lab and in the RiSE program has showed Andrea that organic chemistry is the career for her.

Kevin Chavez

Kevin Chavez was born and raised in Queens, NY. He is a junior majoring in biochemistry and minoring in health and wellness at Stony Brook University, where he also works as a MARC fellow in Dr. Laurie Krug's laboratory of molecular genetics and microbiology. He recently was awarded the American Chemical Society scholarship. He's had a broad undergraduate research career, including synthesizing bisphosphonates for the treatment of osteoporosis; using bioinformatics to identify, annotate and compare the genome of mycobacterium phages under the National Genomics Research Initiative of Howard Hughes Medical Institute; and working with a highly-sensitive absorption laser-spectroscopic technique in order to understand the fundamental process of combustion energetics and dynamics at Brookhaven National Laboratory. At his home school, he directly helps his community by volunteering as an Emergency Medical Technician in the local fire department. This gratifying REU experience at Rutgers University/UMDNJ has not only helped him improve his independent thinking in a collaborative research discipline but has also cemented his dreams to obtain a M.D./Ph.D. degree and become a private investigator at a biomedical research institution.

Katterin Colon

Katterin Colon was born on July 24, 1989 in Jersey City, New Jersey. She's currently a student at New Jersey City University and is pursuing a B.S in chemistry with a minor in biology. Upon graduating in May 2013, she plans to pursue a doctorial degree in pharmacology and molecular signaling. RiSE has given her the opportunity to explore the diversity of the various fields in scientific research and has helped sharpen her laboratory and analytical skills. She is currently working in Dr. Jason Richardson's laboratory in the department of neurotoxicology and will investigate the effects of pesticides in Alzheimer's disease.

Jonathan Colon

Jonathan Colon was born in Guayama, PR. He is a Chemical Engineering senior student specialized in Pharmaceutical Sciences at University of Puerto, Mayaguez Campus (UPRM). He enjoys music tutoring, conducting orchestral concerts and playing guitar as well as any kind of sport and cooking. His research interests include continuous manufacturing of tablets, near infrared spectroscopy (NIRS) and chemometric applications. Jonathan is currently working with Dr. Romañach in the development and integration of effective sensing methodologies to provide real-time chemical and physical information needed to control pharmaceutical manufacturing processes. Thanks to the RiSE and ERC-SOPS programs Jonathan has decided to continue in graduate studies for a PhD. in Pharmaceutical Engineering.

Joshua Erndt-Marino

Josh was born on September 26, 1991 and grew up near Long Beach Island, NJ. He is a rising senior at The College of New Jersey, majoring in biomedical engineering. At school, he is an active member in Sigma Pi Fraternity International Theta Delta Chapter as well as the Brazilian Jiu Jitsu/Mixed Martial Arts Club. Josh enjoys spending time on the beach and on the mountains snowboarding with his friends and family, as well as playing basketball and lifting weights. This summer, Josh is performing research in tissue engineering as part of the REU program in Cellular Bioengineering at Rutgers/UMDNJ. Josh is excited to continue with research in the future and to turn 21 this upcoming September.

Amber Fairley

Amber Shirlionne Fairley is currently a senior biology major at Grambling State University, Grambling, LA. She was born a proud military brat in Hattiesburg, MS to SFC Tara L. Rivers and SGT Lee R. Fairley both of the Mississippi Army National Guard. She is a very active student at GSU. A few of her activities include team captain of the women's bowling team, president of the Student-Athlete Advisory Committee, president of Biology Club, Chemistry Club, Research Initiative for Scientific Enhancement (RISE) scholar, Ignite Collegiate Ministries, and she also serves on the President's Advisory Committee. Her plans upon completion at Grambling State University include attending graduate school to study cancer biology and becoming a senior scientist. She is an avid sports fan and in her spare time she enjoys doing community service with Habitat for Humanity and Alpine Nursing Home, Ruston, LA, caring for her animals, cooking, sewing, and reading romance novels. As a RiSE summer scholar, Amber is currently working on induced pluripotent stem cell biology in the lab of Dr. Chi-Wei Lu at the Children's Health Institute of New Jersey. Throughout the summer, she hopes to gain a life-changing experience and lifelong friends. Her motto in life is "What we are is God's gift to us. What we become is our gift to God", Eleanor Powell.

Bintou Fisiru

Bintou Fisiru was born and raised in the Bronx, NY. She is a rising senior at the University of Pennsylvania in Philadelphia, PA majoring in Chemistry. At Penn, Bintou is a NcNair scholar and has done research in an organic chemistry lab for a year. She is also active in the West Philadelphia community co-teaching in elementary science classrooms as well as mentoring high school science fair projects. In her free time, Bintou enjoys running and reading. This summer Bintou is a participant in RiSE and REU-SOPS at Rutgers University. She is working in the laboratory for drug delivery on simulating saliva for testing in the dissolution of drug films.

Erica Harris

Erica Harris was born and raised in Brooklyn, New York. She is a rising junior pursuing a B.S. in Bioengineering at the University of Maryland, College Park. Upon graduation, she plans to work toward a Ph.D. and conduct research in the field of tissue engineering. The RiSE program has served as

her first research experience. This summer Erica is working in the lab of Dr. Prabhas Moghe in the Biomedical Engineering department, where she is studying the influences of topography on the morphology and function of human mesenchymal stem cells. Outside of the classroom, Erica is an avid fan of basketball and dance. She is grateful for the opportunity to experience such a wonderful introduction to research.

Derek Holyoak

Derek was born on October 15, 1990 and has lived in Hardwick, NJ his entire life. He is a rising senior at the University of Connecticut with a major in biomedical engineering and minor in electrical engineering. Always trying to be involved at his university, Derek has recently become the secretary for the Alpha Eta Mu Beta BME National Honor Society chapter at UConn, and he is an active member in BMES. In his free time, he enjoys playing basketball, lifting weights, and spending time with his friends and family. This summer, Derek is performing research in the BioMEMS department as part of the RiSE program at Rutgers/UMDNJ. His research goal for the summer is to design and fabricate a theory-based double-pulse electroporation microfluidic device for cellular manipulation. Derek is looking forward to continuing with research in his career and is grateful that RiSE has provided a solid foundation for his future goals.

Finterly Hu

Finterly Hu is a rising junior majoring in Microbial Biotechnology at Rutgers University, where she also works as a research assistant. The REU in Bio-transformation of Halogenated Compounds has helped her develop her skills as a researcher. After graduating, Finterly hopes to continue her education while working in industry as a bio-entrepreneur to advance science.

Nicole Keenan

Nicole Keenan was born and raised in Rochester, NY. She is a rising junior at Alfred University, majoring in biomaterials engineering and minoring in business. In her spare time at school, she is on the step team and also enjoys her job working as a game day assistant at sporting events. She is working as a RiSE student in Dr. Freeman's lab this summer, studying methods of delivery for proliferative therapy. She hopes to obtain internships in both industry and business over upcoming winter and summer breaks. In the future, she plans on obtaining either an M.B.A. or M.S. (maybe both!).

Joan Kuchie

Joan Kuchie is New Jersey born and raised. She has already completed her Associates degree in Biology from Middlesex county College and is a rising senior at New Jersey City University. Her pending graduation will be in the Spring of 2013 where she will have completed a Bachelor's of Science degree in Biology. Through the RiSE program, she has been able to vastly expand her skills in Bioinformatics and gained an appreciation of the impact of computational work. This experience is in addition to her

homemade projects which are focused on yeast fermentation in wine making. As a florist through family trade, she finds it ironic that her research focus is on a genera of plant virus, but this connection has allowed her drive in her project to reach a more personal level. Her future plans are not necessarily to dive straight into higher academia, but to explore career opportunities in industrial research. She feels that this experience in research was God sent, and that this experience was the edge needed to successfully propel her future aspirations.

Modupe Kuti

Modupe Kuti was born and lives in Brooklyn, New York. She is a rising senior at New York University majoring in Biochemistry. Chemistry has always been her favorite subject in school, but after taking a biochemistry course her junior year of college she decided to take it up as her major. Outside of school, Modupe volunteers as a mentor to young high school girls in a Brooklyn high school and she also enjoys singing in her church choir. She is currently an American Chemical Society Scholar, which is how she found out about the RiSE program. This summer in the RiSE program, she is doing research under the supervision of Dr. Nina Shapley in water purification technology using calcium-alginate beads. Modupe was really eager about the RiSE program because as her first research experience, she wanted to know whether attending graduate school was the right decision for her. After getting a feel of what it's like to be in the lab and conducting research, Modupe has decided to apply for graduate school this fall to pursue a doctorate degree in Chemistry and in the future hopes to work in the pharmaceutical industry.

Nilsa La Cunza

Nilsa La Cunza was born in Lima, Perú. After spending half of her lifetime at such a beautiful and diverse country she decided to move to the U.S., where her future aspirations could become a reality despite monetary problems but just on pure avidity. She is currently living in Clifton, NJ where she attended Clifton High School and graduated with honors at the top of her class. She is currently a rising junior at the New Jersey Institute of Technology where she is majoring in Biomedical Engineering with two minors in Mathematics and Chemistry. Through the RiSE program, she has familiarized herself with more than just laboratory skills and academics but with real research life. She now knows what a researcher's lifestyle consists of, whether it includes writing grants or research proposals to publishing and social life patterns. She has shortened her two paths between medical and graduate school and created a brand new one, which is not just an amalgamation of the two previous ones but one that logically shortens the amount of years in academia and increases the years of application, an M.D./Ph.D. program. She will strive to medical school and be able to apply her research interests as well as her love to help others, specifically children who suffer from neurological disorders. Next year, she plans to take MCATs and GREs as well as balancing schoolwork, student council responsibilities and volunteer work at the UMDNJ hospital in Newark, NJ.

Alejandra Laureano

Born in Puerto Rico, Alejandra currently studies at the University of Puerto Rico, Rio Piedras Campus. Alejandra expects to graduate in May 2013 with a bachelor's degree in Molecular and Cell Biology. After graduation she intends to pursue a Ph.D. in Neurosciences, and hopes to become a professor or a P.I. This summer, in the RiSE program, Alejandra has been working with Dr. Emmanuel DiCcico-Bloom and a visitor professor from Korea, Dr. Hee Jae Lee, who has been her mentor on a project related to the effects of valproic acid on the development of the brain in rat pups. Back home, she works in a lab that focuses on Alzheimer's disease and the different proteins that can be associated with the disease. At her home institution, Alejandra belongs to the American Society of Biochemistry and Molecular Biology (ASBMB). As a member of ASBSM, Alejandra along with her fellow students participates in charity events, fund raisers, community outreach activities, and engages in scientific discussions. In her spear time she likes to read books, do pilates, learn history, spend time with her family and friends, and have new experiences. Alejandra is also very happy to participate in the RiSE program, be a part of this wonderful summer family, and be exposed to life changing experiences.

Crystal LeBlanc

Crystal Necole' LeBlanc was born in Jackson, TN and currently resides in Murfreesboro, TN, about 40 minutes outside of Nashville. She is a rising junior at Belmont University in Nashville, TN where she is pursuing a major in Biology, a minor in Chemistry, and also a minor in Spanish. At her home institution, some activities that she enjoys doing include volunteering at the Boys and Girls Club (an afterschool program for inner-city children), serving as a Bruin Recruiter for the university, where she enthusiastically as the face of Belmont on Preview Days, and serving as a Spiritual Life Assistant, where she assists freshman students in any spiritual matters with which they may need help. Crystal also has a distinct interest in novels from the Romantic and Victorian periods, such as those from Jane Austen and Charlotte Brontë. In addition to Biology, she also has passions for the Spanish language, traveling the world, riding horses, playing the piano and helping orphans. A huge *Wicked* fanatic, this summer, she has been delighted to knock "see *Wicked* on Broadway" off her bucket list. Over the past 10 weeks, she has thoroughly enjoyed working in an immunology lab with Dr. Courtni Newsome under Dr. Derek Sant'Angelo. As of now, her future plans include either going to medical school, graduate school, or entering a Master's Program. Through her RiSE summer experience, Crystal has been able to nurture her passion for research, which will hopefully assist her in making a decision about future educational plans.

Michael Little

Michael Little is a rising senior and chemistry major at Montclair State University in Montclair, New Jersey. Michael is actively involved at Montclair State University as an LSAMP scholar, mentoring his fellow science students. Michael is also a member of Science Honors Innovation Program, which is a research-intensive program. He has done undergraduate research in chemistry analyzing the associate behavior of ionic liquids in solvents of low polarity by NMR. Currently at his home university Michael

is involved in research that is looking to experimentally validate a predictive method in ligand specificity determining residues in *B. Strearothermophilus*. As a member of the RiSE program Michael is working in the toxicology department under the mentorship of Dr. Aleksunes, where he is studying the effects of inflammation on efflux transporters in the liver and kidney.

Jordan Martinez

Jordan Martinez was born in Staten Island, New York and currently lives in Hillsborough, New Jersey. He is a rising senior Biology major at The College of New Jersey (TCNJ). Jordan is planning on going to medical school to pursue a M.D. degree and become an anesthesiologist. He is currently involved in research at TCNJ, where he is investigating the interactions between splicing and transcription factors during gene expression using yeast as a model organism. This summer, he is working in Dr. Soto's Pathology Lab as part of the RiSE Program. Jordan loves going to concerts and playing guitar, video games, and basketball in his spare time. His favorite band is Blink-182 and he has seen them eight times in concert so far. Jordan has four brothers and a dog, so his house is always loud and entertaining!

Jose Martinez

Jose Martinez is native of Hood River, Oregon. Jose is a rising senior majoring in chemistry, computer science, and a minor in physics at Cornell College in Mount Vernon, IA. The past summer, Jose did a fellowship under Professor Andrzej Wieckowski at the University of Illinois-Urbana Champaign analyzing samples of porphyrins with transition metals adsorbed on Au with Raman Spectroscopy. Jose is also a class tutor for Organic Chemistry 2, Organic Chemistry 1, General chemistry, as well as a lab instructor for Analytical Chemistry at Cornell College. Jose is as well the president of Cornell College's chemistry club and the office manager at the Career Engagement Center at Cornell College. Jose hopes to attend graduate school and obtain his PhD. in Organic Chemistry. For the summer, Jose will be working under Alan Goldman through the RiSE program with a focus on studying and finding an improved support for pincer-catalysts.

Desiree Matias-Lopez

Desirée was born in Cincinnati, Ohio. When she was 1 year old, her parents moved to Puerto Rico, where she has lived ever since. She plans to complete her Bachelor's Degree in Chemistry from the University of Puerto Rico, Rio Piedras Campus in May 2013. Her interest in research began when her Organic Chemistry professor sat down with her and explained what research was all about. On her free time, Desirée enjoys to read a good book, watch TV series, and go scuba diving. Her experience at Rutgers has been more than what she imagined and has surely been important in the formation of her future. Desirée worked in Dr. Hultzsch lab during these 10 weeks.

Bridget Mendoza

Bridget Mendoza is a recent graduate of Northern Arizona University with a Bachelor's in Biology Education. Bridget has previously participated in undergraduate research at North Dakota State University and the Massachusetts Institute of Technology. During her prior research experience, Bridget studied enzymatic immobilization and meiotic chromosome misegregation. Bridget is currently participating in the RiSE (Research in Science and Engineering) program at Rutgers University and is working in the lab of Dr. Andrew Singson studying male fertility in nematodes. Bridget plans to apply for graduate school next year to pursue a PhD in molecular biology.

Coleen Nemes

Coleen Nemes is a rising senior majoring in chemistry with a minor in mathematics at Marist College. At Marist, Coleen does computational chemistry studies with Dr. John Galbraith on hydrogen bonding in small systems using Valence Bond Theory. She is interested in pursuing physical chemistry in graduate school, however prior to this summer she has only experienced theoretical physical chemistry research. This summer Coleen is working under the advisement of Dr. Deirdre O'Carroll and near-peer mentor Christopher Petoukhoff. Her specific project involves experimentally studying the optical properties of nanoparticle arrays which are to be incorporated into organic photovoltaic devices in an effort to improve their efficiency. Coleen is grateful to have the opportunity to be a part of the RiSE program, and to experience research in the field of renewable energy.

Kevin Ortiz

Kevin J. Ortiz-Rivera was born in Manati, Puerto Rico. Kevin is a senior at the University of Puerto Rico, Mayaguez Campus, where he is studying a B.S. in chemical engineering and expects to graduate with a certificate on a pharmaceutical engineering by May 2013. He works for the Analytical and Pharmaceutical Laboratory and is currently the representative of the Chemical Engineering Department in the engineering honor society Tau Beta Pi. Kevin is contemplating on pursuing a doctorate or graduate degree in a near future.

Maria Pietri-Pabon

María del Carmen Pietri was born in Mayagüez, Puerto Rico. She is an undergraduate student currently majoring in biology at the University of Puerto Rico- Mayagüez Campus. María has previously worked with Dr. Alejandro Ruiz in the Mycology Laboratory at the University of Puerto Rico, and helped determine the geographical distribution of *Cryptococcus neoformans* microorganism of the type *gattii* around the island of Puerto Rico. She has also worked under the supervision of Dr. Barbara Corkey in the Summer Undergraduate Research Program at Boston University, where she studied how changes in oxidative stress and redox state can alter hepatic functions. As a member of the 2012 RiSE program and co-participant in the REU in International Environmental Sciences, Maria has expanded her research skills and strengthened her goal of obtaining a M.D. / Ph.D. degree.

Andres Ramirez

Andres is a rising senior at Cornell double majoring in Psychology and Religious Studies with a concentration in Eastern philosophy. He is currently the Administrative Lab Manager of Cornell's Automaticity Lab, which studies the ways in which human social behavior unfolds in an unconscious, unintentional manner. Andres is also a Research Assistant in Cornell's Computational Physiology Lab; the project he is currently working on investigates the role of neuromodulators on the learning and recall of olfactory discrimination in rodents. Andres is deeply interested in clinical psychology. One question that particularly intrigues him is how Western modes of counseling and Eastern religious practices can be integrated to foster one's mental health. He hopes to shed light on this question while obtaining his doctorate degree and perhaps one day incorporating the fusion into his own clinical practice.

Ixtli-Nitzin Sanchez

Ixtli-Nitzin was born on August 9, 1989 in Los Angeles, California. He is a rising junior, pursuing a B.S. in Mechanical Engineering with a minor in Computer Science at San Jose State University in San Jose, California. His main research interest is in brain-computer interfacing, artificial intelligence, and robotics; after graduating, he plans to further his studies in the Computer Science field. For the summer, he is working as a RiSE and DIMACS (Center for Discrete Mathematics & Theoretical Computer Science) student with Dr. Eugene Fiorini in the CoRE building. Ixtli-Nitzin is developing mathematical and routing algorithms using graph theory and game theory. These algorithms will then serve as the foundation for developing a navigation iPhone application. Through this summer experience he expects to get more familiarized with the research environment, acquire new skills that will help him to achieve his professional goals, and make new friends along the way. When he is not in the lab he enjoys working on his robotic projects, playing sports, and traveling.

Imani Sanders

Imani Sanders is a native of Somerset, New Jersey and currently a junior within the Honors College at the University of Maryland – College Park. She is pursuing a B.S. in Bioengineering, as well as a pre-medical curriculum. In 2012, Imani completed the FLEXUS Women In Engineering Living and Learning Program. Imani is a devoted member of National Society of Black Engineers (NSBE) and she holds leadership positions in the Charles Drew Medical Society and Kappa Phi Chapter of Delta Sigma Theta Sorority, Inc. Her consistent passion for the performing arts prompted her to co-found the Terrapin Tap Dance Troupe. During academic breaks, Imani enjoys volunteering at Robert Wood Johnson University Hospital, facilitating arts & crafts and playing games with patients of the Child Life Department. Imani's interest in an M.D./Ph.D program has been inspired by the research experience with the RISE program. She found her laboratory project to be challenging and rewarding, working with Dr. Noshir Langrana and Dr. Devendra Verma to study the formation of post-surgical abdominal adhesions. Imani looks forward to keeping in touch with her friends and mentors from RISE.

Shelby Swiggum

Shelby Swiggum is a senior psychology major at Ripon College in Ripon, Wisconsin. She plans to graduate from Ripon College in May 2013 with a B.A. in Psychology. Her summer research was conducted in the lab of Dr. Tracey Shors, in which she worked with graduate students Megan Anderson and Lily Bowles on studies examining neurogenesis in rats. In the future, Shelby plans to pursue a Ph.D. in Psychology.

Patricia Sylvestre

Patricia Sylvestre was born on January 15, 1991 in Brooklyn NY. She is a rising senior at SUNY Binghamton majoring in Psychology with a minor in Women's Studies. Upon graduation in May 2013, Patricia plans to attend graduate school and obtain her Ph. D in Clinical Psychology. She is a McNair Scholar, the current Social-Cultural Coordinator of the Black Student Union, and an active member of Sigma Alpha Pi National Honor Society. This summer she is excited to be working alongside Dr. Elias conducting research on promoting positive social emotional character development in children with an emphasis on childhood anxiety. Being involved in the RISE Program has allowed Patricia to realize her passion for research with hopes of becoming a distinguished Psychologist in the future.

Stephanie Tse

Stephanie Tse was born in Brooklyn, NY. She is a rising senior and chemistry major at Bryn Mawr College located in Bryn Mawr, Pennsylvania. When she is not attending classes and working as a peer mentor for general chemistry, she enjoys working as a tax preparer in Norristown and baking. Her research interests include food science, organic chemistry, and medical research. Stephanie has worked on several research projects in the field of biochemistry and nanotechnology. She is currently working in Dr. Kathryn Uhrich's lab on the polymer drugs project. The RiSE summer research experience definitely has expanded Stephanie's views on research and will encourage her to continue her path on research.

Taylor Vega

Taylor Vega was born in Los Angeles, California. She currently attends the University of California, Berkeley and is obtaining a major in Molecular and Cellular Biology with Neuroscience as an emphasis and a minor in Education. Taylor decided to pursue neuroscience after participating in a research experience this past year, and her decision has been further solidified after participating in the RISE program. This opportunity has allowed her to explore the different focuses within neuroscience, and has been an indispensible learning experience. In her free time Taylor enjoys running, baking, photography, and exploring the hiking trails in the bay area. Upon graduation, Taylor plans to purse a PhD in neuroscience and looks forward to what the future holds.

Samjit Walia

Samjit Walia was born and raised in Queens, NY on July 23, 1991. She has been situated in NYC for the past 7 years, graduating Stuyvesant High school, where she gained her love for the math and sciences, and currently attends The Cooper Union as a rising senior in Chemical Engineering. Her plans after graduating are to pursue a Ph.D in pharmaceutical engineering, while become well versed in business and management courses. Her ultimate goal is to go into research and development within the pharmaceutical industry, functioning as a catalyst for the next wave of innovative changes. Samjit loves giving back to the community and helping students achieve success in the math, science and engineering fields. She has enjoyed teaching students through the Engineers as Teachers (EasT) program sponsored by Iridescent and being a research teaching assistant for high school students at The Cooper Union. In her free time, she enjoys dancing, painting, cake decorating, swimming and spending time with her family and friends. She would like to personally thank the RiSE-ERC/SOPS program and her mentors Dana Barrossa and Dr. Rohit Ramachandran for helping her discover her newfound love for computational research and solidifying her decision to pursue pharmaceutical engineering as a career choice.

Elizabeth Wilson

Elizabeth Wilson is going to be a senior neuroscience major at Lafayette College. Last summer, Elizabeth did research at the National Institute of Technology in Panama City, Panama on stress response in rats. At Lafayette, Elizabeth is conducting research on changes in humans' oxytocin levels in response to physical interactions and oral contraceptives. Through Rise, Elizabeth is conducting research with Dr. Janet Alder and Dr. Smita Thakker-Varia on the mechanism through which VGF increases neural proliferation. Elizabeth has learned a lot about the research process through rise and is looking forward to the rest of her research experience this summer. She hopes to attend medical school in the fall of 2013.

Justin Womack

Justin Womack is an American Chemical Society Scholar who hails from the farmlands of Wisconsin. He expects to graduate in the winter of 2013 with a bachelor's degree in Chemical and Biological Engineering from University of Wisconsin-Madison. In addition to working in Dr. Stavroula Sofou's laboratory and studying liposomes as drug delivery carriers, Justin has spent his summer meeting lots of prodigious people from around the country, savoring the beach front and ocean waters (something he has never been able to experience in Wisconsin), and exploring the capacious city of New York. The RISE program has been a great opportunity, introducing him to his assiduous, yet enjoyable mentors—Ana Gomez and Charles Zhu—and reinforcing his plans to further his education in the Chemical Engineering field. Justin has also enjoyed the chance to augment his vocabulary over the summer in the GRE prep course.

Isaiah Woodson

Isaiah Woodson was born on December 13, 1990 in Richmond, Virginia. He is currently studying chemical engineering with a minor in chemistry at Louisiana State University. Isaiah expects to graduate in May 2014 and attend graduate school to obtain his Ph.D. in chemical engineering. Isaiah is currently doing research in the Department of Mechanical and Aerospace Engineering relating to the fabrication and analysis of piezoelectric thin film composites for hybrid energy systems in Dr. Kimberly Cook-Chennault's lab. Isaiah is grateful for his acceptance and participation in the RISE program and will take full advantage of this opportunity.