RISE at Rutgers/UMDNJ
Research In Science and Engineering

2010 Summer Research Symposium

Sponsored by:

Rutgers Graduate School-New Brunswick

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

August 4, 2010

2010 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, August 4, 2010

Computing Research and Education (CoRE) Building
96 Frelinghuysen Road
Busch Campus, Rutgers University, Piscataway, NJ

9:00 – 9:30 AM	**Welcome**	**CoRE Lobby**
9:30 – 10:30 AM	**Plenary Session**	**CoRE Auditorium**

Michael Anderson, Ph.D.
U.S. Patent and Trademark Office
Ph.D., Biomedical Engineering Rutgers University, 1999

"How We Hear:
New Research on How the Brain Determines the Location of Sound"

10:45 – 11:30 AM	**Student Research Presentations-A**	**CoRE Lobby**
11:30 – 11:45 AM	Break	
11:45 – 12:30 PM	**Student Research Presentations-B**	**CoRE Lobby**
12:45 PM	**Buffet Luncheon**	**CoRE 401**

Sponsored by:

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

REU[1] in Cellular Bioengineering

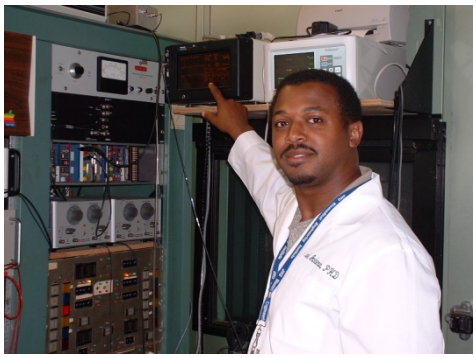
REU[1] in Structured Organic Particulate Systems (SOPS)

[1]REU = Research Experience for Undergraduates

PLENARY SPEAKER

How We Hear:
New Research on How the Brain Determines the Location of Sound

Michael J. Anderson, Ph.D.
U.S. Patent and Trademark Office



Dr. Michael J. Anderson, Sr. is currently a Patent Examiner at the United States Patent and Trademark Office. Before joining the patent office he was a faculty member in the Department of Otolaryngology-Head and Neck Surgery at the Johns Hopkins University School of Medicine where he also completed a post-doctoral fellowship in the Department of Biomedical Engineering. Dr. Anderson's research interest has been focused on understanding how the brain processes sounds in noise and how this processing provides directional information about the source. He received both his Masters and Doctorate degrees in Biomedical Engineering from the joint program between Rutgers University and the University of Medicine and Dentistry of New Jersey. His three undergraduate degrees in Physics, Mathematics, and Physics with Engineering Emphasis were completed at Delaware State University. As an undergraduate, Dr. Anderson completed summer internships in Nuclear Physics at Princeton University and Astrophysics at University of California at Berkeley. When he is not working, Dr. Anderson enjoys family time with his wife, Ebony, and two sons, Michael Jr. and Johnathan.

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 28 scholars this summer. These students, selected from over 350 applicants, represent 22 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM disciplines as well as psychology and the behavioral sciences. 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), 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 inaugural year as an autonomous program. 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. Participants in REU-CB started the summer with a Cellular Bioengineering Boot Camp in which they were inoculated with essential skills for working with living 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

ACKNOWLEDGMENTS

Institutional Sponsorship

Rutgers, The State University of New Jersey
Graduate School – New Brunswick
Institute for Advanced Materials, Devices, and Nanotechnology (IAMDN)
Office of Women in Science, Engineering in Math (WiSEM)
Rutgers WINLab

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)

Garden State LSAMP Program

New Jersey Space Grant Consortium

NIH MARC Program

NJ Commission on Cancer Research

NSF – Northeast Alliance for Graduate Education & the Professoriate

NSF Innovation in Institutional Integration (I3) Program

U.S. Department of Education McNair Scholars Program

United States Department of Labor Workforce Innovation in Regional Economic Development WIRED Initiative (Bio-1 Grant)

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.

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

The Art and Science of Networking
Mr. Michael Goldberg
Building Blocks Consulting

Graduate School: How to Get In, Get Funding and Meet Success
Nina Shapley, Ph.D., Associate Professor, Chemical and Biochemical Engineering, Rutgers
Megan Anderson, PhD candidate, Psychology, and IGERT Fellow, Rutgers
Jeffrey Barminko, PhD candidate, Biomedical Engineering, and IGERT Fellow, Rutgers
Elina Tzatatzalos, PhD candidate, Biomedical Engineering, and IGERT Fellow, Rutgers

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
Jenel Cobb, Ph.D.
Head, Project Management, Niiki Pharma, Inc.

Patricia Portillo Brieva, Ph.D.
Senior Chemist, L'Oreal

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

Aleta You, Ph.D.
Associate Director, Professional Science Masters Program, Rutgers

Eduardo Perez, Ph.D.
Vice President, Signum Biosciences

Lisa Cloutier, Ph.D.
Scientific Writer

Alex Chang, Ph.D.
Director of Business Development, Samyang Pharmaceuticals

Summer Research Program Participants

Mariangely Almenas-Santiago[1] ~ University of Puerto Rico-Rio Piedras
Kamil Amer[1] ~ The College of New Jersey
Ayanna Campbell[1,3] ~ Rutgers, The State University of New Jersey
Robert Chou[2] ~ University of Texas, Austin
Robert Cichocki[1,2] ~ The College of New Jersey
Devin Clark[1] ~ Rutgers, The State University of New Jersey
Catherine DeBlase[1] ~ Marist College (NY)
Rose Filoramo[1] ~ The College of New Jersey
Amanda L. Flores-Torres[1,2] ~ University of Puerto Rico-Mayagüez
Yelena Ilin[1,3] ~ The Cooper Union (NY)
Jonathan M.E. Jones[2] ~ University of Georgia
Maleshia Jones[1] ~ University of Maryland, Baltimore County
Monroe Kennedy III[1] ~ University of Maryland, Baltimore County
Kevin Ling[2] ~ Lafayette College
Frances M. Marín Maldonado[4] ~ University of Puerto Rico- Mayagüez
Tatiana Melendez-Valle[4] ~ University of Puerto Rico- Mayagüez
Emmanuel J. Méndez-Acevedo[1,3] ~ University of Puerto Rico-Mayagüez
Adam Midouin[1,3] ~ The College of New Jersey
Stephanie Mitnaul[1,2] ~ University of South Carolina
Myreisa Morales Cruz[1] ~ University of Puerto Rico-Rio Piedras
Brett Noel[1,3] ~ New Jersey Institute of New Jersey
Dolu Obatusin[2] ~ New York Institute of Technology
Michelle Chi Oyeka[1] ~ Duke University
Franklin E. Paulino[1] ~ Montclair State University
Bruno Pinto[1] ~ CUNY Hunter College
Greg Prisco[2] ~ The College of New Jersey
Erika Ramirez [1] ~ Bloomfield College
Christie Rodriguez[1] ~ University of Puerto Rico-Mayagüez
Eva Nelly Rubio-Marrero[1] ~ University of Puerto Rico-Mayagüez
Eduardo Sanabria Figueroa[1] ~ University of Puerto Rico-Aguadilla
Ethan Sebasco[1] ~ Montclair State University
Nicole Sermabeikian[1,3] ~ University of Delaware
Antonio Smith[1] ~ Grambling State University
Victoria Stefanelli[2] ~ University of Maryland, College Park
Evelyn Strombom
Wallace A. Torres[1,3] ~ Cooper Union (NY)
Kevin Trout[1,2] ~ The College of Saint Scholastica (Minnesota)
Alexander Ucci[1] ~ Ramapo College
Nicole M. Vega Cotto[4] ~ University of Puerto Rico- Mayagüez

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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] Summer Scholar, NIH-funded "Bridge to the Doctorate, UPR- Mayagüez to UMDNJ"

POSTER PRESENTATIONS

Poster Session A

10:45 AM – 11:30 AM

Poster #	Name	Title
1A	Evelyn Strombom	*Laboratory Investigation of Earthquake Lightning: The Electrostatics of Granular Slip Events*
2A	Greg Prisco	*Simulation of Sand Swimming*
3A	Robert Chou	*Physical Characterization of Graft Copolymers for the Delivery of Antisense Oligodeoxynucleotides*
4A	Monroe Kennedy III	*Effects of Material Composition and Process Parameters on the Bonding Strength of Tablets*
5A	Adam Midouin	*Granular Materials: Segregation and Mixing*
6A	Alexander Ucci	*Preparation of Functionalized Microporous Metal Organic Frameworks for Gas Storage and Separation*
7A	Rose Filoramo	*Isolation of Bacteria Able to Degrade the Antimicrobial Triclosan*
8A	Devin Clark	*Investigation into the Effect of Stereochemistry on Amphiphilic Macromolecules for Nucleic Acid Delivery*
9A	Emmanuel J. Méndez	*Coupled deformation and solute diffusion in swelling compacted solids*
10A	Franklin Paulino	*Potentially Druggable Novel Chlamydial Transcription Factors*
11A	Stephanie Mitnaul	*Gene expression profiling of short-term changes in rat liver following sham burn and burn injury*
12A	Amanda L. Flores-Torres	*Intracellular Assessment of Pancreatic Beta cells Under Different Oxygen Supplementation Regimes*
13A	Wallace A. Torres	*Flow Variability in Continuous feeders as a Result of the Refill Operation*
14A	Nicole Vega Cotto	*Opioid & Cannabinoid Regulation on Glucose Homeostasis*
15A	Michelle Oyeka	*Moderate Alcohol Consumption Differentially Affects Neurogenesis in the Dentate Gyrus of Males versus Females*

POSTER PRESENTATIONS

Poster Session B

11:45 AM – 12:30 PM

Poster #	Name	Title
1B	Kevin Trout	*Force Generated and Fibroblast Growth Upon Expansion of a DNA-crosslinked Polyacrylamide Hydrogel*
2B	Bruno Pinto	*Understanding Elliptical Galaxy Formation Through Modeling Gas Motions in Ultraluminous Infrared Galaxies*
3B	Mariangely Almenas-Santiago	*A Retrospective Medical Audit Review to Examine Potential Rates of Organ Donation*
4B	Ayanna Campbell	*Surface Modification of Polyethylene via UV Radiation*
5B	Dolu Obatusin	*Comparison of quantum dots and organic fluorophores as fluorescent labels in binding assays*
6B	Ethan Sebasco	*Investigation of Alu-containing CHK2 Protein Kinase as a Novel Selenoprotein*
7B	Erika Ramirez	*Recycling the Glycerol Byproduct to Maximize Biodiesel Production from Algae: Metabolic, Energy Storage, and Photosynthetic Effects*
8B	Victoria Stefanelli	*Astrocyte Adhesion and Migration in RGD and RDG-Conjugated Type I Collagen Gels*
9B	Christie Rodriguez	*Calcium Channels unc-2, egl-19 and cca-1 Function in Axon Guidance and Outgrowth in C. elegans*
10B	Brett Noel	*Effects on Material Properties on Residence Time Distribution*
11B	Kamil Amer	*Establishing Cell Polarity through Regulation of Actin Polymerization: Mapping of a novel gex gene in Caenorhabditis elegans*
12B	Maleshia Jones	*Development of Particle Imaging Velocimetry to Examine Nanoparticle Transport*
13B	Kevin Ling	*3D Fibrous Polymer Scaffolds as Substrates for Control of Stem Cell Fates*
14B	Yelena Ilin	*Effect of surfactant and high-shear stress on β-Carotene-in-triacentin nanoemulsions*
15B	Robert Cichocki	*Evaluation of Photoinitiator and Mesenchymal Stem Cell Concentrations in a Collagen Gel for Optimal Cell Viability Following Photocrosslinking*

ABSTRACTS

Poster Session A

1A **Evelyn Strombom**
Swarthmore College

Mentors: Nirmal Thyagu, Ph.D.
Department of Biomedical Engineering
Rutgers University

Troy Shinbrot, Ph.D.
Department of Biomedical Engineering
Rutgers University

Earthquake lightning in the laboratory: The electrostatics of granular slip events

Earthquakes are unpredictable and can be spectacularly devastating. Recent scientific measurements indicate that electrical disturbances precede earthquake events, however the size, sign and spatiotemporal signature of the precursor remain unknown. To explore the mechanism by which electrical disturbances relate to earthquakes, laboratory experiments of granular slip events were conducted using a Gravitational Displacement Rheometer instrumented with a load cell and voltage probe. Data obtained indicate that voltage readings may indeed precede slip events in this laboratory apparatus. If corroborated, this could provide a mechanism to analyze and explain reports of electrical precursors to geological slip events. Further experiments are being conducted to evaluate the precursors and to isolate possible causes.

2A **Greg Prisco**
The College of New Jersey

Mentors: Troy Shinbrot, PhD
Department of Biomedical Engineering
Rutgers University

Nirmal Thyagu, PhD
Department of Biomedical Engineering
Department of Chemical and Biochemical Engineering
Rutgers University

Simulation of Sand Swimming

Several desert-dwelling reptiles are known to escape harsh desert conditions by submerging beneath the sand, where they can "swim" for extended periods of time. Existing research studies have characterized the locomotion of animals on land, in the sea, and in the air, however comparatively few studies have investigated sand locomotion. We have characterized the motion of sand swimmers using computational methods in Matlab. We have simulated a bed of sand grains in which a sand swimmer slithers in a manner that agrees with experimental observations produced elsewhere. A goal of this work is to evaluate how oscillatory sideways body movement translates into forward motion. Parameters including granular bed density and frequency of oscillations of the swimmer were modified to determine which swimming motions produce the most efficient transport. Potentially,

sand locomotion could be applied to unmanned exploration or reconnaissance devices in desert environments, for example to produce robots that detect buried land mines.

3A **Robert Chou**
The University of Texas at Austin

Mentors: Lavanya Peddada
Charles M. Roth, Ph.D
Department of Biomedical Engineering
Department of Chemical and Biochemical Engineering
Rutgers University

Physical Characterization of Graft Copolymers for the Delivery of Antisense Oligodeoxynucleotides

The use of antisense oligodeoxynucleotides (ODNs) has potential for the treatment of diseases that are driven by aberrant gene expression. However, the efficient delivery of ODNs into the target cells requires overcoming many intracellular and extracellular barriers, which include escape from sequestration in the lysosomes and survival against degradative enzymes present in blood serum. Previous studies have shown that viral vector delivery systems are harmful due do their non-specific targeting and potential to elicit an immune response. By using biocompatible polymers, we are able to engineer an effective delivery system for antisense drugs. The use of the cationic liposome, dioleoyl-3-trimethylammonium-propane (DOTAP) is to provide encapsulation of ODNs by electrostatic interactions. Poly (propylacrylic acid) (PPAA), an anionic pH sensitive polymer, is incorporated into the DOTAP/ODN complex (by electrostatic interactions) in order to improve the endosome escape capability of the liposomal-based carrier. This ternary complex has been further modified for serum stability by grafting a hydrophilic polymer, poly (ethylene oxide) (PEO) and its more hydrophobic analog, Jeffamine, onto the backbone of PPAA. Physical characterization of the complexes was performed by measuring the particle surface charge and ODN degradation in the presence of serum nucleases. The serum stability of the ternary complexes composed of PPAA or the graft copolymers was tested in the presence of 50% fetal bovine serum using gel electrophoresis, which was used to quantify concentrations of intact ODN. Preliminary results show that after 1 hr incubation at 37 °C, complexes containing PPAA, PPAA-g-1%Jeffamine and PPAA-g-1%PEO, had 27, 59 and 59% ODN remaining suggesting that the graft copolymer containing Jeffamine and PEO conferred the greatest protection against serum attack. Results of particle surface charge measurements indicate incorporation of PPAA and graft copolymers into positively charged DOTAP/ODN complexes (+50 mV). The average particle surface charge for complexes containing PPAA, 1, 5 and 10% grafted Jeffamine was -16, -14 and -8 mV, respectively, as is expected with increasing grafting density thus translating to decreasing anionic charge. For PEO-containing complexes, 1, 5 and 10% grafting yielded a particle surface charge of -22, -9 and -9 mV, respectively. Future experiments will involve determining the optimum polymer chemistry and charge ratio of DOTAP/ODN/polymer complexes that will result in maximal intracellular ODN uptake in serum-containing treatment conditions.

4A **Monroe Kennedy III**
University of Maryland, Baltimore County

Mentors: Alberto Cuitino, Ph.D., Athanas Koynov, Ph.D.
Department of Mechanical and Aerospace School of Engineering
Rutgers University

Effects of material composition and process parameters on the bonding strength of tablets

Tablets are the most popular pharmaceutical oral delivery dosage form due to their long shelf life, ease of storage and transportation, mechanical and chemical stability. The release characteristics of the tablets directly correlate to their mechanical properties with harder tablets usually resulting in longer release times. Different release profiles are desirable depending on the condition being treated. For instance, pain relief requires a quick dosage release to alleviate the pain, whereas sustained treatment may be desirable for more long-term conditions. A typical pharmaceutical tablet consists of the following components: active ingredient, excipients and additives. The active ingredients are the medications being delivered. The active ingredients have unique molecular structures that are ordinarily not ideal for compaction, whereas excipients, powders that account for the largest percentage of the tablet, have mechanical properties that are ideal for manufacturing and delivery. Additives such as lubricants, glidants and disintegrants enhance the properties of the tablet. Lubricants allow the powder to resist cohesion with the tablet press machinery, glidants allow the powder to flow well and is especially useful if the active ingredient particles have irregular shapes, and disintegrants absorb fluids and enlarge allowing for quick dissolution of the tablet. The goal of this study is to map the design space of solid tablet compaction including formulation composition and process parameters. The composition mapping included the investigation of two different types of excipients: Avicel 102 and Lactose, each having very different mechanical properties, it also included the effect of different concentrations of lubricant Magnesium Stearate and active ingredient acetaminophen. The process parameters mapping included compaction of tablets at a range of forces from 3kN to 17kN. The manufacturing scale up was also considered where the tablet production speed would need to be increased; therefore experiments spanning the range of compaction speeds from 5rpm to 75rpm were performed. Future investigations may include the integration of composition alteration and process parameters in order to design optimized compaction processes.

5A **Adam Midouin**
The College of New Jersey

Granular Materials: Segregation and Mixing

Granular materials have a tendency to segregate in natural systems and industrial processes. The prototypical case is that of a binary mixture, where an initially uniformly mixed material segregates into its constituents during tumbling or discharge from a blender. Segregation can occur for a binary mixture that differs in size, density or any other property of the constituents. In the present work, we investigate segregation of differently sized grains used in catalysis manufacture with the goal of providing a criterion for whether a blend will mix or segregate during hopper discharge. The central hypothesis of this study is that the introduction of an intermediate particle size into a binary mixture will mitigate segregation. Results obtained using milled powders and glass spheres support this hypothesis.

6A **Alexander Ucci**
Ramapo College of NJ

Mentor: Prof. Jing Li
Peer-Mentor: Dr. Yong Gang Zhao
Department of Chemistry and Chemical Biology
Rutgers University

Preparation of Functionalized Microporous Metal Organic Frameworks for Gas Storage and Separation

Since last decade, microporous metal-organic frameworks (MMOFs, pore diameter < 2 nm), as a new class of adsorbate materials, have shown a promising perspective for gas storage and separation, catalysis, and sensing applications. In the continuous endeavor to enhance the performance of MMOFs, modification of the organic

linkers in the framework has been considered to be one of the most effective means. In this project, two functional ligands, 2-hydroxybenzendicarboxylic acid or 2-aminoterephthalic acid, were synthesized and used. By using these ligands, several functionalized frameworks were successfully prepared by solvothermal synthesis. The porosity of these frameworks, such as pore size and pore volume, surface area, and thermal stability can be systematically tuned as a result of introducing functional groups. The ligand functionalization of the frameworks will also lead to enhanced gas-MMOF interactions and consequently, uptake of gases. X-Ray diffraction and thermogravimetrical analysis were used to determine the crystallinity, the phase purity, and the thermal stability of the reaction products. Studies have also shown that the synthesis of crystals are very sensitive to the reaction conditions which include variation in acidity of solution, types of solvent, ligands, metals and vials, ratio of metal to ligand, temperature of reaction, the duration of heating, and the time to allow the reaction to cool.

7A **Rose Filoramo**
The College of New Jersey

Mentors: Abigail Porter, Ph.D. and Lily Young, Ph.D.
Department of Environmental Sciences
Rutgers University

Isolation of bacteria able to degrade the antimicrobial triclosan

Triclosan (5-chloro-2-(2,4-dichlorophenoxy)phenol) is an antimicrobial agent found in a wide variety of personal care products such as soaps, shampoos and body creams, which came into use in the 1970s. Residual triclosan enters the sewage system via gray water but can be only partially biodegraded in many wastewater treatment facilities. Because of this incomplete removal, triclosan has been detected at low concentrations in a high percentage of receiving waters that are fed by treated wastewater effluent. Recent evidence suggests the potential for adverse effects on aquatic ecosystems associated with exposure to these low levels of triclosan, including toxicity, potential endocrine disruption, and bacterial resistance. The goal of this project is to isolate bacteria that are able to utilize triclosan as a sole source of carbon through a series of enrichments and dilution plating techniques. The evolution of chloride as degradation occurs will be measured by ion chromatography, and HPLC will be utilized to monitor triclosan disappearance in conjunction with the formation of metabolic intermediates.

A culture from anaerobic digester sludge, enriched with 500 parts per million triclosan, showed an increase in chloride production over twenty days and displayed growth when plated on minimal media supplemented with 500 parts per million triclosan. Isolates will be classified based upon 16S rDNA sequence. Further characterization of the triclosan-degrading isolates will allow for the examination of the specific biodegradation mechanism and will allow triclosan fate to be assessed in wastewater treatment systems and monitored in the environment.

8A **Devin Clark**
Rutgers University

Mentors: Kathryn Uhrich, Ph.D., Bryan Langowksi, PH.D. and Sarah Hehir, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers University

Investigation into the Effect of Stereochemistry on Amphiphilic Macromolecules for Nucleic Acid Delivery

Nanoscale amphiphilic macromolecules (AMs) are polymers that possess both a hydrophobic region, non-water soluble, and a hydrophilic region, water soluble. The hydrophobic region is a sugar backbone functionalized with alkyl branches and the hydrophilic region is PEG attached to the alkylated sugar backbone. These polymers have been shown to form micelles of ~10-20nm in solution. An important application of polymer micelles is their use as delivery vehicles for therapeutics such as nucleic acids. Previously in our laboratory a series of nanoscale AMs based on a mucic acid sugar core have been synthesized. They have been found to possess all of the characteristics necessary to function as effective delivery agents *e.g.* biocompatibility, tunable structure, stability, extended circulation time and the ability to gain rapid entry to cell nuclei. These mucic-acid based AMs have been investigated as non-viral vectors for nucleic acid delivery through amination of the hydrophobic portion with ethyleneamine oligomers. By aminating the AMs, the polymers gain a positive charge. The aminated AMs form stable polyplexes with negatively charged small interfering RNA (siRNA) and have demonstrated the ability to transfect cells. To explore the effect of the stereochemistry of the sugar backbone on the ability of polymers to deliver nucleic acids, a series of aminated AMs will be synthesized where the mucic acid core is replaced by saccharic acid. Saccharic acid is an isomer of mucic acid and differs in only one position of stereochemistry thus allowing elucidation of the effect of stereochemistry.

9A **Emmanual Mendez**
University of Puerto Rico at Mayagüez

Coupled deformation and solute diffusion in swelling compacted solids

E. Méndez, D. Braido, Y. Gulak and A. Cuitino

In order to ensure uniformity and quality in the physical and chemical characteristics of tablets, it is important to develop a deeper understanding of their adsorption properties under different processing parameters. We have measured specific solvent adsorption parameters for a number of compacted powders by recording and analyzing high quality videos and graphing the location of the solvent vs. time. The adsorption rate of the solvent demonstrates a strong dependence on both the compaction power and material used to make the tablets. The results of the physical experiments are to be compared to a numerical model that was developed to explain the anomalous diffusion behavior of the solvents in different materials. The main objective is to construct a repository of numerical models of tablet performance along with physical experiments proving their validity. The properties gleaned from the single component tablets will be used to construct models of composite tablets as well.

10A **Franklin E. Paulino**
Montclair State University

Mentors: Huizhou Fan, M.D. Ph.D., and Xioafeng Bao, Ph.D.
Department of Physiology and Biophysics
Robert Wood Johnson Medical School

Potentially druggable novel chlamydial transcription factors

Chlamydia is one of the most prevelant pathogens and causes a multitude of human ilnesses. Chlamydial peptide deformylase (cPDF) is an ezyme essential for the production of functional proteins in the organism and a potential therapeutic target. Chlamydial topoisomerase (Top-A) and TA32 have been identified as proteins that bind to the cPDF promoter. In vitro transcription assays utilizing varying concentrations of the purified protein will be performed in order to ascertain Top-A's possible role in cPDF transcriptional activity. TA32 has been identified as a transcription activator of the cPDF gene in vitro as well as in vivo (Bao et al. 2010). However the mechanism of TA32's binding to the cPDF is not understood. TA32's binding activity may be dependant on the proteins

ability to form dimers via disulfide linkages. TA32 contains three cysteine amino acids that were selectively mutated into serine amino acids which might prevent the formation of dimers. Our goal is to ultimately perform transcription assays with mutated TA32 and possibly observe change in transcription activity. Knowledge of the function of TA32 and Top-A, as related to cPDF transcription, may pave the way for the development of more effective treatments for Chlamydial infection.

11A **Stephanie Mitnaul**
University of South Carolina

Mentors: Ioannis Androulakis, Ph.D., Ms. Qian Yang
Department of Biomedical Engineering
Rutgers University

Gene expression profiling of short-term changes in rat liver following sham burn and burn injury

Clustering is a technique that groups genes together with identical expression patterns to reveal an underlying response mechanism. Using two clustering techniques we will gain a better understanding of gene expression of the rat liver two days after experiencing sham burn and burn. Rats that experience sham burn will be exposed to 37^{o} C water which won't result in any trauma (used as control). With the analysis of sham burn data, we will explore the gene expression of the liver as it coincides with the change in day and night. Rats that experience burns will be subjected to a third degree scald burn using boiling water to 20% of their total body surface area. Furthermore, sham burn data results will show significant circadian variability of liver specific responses which will be compared with burn data to show change in gene expression when an inflammatory response occurs. For the first clustering technique (Method 1), we obtained two clusters for the sham burn data. Cluster 1 (sham) gene expression focused on metabolism while the Cluster 2 (sham) had various characteristics that ranged from cell growth and death to genetic information processes. With the second clustering technique (Method 2), we obtained three clusters because the various functions of Cluster 2 (sham) obtained using Method 1 were divided between two clusters. The burn data yielded three clusters using Method 1 and four clusters using Method 2. These clusters were related to pro-inflammatory, anti-inflammatory and anabolism for Method 1. When comparing sham burn and burn data, genes related to both included those related to the endocrine system and neurodegenerative diseases. With the results from this data, a better understanding of gene expression changes in rat liver can be determined to gain knowledge of the processes that occur in the liver.

12A **Amanda L. Flores-Torres**
University of Puerto Rico at Mayaguez

Intracellular Signaling Assessment of Pancreatic Beta Cells Under Different Oxygen Supplementation Regimes

Amanda L. Flores-Torres, Jonathan Jones, Nir I. Nativ, Nripen Sharma, Tim Maguire, Rene Schloss, Martin Yarmush

Type-I Diabetes mellitus is a worldwide disease that affects up to 2.3 million people in the US (mostly children and young adults). Type-I Diabetes mellitus is characterized by insufficient insulin production by the pancreas and it is in need of an efficient therapy solution. Currently a few therapies exist, such as direct insulin injection, pancreas transplantation and pancreatic islet transplantation to the liver based on the Edmonton protocol, with the later having the highest proven glucose control and the advantage of avoiding a major surgery. However a current limitation of this approach is that the cells are being transplanted into hypoxic environment which limits the viability of the transplanted cells, and impedes their insulin secretion.

In an effort to overcome this limitation, the approach taken by our lab is to engineer b islets in vitro, to improve their engraftment in vivo. To accomplish this, we will use siRNA therapies to transiently modulate key regulators within multiple pathways (metabolism, insulin and VEGF secretion) of the b islets so that they have the optimal signaling and metabolic pathways as well as optimal VEGF secretion upon transplantation so that vascularization is maximized.

In order to find optimal targets for the siRNA therapies, an in vitro model was developed to explore relevant activated pathways under low oxygen conditions, which affect insulin secretion and vascularization of b cells. To identify the key regulators of the pathways, we used a combination of text mining bioinformatics tools, immunohistochemsitry, and ELISA assays.

Text Mining provided a clear map of which targets may be used to improve vascularization. We have analyzed using inmunohistochemistry the levels of two key regulatory proteins, HIf1a and PDX1, which regulate vascularization and insulin secretion in INS1 cells respectively in response to different oxygen supplementation regimes.

INS1 cells under 1% Oxygen regime for 24 hours expressed higher levels of Hif1α and PDX-1 when plated at a lower cell density (15000 cells/1cm2) and formed smaller cell colonies compared to cells that were plated at a higher cell density (30000 cells/1cm2) and formed larger colonies. The cells in the smaller colonies were shown to produce more VEGF than the cells in the larger colonies which may indicate that smaller b cells colonies have a higher potential to promote vascularization. In order to assess the full insulin secretion potential of the cells under low oxygen regime, further results from insulin secretion assay should be obtained. Understanding the pathways that are activated under low oxygen regimes and the key regulators of these pathways may help us identify potential targets that can be treated with siRNA in vitro to improve engraftment outcome in vivo.

13A **Wallace A. Torres**
Rutgers University

Flow Variability in Continuous feeders as a Result of the Refill Operation

Continuous processing of pharmaceutical products, achieved through the use of weight-in-loss feeders, will allow the pharmaceutical industry to lower costs and improve the quality of their product. In order to guarantee the overall quality of the product, it is necessary to obtain a consistent performance from the feeders to obtain constant amounts of powder are being delivered to the process. To this end, feeding trials must be run to observe the fluctuations and deviations that occur during continuous powder feeding. In particular, the effects of refilling on feeder performance will be evaluated with the goal of determining the optimal parameters for a mixture of 0.25% silica and semi-fine acetaminophen (APAP). The effects of powder properties, feeder tooling, and other refilling parameters will be analyzed.

14A **Nicole M. Vega Cotto**
Bridge Program

Opioid & Cannabinoid Regulation on Glucose Homeostasis

Mike Ansonoff, Bonnie Peng, Tara Cominski & Carol Turchin, John Pintar

The incidences of obesity and metabolic disorders, such as type 2 diabetes, are increasing dramatically. Therefore, research into novel treatments of obesity and diabetes are critical. Possible targets are G protein coupled receptors (GPCRs) found in pancreatic islets. Two GPCRs found within the pancreatic islets cells are the endocannabinoid

receptor 1 (CB1) and mu opioid receptor (MOR). Both of these GPCRs have been shown to modulate glucose homeostasis. We performed glucose tolerance tests in C57BL/6J wild type, MOR knockout (KO), CB1 KO and MOR-1/CB1 KO mice with and without corresponding CB1 and MOR agonists to investigate the effect of loss and/or stimulation of MOR and CB1 receptors on glucose regulation. Knockout of the MOR gene resulted in enhanced glucose tolerance, whereas stimulation of the MOR reduced glucose tolerance. In contrast, knockout of the CB1 gene reduced glucose tolerance. In the double KO mice, glucose tolerance was unchanged from controls. These results suggest that both MOR and CB1 are modulators of glucose regulation and that they most likely function via independent pathways. In conclusion, these findings provide a genesis for future experiments into use of drugs specific to these receptors as targets of innovative treatments for type 2 diabetes.

15A **Michelle C. Oyeka**
Duke University

Mentor(s) Tracey J. Shors, Ph.D.
Megan Anderson
Department of Psychology and Neuroscience
Rutgers University

Moderate Alcohol Consumption Differentially Affects Neurogenesis in the Dentate Gyrus of Males versus Females

Recent studies on the adult brain have shown that large amounts of alcohol consumption can negatively impact cognitive function. In addition, chronic alcohol intake has been shown to have an adverse effect on the process of neurogenesis in the hippocampal formation of the adult brain, an area important for learning and memory. More specifically, alcohol seems to be largely impact the early neuronal precursors that are still dividing. However, these studies were conducted exclusively in males and only with acute high doses of alcohol. It is important to understand how moderate drinking can alter the process of neuron formation as a function of sex differences in behavior. In the present study, we aimed to indentify sex differences in voluntary consumption of moderate amounts of alcohol and the resulting effect on adult neurogenesis in the dentate gyrus (DG) of the hippocampus. Each day for two weeks, male and female adult Sprague-Dawley rats were given a liquid diet that contained either a 4% ethanol solution or a control maltodextrin calorie replacement. Their consumption of diet was measured daily. After the first week the rats were given a 5-bromo-2-deoxyuridine (BrdU) injection, which compound that labels proliferating cells. At the conclusion of the second week, seven days after the BrdU injection, rats were immediately sacrificed. Trunk blood was collected to measure blood alcohol content and the body was perfused with paraformadehyde and the brain extracted. Cells labeled with BrdU will divide for up to about seven days before beginning to make choices about cell fate and survival. In order to determine how many cells were produced in the presence or absence of alcohol, brains were then sectioned and a sampling of sections were used to stain for BrdU using immunoperoxidase labeling. The total number of BrdU-positive cells was estimated in DG of both hemispheres. We found that females consumed more diet whether it contained alcohol or not compared to males when weight was controlled. As result of the difference in behavior, females drank more alcohol than males. Alcohol consumption in females and males tended to result in fewer new cells produced in the DG. The volume of the hippocampus will be measured to account for differences in brain size between sexes in order to compare the number of cells produced in females to males. Preliminary data suggests that alcohol differentially affects the proliferation of neuronal precursors in females and males in relation to their consumption habits.

ABSTRACTS

Poster Session B

1B **Kevin L. Trout**
The College of St. Scholastica, Duluth, MN

Mentors: Michelle L. Previtera, Ph.D., Uday Chippada, Ph.D., Devendra Verma, Ph.D., Noshir A. Langrana, Ph.D., Rene S. Schloss, Ph.D.
Department of Biomedical Engineering
Rutgers University

Force generated and fibroblast growth upon expansion of a DNA-crosslinked polyacrylamide hydrogel

An important aspect of biomaterials engineering is the ability to mimic the natural interactions between cells and their environment. The extracellular environment is dynamic throughout development, aging, and pathological processes. Most biomimetic materials have static properties, but a biomaterial has recently been developed to simulate this dynamic environment. This biomaterial, a DNA-crosslinked polyacrylamide hydrogel, necessitates further research to form a more complete characterization of mechanical properties and cellular interactions. The expansion force generated by a controlled decrease in gel stiffness, via the removal of crosslinks upon DNA delivery, was determined using a calibrated wire deflection force test. GFP fibroblasts were subjected to the hydrogel rigidity alterations. The results compare projection area and polarity of GFP fibroblasts on dynamic DNA gels to their reaction on static DNA gels. This data adds to the understanding of these DNA hydrogels, which aids in the design of biomaterials with dynamically controllable stiffness. The production of these biomaterials has implications in the interpretation of human pathology and the development of various clinical treatments.

2B **Bruno C. J. S. Pinto**
CUNY Hunter College

Mentors:
Andrew J. Baker, Ph.D., Mr. Robert Lindner
Department of Physics and Astronomy
Rutgers, the State University of New Jersey

Collaborators:
Linda J. Tacconi, Ph.D.
Max Planck Institute of Extraterrestrial Physics

Reinhard Genzel, Ph.D
Max Planck Institute of Extraterrestrial Physics, University of California at Berkeley

Understanding elliptical galaxy formation through modeling gas motions in ultraluminous infrared galaxies.

Galaxy mergers occur when two galaxies fall together under their mutual gravitational attraction. The formation of an elliptical galaxy, as put forth by theory, is due to the merging of two disk galaxies. Observed elliptical galaxies are found to be on a fairly tight plane, called the fundamental plane, within the space of surface brightness, half-light radius, and line-of sight velocity dispersion. An elegant test of the merger hypothesis is to

evaluate whether late stage disk-galaxy mergers already share the fundamental plane (FP) characteristics for ellipticals. It has been suggested that nearly all ultraluminous infrared galaxies (ULIRGs), late-stage mergers with luminosities equivalent to 10^12 that of the sun in the far-infrared, follow the scaling relations of the FP. The molecular gas in UlIRGs is the future stars in ellipticals. Thus, we aim to parametrize ULIRGs through modeling the kinematics of the CO (1-0) and CO (2-1) rotational transitional lines, and use such information to better understand the formation of elliptical galaxies. A computer program, written to model galaxies, allows us to emulate the data acquired at radio frequencies from the arrays generated by IRAM (France) and OVRO (Bishop, California) .By assuming different intensities, spatial distribution, and velocity dispersion of the CO emission lines, we can fit our model to the data and estimate how they might evolve over time. The goodness of our model fit is examined through the reduced chi-square statistic. Preliminary work has shown a model fit for IRAS 17208 to be coherent with the data, and further analysis is needed to conclude if its parameters fit the FP for ellipticals. Current work on two other ULIRGs is also being conducted.

3B **Mariangely Almenas-Santiago**
University of Puerto Rico, Rio Piedras Campus

Mentors: Pamela Ohman-Strickland, PhD
Department of Biostatistics
UMDNJ School of Public Health

Mark Merlin, DO, EMT-P, FACEP; Adam M. Shiroff, MD; and Jessica Crystal, MD
Department of Emergency Medicine
UMDNJ Robert Wood Johnson Medical School

A retrospective medical audit review to examine potential rates of organ donation

Organ donation is a procedure that saves and improves the quality of many lives every year. Nevertheless, the waiting list to get an organ is continuously increasing thus the need of donors is a real concern. Solid organs and tissues all over the human body can be donated by a deceased donor for transplantation as long as the donor meets some quality and safety criteria. The United Network for Organ Sharing (UNOS) keeps a centralized electronic network that links all Organ Procurement Organizations (OPO's) under federal contract, though the organs are recovered and distributed by other organizations (e.g. Musculoskeletal Transplant Foundation, MTF; Life Net; Eye Bank; Life Cell) following different standards and criteria depending on the kind of organ and tissue they procure to ensure quality and safety. Based on the MTF donors' acceptance criteria the overall potential rate of deceased organ donors that could be eligible for further screening processes prior to organ recovery was determined. The retrospective study is based on data retrieved from the Emergency Medical Services (EMS) Charts and the Robert Wood Johnson University Hospital (RWJUH) medical records for every patient dying in the field in the Middlesex County (New Jersey) during a 18-month period, regardless of their donor status. The overall potential rate for organ donors is 65.5% and the most common rule out characteristic using this criterion is the Cardiomyopathy diagnosis. Most of the cases recorded (97%) can't be ruled out for further screening due to lack of information regarding the patients health status, thus medical record availability makes the screening selection process more selective and efficient.

4B **Ayanna Campbell**
Rutgers University

Oxidative Hydrophilization of Polyethylene for Controlled Release Applications

Ultraviolet/ Ozone (UVO) exposure modifies polymer surfaces by affecting the surface properties and molecular arrangements. This surface modification is of great interest because it sets a foundation for engineering a functional food or drug packaging system that would be compatible with a biopolymeric coating. The antimicrobial agents within the coating would prolong the shelf life of a food or drug product. The experimental approach involves manipulating the surface properties, more specifically surface energy, of low density polyethylene (LDPE) by adjusting the distance and duration of UVO exposure. Using the Sessile drop method of water, diiodomethane, and ethylene glycol, goniometry (contact angle measurements) can be used to calculate the surface energy of polyethylene. At 10 minutes and 2.5 cm from the polymer surface, the surface energy increased to a value at which contact angles were low and surface "wettability" increased. This provides for a more hydrophilic surface for the biopolymeric coating to adhere to.

5B **Dolu Obatusin**
New York Institute of Technology, Manhattan campus

Mentors: Dr. Jeffrey D. Zahn and Lawrence Sasso, PhD
Department of Biomedical Engineering
Rutgers University

Comparison of quantum dots and organic fluorophores as fluorescent labels in binding assays.

When studying life science applications, many experiments rely on the use of immunosensor and/or fluorescence labels as means of quantifying protein concentrations within samples obtained during the experiment. One of the more exciting and increasingly popular technologies used for immunofluorescence imaging and immunosensing is the use of quantum dots (Qdots)-semiconductor nanocrystals as a fluorophore, where the fluorescence emission characteristics of the nanocrystals are closely related to the size and shape of the individual crystal. This work presents experiments conducted comparing the use of Qdots as a labeling fluorophore to organic fluorophores, specifically in binding assays as a model for immunoassays. It builds upon previous work where bench-top incubations were performed in order to validate a paramagnetic bead immunofluorocytometry assay with fluorescence detection (Sasso, Undar and Zahn 2009). In the experiment, streptavidin coated cytometric bead were used to capture biotinylated fluorescence labels with the fluorescence intensity quantified via flow cytometry. Here we design experiments which demonstrate that Qdots are better fluorescent labels than organic fluorophores such as fluorescein isothiocyanate (FITC) in traditional benchtop assay binding, showing a significantly higher fluorescence intensity with no photobleaching as is common with organic fluorophores. Coupled with this goal, the second stage of the experiment verifies that quantum dot labeling will function similarly within microfluidic immunoassays as it does with bench-top assays, as has been the case for organic fluorophores. Although this application is intended specifically for monitoring inflammation biomarker proteins in blood produced during cardiac surgeries involving cardiopulmonary bypass (CPB), using quantum dots as replacements for organic fluorophores has additional benefits like long-term stability (better shelf life, better stability during the assay, etc). Furthermore, it is believed that the use of quantum dots over organic fluorophores will result in an improved detection limit in terms of minimum assay concentration sensitivity increasing. In turn, this will also increase the sensitivity of high sample rate immunoassays capable of tracking and more thoroughly characterizing the systemic inflammation process. Most importantly, it may aid in the development of better treatment options for systemic inflammation during and after CPB.

6B **Ethan G. Sebasco**
Montclair State University

Mentors: Paul R. Copeland, Ph.D.
Department of Molecular Genetics, Microbiology, and Immunology
UMDNJ – Robert Wood Johnson Medical School

Mr. Jesse Donovan
Department of Molecular Genetics, Microbiology, and Immunology
Graduate School of Biomedical Sciences – Robert Wood Johnson Medical School

Investigation of Alu-containing CHK2 protein kinase as a novel selenoprotein

Selenium is an important trace element in the diet of mammals, and is incorporated into proteins as the 21st naturally occurring amino acid selenocysteine (Sec). However, the mechanism for adding a Sec residue to a growing polypeptide chain is complex. It involves interactions between the selenocysteine insertion sequence (SECIS) located in the 3` UTR, and two trans-acting components: a SECIS binding protein (SBP2) and a Sec-specific elongation factor (eEFSec). Whereas the 25 selenoproteins identified to date contain a SECIS, non-selenoproteins have been discovered that possess this sequence. Along this line, the wild-type CHK2 protein kinase we have isolated possesses a SECIS, yet has not been shown to incorporate Sec. Interestingly, a CHK2 spliced variant has been identified that does possess the required UGA codon contained within an Alu sequence. We set out to determine if the SECIS associated with CHK2 can function in the incorporation of Sec under ideal conditions. Using a luciferase reporter system, we measured the activity of the CHK2 SECIS in Sec incorporation against a variety of constructs, including a known selenoprotein SECIS. The second phase of the project involves the optimization of the conditions under which the CHK2 SECIS can incorporate Sec. If our eventual results support our hypothesis that Alu-containing CHK2 does incorporate Sec in vitro, we will have strong evidence that we have discovered a novel selenoprotein. This could allow us to evaluate in future projects what the purpose of this CHK2 selenoprotein isoform is in vivo.

7B **Erika Ramirez**
Bloomfield College

Mentor: Charles Dismukes, Ph D. (PI) and Elizabeth Burrows, Ph D. (mentor)
Department of Biochemistry
Waksman Institute, Rutgers University

Recycling the glycerol byproduct to maximize biodiesel production from algae: metabolic, energy storage, and photosynthetic effects

The Dismukes laboratory is investigating green microalgae and diatoms as potentially efficient sources for accumulating lipids as primary energy storage molecules. *Phaeodactylum tricornutum*, a marine diatom, is a candidate organism. The specific aim of the current project is to elucidate the metabolic pathways that *P. tricornutum* uses for lipid production with and without the organic carbon source, glycerol . Glycerol is a byproduct of biodiesel production, which enters the metabolic cycle midway in glycolysis. Current research shows that glycerol compared to acetate and glucose yielded higher growth rates and biomass accumulation in the organism *P. tricornutum*. Therefore, by growing the organism mixtrophically in the presence of glycerol versus photoautrophically, the changes in the metabolism, lipid accumulation and photosynthetic capacity of *P.*

tricornutum can be observed, and the potential for this promising closed-loop system for the use of *P. tricornutum* as lipid cell factories can be analyzed.

8B **Victoria Stefanelli**
University of Maryland, College Park

Mentors: Jeffrey Fox and David I. Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers University

Astrocyte adhesion and migration in RGD- and RDG-conjugated type I collagen

Central nervous system (CNS) injury induces astrocytosis, a process characterized by hypertrophy, proliferation, and the formation of a glial scar. While such scars mitigate short-term damage to the CNS, they are a major obstacle to neuronal regeneration in the long-run. This study investigated the adhesive characteristics of astrocytes as a preliminary step to understanding their motility, since previous studies have demonstrated a biphasic relationship between the two phenomena. Various levels of adhesivity were achieved through type I collagen gels conjugated to either glycine-arginine-glycine-aspartic acid-serine (GRGDS), which contains the bioactive RGD sequence, or glycine-arginine-aspartic acid-glycine-serine (GRDGS), containing the biologically inactive RDG sequence. Fibroblast adhesivity was assayed as a control model for comparison with known results. Both astrocytes and fibroblasts behaved similarly, demonstrating increased levels of adhesion on RGD-grafted collagen and decreased levels of adhesion on RDG-grafted collagen. These results may be extended in further analysis of astrocyte migration using a haptotactic boundary condition of peptide-grafted collagen in a microfluidic construct. Ultimately, these studies are an important step towards the eventual control and direction of astrocyte growth during CNS injury.

9B **Christie Rodríguez**
University of Puerto Rico at Mayaguez

Mentors: William Wadsworth, PhD. and Haichang Li, PhD.
Department of Pathology and Laboratory Medicine
UMDNJ- Robert Wood Johnson Medical School

Calcium channels unc-2, egl-19, and cca-1 function in axon guidance and outgrowth in *C. elegans*

During the development of the nervous system, axons are directed to their targets through signaling pathways by extracellular molecules called guidance cues. Previous studies, particularly in cell culture systems, show that voltage-gated calcium channels affect neuronal migration and path-finding, but little is known about their function in axon guidance and outgrowth. That is, calcium channel proteins might function in axon guidance either downstream of a signaling pathway or might affect guidance cue receptor levels. We are studying how calcium channels affect axon guidance *in vivo*. By using neuronal GFP markers to visualize motor and mechanosensory neurons, we observe neuronal defects of calcium channels *unc-2*, *egl-19*, and *cca-1* loss-of-function mutants in *C. elegans*. Double mutants were made using known loss-of-function mutations that affect the calcium channels and guidance cue receptors. Genetic interactions might be revealed by the enhancement or suppression of neuronal defects in the mutants. Further, by using transgenic strains that express GFP-tagged versions of the receptors, we will determine whether the mutation affects guidance receptor levels and location. Because guidance signaling are highly conserved in humans and *C. elegans, k*nowledge of how guidance molecules are regulated in *C. elegans* may lead to the development of therapies that target brain or spinal cord injury repair in humans.

10B **Brett Noel**
New Jersey Institute of Technology

Effects on Material Properties on Residence Time Distribution

Brett Noel, Aditya Vanarase, Maiju Järvinen, Dr. Fernando Muzzio

Continuous powder mixing process, although well established in the other industrial sectors is not applied in pharmaceutical industry. One of the major advantages of continuous processing is that the scale-up can be done simply by the extension of time. In this work, the effect of raw material properties of pharmaceutical excipients on the flow and mixing behavior in the mixer were characterized. Material properties of the excipients include particle size, bulk density and flow index. Along with the material properties, other parameters include flow rate and impeller rotation rate. To characterize the mixing process, Residence Time Distribution (RTD) is measured. Impulse response experiments were carried out to measure RTDs in the continuous mixer. Once the tracer impulse is given, powder samples are taken to be analyzed by the Near-Infrared (NIR) Spectrometer. NIR Spectroscopy is used to measure the amount of an element in a sample based on the absorption of near-infrared light at a particular wavelength.

11B **Kamil Amer**
The College of New Jersey

Establishing Cell Polarity through Regulation of Actin Polymerization:
Mapping of a novel *gex* gene in *Caenorhabditis elegans*

In order to understand how cells and tissues move during embryonic morphogenesis, it is necessary to understand specific regulators of the cytoskeleton. The WAVE/SCAR protein complex promotes polymerization of cytoskeletal actin filaments at the leading edge of cells undergoing movement. Upon activation by a small GTPase, Rac, this complex binds Arp2/3, which initiates branched actin filament polymerization. A number of factors that are required for cell motility and whose homologs are involved in actin nucleation have been identified. Cell migrations including those regulated by the WAVE/SCAR pathway are coordinated through changes in cell shape. *C. elegans* embryos lacking any component of the WAVE/SCAR pathway fail to complete epidermal enclosure due to morphogenesis defects, and they exhibit the "Gut on the exterior" or "Gex" phenotype. Some components that regulate actin polymerization, like the upstream signals, are still unknown. Cloning novel mutants with the Gex phenotype may identify these missing components. This study ultimately seeks to map a novel gene encoding a potential component of this pathway. A genetic screen was performed to identify novel WAVE/SCAR regulators. The *C. elegans* mutant *pj21* was recovered, which exhibited the Gex phenotype. DNA was extracted for single-nucleotide polymorphism (SNP) mapping from *pj21* mutants, amplified via polymerase chain reaction (PCR), cut with a restriction endonuclease, and visualized with UV transillumination on an agarose gel. Comparison of mutant DNA cutting patterns to those of known DNA identified SNPs linked to *pj21* in segment 15 of chromosome 1, thus greatly narrowing the molecular location of *pj21*. Through extensive mapping, the previous 42 cosmid region has been narrowed down to 12 cosmids Three-point mapping was also conducted which narrowed the potential region containing the novel gene. The mutant was also crossed into into plin-26::vab-10 ABD::GFP to image actin formation in the mutant. These results will help when cloning *pj21*, after which the PJ21 protein and its potential interaction with the WAVE/SCAR pathway can be studied. Since defective WAVE proteins have been associated with metastasis, this knowledge of WAVE/SCAR regulators can guide research concerning novel cancer therapeutics.

12B **Maleshia Jones**
University of Maryland, Baltimore County

Mentors: Stephen Tse, Ph.D., and Mr. Joseph Kalman
Department of Mechanical and Aerospace Engineering
Rutgers University

Development of Particle Imaging Velocimetry to Examine Nanoparticle Transport

The purpose of this work is to develop a new method to determine the velocity field of flame-synthesized nanoparticles. Such application of a "Nano-particle" Image Velocimetry (nano-PIV) system, based on Rayleigh rather than Mie scattering, would allow one to understand better the various forces involved in nanoparticle transport, including thermophoretic and electrostatic forces. To validate and calibrate the technique, a nano-PIV system is set up to evaluate and compare the trajectories of seeded nano- and micro-particles in a cold flow and a diffusion flame. The final goal is to diagnose the presence and transport of nanoparticles that are innately synthesized in a low-pressure premixed flame. By comparing with computational simulations and theory, the transport process will be better revealed, allowing for optimization of the gas-phase synthesis process.

13B **Kevin Ling**
Lafayette College

Mentors:

Joseph Kim,
Department of Biomedical Engineering
Rutgers University

Prabhas Moghe, Ph.D.
Department of Biomedical Engineering
Department of Chemical and Biochemical Engineering
Rutgers University

3D Fibrous Polymer Scaffolds as Substrates for Control of Stem Cell Fates

Ling Kevin, Kim Joseph, Griffith Craig, Bolikal Das, Vega Seabstain, Gordonov Simon, Moghe Prabhas.

Stem cells hold enormous potential in the field of regenerative medicine. The large majority of current stem cell studies *in vitro* are conducted in 2D microenvironments. Many factors that influence a stem cell's behavior in a 3D physiological environment are lost when culturing these cells on a flat 2D surface. Thus, in an effort to more closely mimic the 3D physiological environment that these cells occupy *in vivo,* we have cultured stem cells on electrospun fibrous scaffolds fabricated from poly(Desaminotyrosyl Tyrosine Ethyl Ester Carbonate) (pDTEc) (courtesy of the New Jersey Center for Biomaterials, Dr. Joachim Kohn). pDTEc is a completely synthetic, biocompatible, degradable biomaterial, which is easily translated to the clinic. In this study, we investigated the self renewing and differentiating behaviors of two stem cell lines, induced pluripotent stem cells (iPSCs) and adult mesenchymal stem cells (MSCs), which are among the leading candidates for cell replacement therapy today. They are autologous stem cell lines that bypass many of the ethical issues surrounding human embryonic stem cells. In the case of iPSCs, we adsorbed different extracellular matrices (matrigel, fibronectin, poly-D-lysine and poly-D-ornithine/laminin) to investigate their effect on iPSC self renewal in 2D vs 3D via immunocytochemistry. In the case of MSCs, we induced differentiation into adipogenic and osteogenic lineages by adding soluble cues in their media and investigated the difference between 2D vs 3D via staining for positive

alkaline phosphatase activity or intracellular lipid accumulation. All images were obtained using a laser scanning confocal microscope and all quantification was conducted using ImagePro Plus image analysis software. Studying cells cultured in these 3D microenvironments may be more accurate in predicting their behavior *in vivo.* By using a 3D culture system, we can shorten the gap between *in vitro* and *in vivo* studies and provide a robust vehicle for stem cell expansion and transplantation.

14B **Yelena Ilin**
Cooper Union

Effect of surfactant and high-shear stress on β-Carotene-in-triacentin nanoemulsions

The development of poorly water-soluble drugs has posed challenges for the pharmaceutical industry due to the drugs' resistance to being wetted in the gastrointestinal tract. There are several techniques being explored that may increase the bioavailability and decrease the toxicity of such drugs. In this study, high-shear mixing and solvent diffusion were used to prepare nanosuspensions from emulsions of a saturated β-carotene/triacetin solution in water in order to increase the total surface area of the particles. The effects of emulsification time, water content of the suspension, and type of surfactant used were investigated. The mechanism of β-carotene/triacetin nanosuspension maturation was determined by monitoring the particle size and distribution over time. The purpose is to outline a scalable process for creating nanoparticles of minimized size and size distribution and maximized stability and zeta-potential.

15B **Robert Cichocki**
The College of New Jersey

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

Evaluation of Photoinitiator and Mesenchymal Stem Cell Concentrations in a Collagen Gel for Optimal Cell Viability Following Photocrosslinking

Cell response to substrate stiffness can be used to regulate stem cell differentiation and to guide cell growth. This fact can be implemented by using human mesenchymal stem cells (hMSCs) encapsulated in a photopolymerizable hybrid hydrogel consisting of collagen and acrylated polyethylene glycol that can have a variety of rigidities patterned into it. The different patterns and gradients in rigidity would add a level of control to the growth and differentiation of hMSCs suspended in the collagen. This collagen gel can potentially be used in a variety of tissue engineering applications, such as spinal cord repair; however, the cytotoxic effects of the photoinitiator on hMSCs is not well known. The experimental process used to determine the cytotoxicity of photoinitiator on hMSCs was first developed and tested with 3T3 mouse fibroblasts. By encapsulating the cells in collagen while varying the concentration of photoinitiator, the cytotoxic effects of the photoinitiator on that particular cell concentration was determined. This process was then repeated while changing the cell concentration. The viability of these cells was quantitatively determined using [3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymethonyphenol)-2-(4-sulfophenyl)-2H-tetrazolium] assay (MTS) and qualitatively determined using live/dead staining. With a cell concentration of 1 million cells/mL a .1% w/v photoinitiator concentration was lethal, and viability increased sigmoidally as photoinitiator concentration decreased. This experiment will be adjusted for hMSCs so that .05% w/v photoinitiator concentration will be the maximum and less cells will be used due to more demanding cell culturing. This data can be used to find a suitable cell and photoinitator concentration for future experiments.

BIOGRAPHIES

Mariangely Almenas-Santiago

Double majoring in Chemistry and Math at the University of Puerto Rico Rio Piedras Campus Mariangely is looking forward to develop a career in Public Health Sciences. Her strong interests in Biostatistics and Epidemiology as well as her interests in public service and volunteerism has encourage her to look beyond the boundaries of sciences while choosing the best career path for her. Nevertheless she will have a specialized science background in Chemistry and Math, Mariangely is looking forward to be able to improve US population quality of life analyzing research questions with different experimental approaches that might require the immersion into other research fields including Psychology and other Behavioral Sciences disciplines.

Kamil Amer

Kamil Amer was born in Amman, Jordan. He is a rising senior pursuing a B.S. in Biology and a minor in Chemistry in the Honors Program at The College of New Jersey. Kamil is a proud scholar and recipient of the EOF Promise Scholarship as well as the Persist Scholarship offered to a maximum of 15 students a year. While passionate about his studies, kamil also enjoys playing basketball, watching movies, and listening to a wide variety of music. This summer He worked in the laboratory of Dr. Soto and has had the opportunity to immerse himself in a fascinating research experience. Although his life long ambition was to solely attain his medical degree, Kamil's role as a Genetics' laboratory assistant and RISE program participant in Dr. Soto's lab has unveiled his enthusiasm for research. His unanticipated passion in research has caused him to recently consider a dual degree, MD/PhD program instead. As a RISE participant for the summer with a research emphasis on cell polarity and morphogenesis, he is enthusiastic and hopeful for his first independent project in a laboratory setting.

Ayanna Campbell

Ayanna Campbell was born and raised in Trenton, NJ. She currently attends Rutgers University as a striving chemical engineering student and looks forward to attending graduate school to continue her education in chemical engineering or material science engineering after completing her courses at Rutgers in summer 2011. She has great passion for learning and experiencing other cultures.

Robert Chou

Robert was born and raised in Austin, Texas. His childhood dream was to work in the field of medicine, but he has grown to love engineering. In his free time, Robert enjoys exploring his creativity through cooking, painting, and music. As a Texan, Robert naturally loves watching college football (Go Horns!) and eating good ol' southern food. Robert is now a rising senior at the University of Texas at Austin. He plans to graduate in May 2012 with a B.S. in Biomedical Engineering and then further his education by pursuing a Ph. D. in BME. Robert is grateful that he had the opportunity and privilege to be an intern in Dr. Charlie Roth's lab, where he has learned unfathomable amounts of new skills, knowledge and insight through the guidance of his near-peer mentor, Lavanya Peddada.

Robert Cichocki

Robert is a rising junior at the College of New Jersey where he studies Biomedical Engineering and he intends to go to medical school or graduate school in the future. His hobbies include volleyball, long-boarding, and literature. During the summer program he worked with his mentor, Ian Gaudet, on the cytotoxicity of photoinitiator and how that cytotoxicity is affected by cell concentration. Robert is very grateful for the help of Dr. Schreiber, his mentor Ian, and the other members of the lab.

Devin Clark

Devin Clark was born on February 23, 1990 in Livingston, NJ. Devin is a biology major and minor in Psychology at Rutgers University in New Brunswick. He lived in New Jersey for all of his life. He wants become a surgeon. He has done volunteer work at Saint Peter's hospital since he was fourteen years old. He has participated in the mixed martial arts since he was 12 and earned a brown belt. He has even attempted to learn how to fence by joining the fencing club. He is also a member of the American Medical Student Association.

Catherine DeBlase

Catherine DeBlase is a senior chemistry major at Marist College in Poughkeepsie, NY. She is the secretary of the student chapter of the American Chemical Society. Cathy is also a member of the Dean's Circle, a college organization of scholars which sponsors cultural events. Cathy began research during the summer after her freshman year on conducting polymers and presented her work at the National ACS Conference in Philadelphia, PA in Fall 2008. She spent the summer after sophomore year at UConn, where she conducted synthesis in the microwave and published her work in *Tetrahedron.* She presented this work at the National ACS Conference in San Francisco, CA in Spring 2010. This summer, she is studying organometallics under the advisement of Dr. Alan Goldman. During the semester at Marist, she runs review sessions for students of organic chemistry, is a teaching assistant in organic chemistry laboratory, and coordinates supplies in the Marist College chemistry laboratory. Cathy was her high school salutatorian and received numerous scholarships upon entry into Marist. In her sophomore year of college, she was named a Barry M. Goldwater scholar, the highest award for undergraduates in science and engineering. Recently, she was awarded the Molloy scholarship, a Marist endowment for chemistry. In addition to synthesis in the laboratory setting, Cathy loves to practice synthesis in the kitchen setting, as well as sharing her creations with others.

Rose Filoramo

Rose Filoramo is a rising senior at The College of New Jersey and is studying Biology, Chemistry and Environmental Science. This summer she worked on Cook Campus in the lab of Dr. Lily Young under the mentorship of Dr. Abbie Porter. Rose worked to isolate bacterial strains from environmental samples that are able to use the recalcitrant anti-microbial agent, Triclosan, as their sole carbon source. By understanding the mechanism by which microbes can break down this compound, wastewater treatment plants can modify their processes in order to provide the optimum conditions for the biodegradation of Triclosan. Rose looks forward to being accepted into a graduate program in Toxicology or Environmental Toxicology. She thanks all involved in RISE for this opportunity!

Amanda L. Flores Torres

I was born on January 16, 1988 in Humacao, Puerto Rico. I graduate from High School In the same town and entered to the University of Puerto Rico at Mayaguez in August 2006. My major is Industrial Biotechnology and currently I am senior this next academic year. I currently belong to the MARC (Minority Access to Research Careers) program in my college institution and I‘ve had opportunities of knowing a lot more about scientific researches, and participate in international conferences like ABRCMS 2009, and proximately in 2010. After graduating in May 2011, I wish to do a master's in Biomedical Sciences, and then do a Ph.D in Biomedical Engineering, Biochemistry or Molecular Biology. I've also been always interested to get involve in business administration and/or law study areas. I enjoy of going shopping, to the beach, listening music and read poetry.

Yelena Ilin

Yelena Ilin was born in Karaganda, Kazakhstan on September 28th, 1989. She was raised in Brooklyn and Staten Island and currently resides in Manhattan where she is beginning her fourth year at the Cooper Union studying

chemical engineering. Her interests include pharmaceutical engineering, tissue engineering, biochemistry, and spectroscopy. Recent independent studies include utilizing geothermal energy to heat a low-budget, outdoor garden in Iceland during the summer of 2009. She hopes to earn a graduate degree in engineering and later design medical devices or work in the pharmaceutical industry. She is working with Professor Takhistov and Phong Tien Huynh at the food science department as a part of SOPS this summer. She hopes her work will one day help provide society with delicious and nutritious ice-cream treats.

Jonathan Jones

Jonathan Jones is a native of Atlanta, Georgia. In the fall of 2010, Jonathan will begin his second year at the University of Georgia as a Biochemical Engineering student in the Faculty of Engineering. Jonathan currently is a member of Engineers Without Borders, a research scholar for the Peach State Alliance for Minority Participation, and the Vice President of Planning to Achieve Collegiate Excellence for the National Society of Collegiate Scholars. Jonathan is lead by charge given to him at his 2009 Coca-Cola Scholar Banquet, "To Seek, Imagine, and Create!" Jonathan begins with eyes open ready to take on the challenges each day may bring, learning to seek, imagine, and create new paths of success.

Maleshia Jones

Maleshia Jones was born on November 18, 1990, at Providence Hospital in Washington, D.C., and was raised in the city of Hyattsville, Maryland. Currently, Maleshia attends the University of Maryland, Baltimore County (the other University of Maryland) in Baltimore, Maryland where she is majoring in Mechanical Engineering and is also a Meyerhoff Scholar. She is a rising junior and expects to graduate with a Bachelors of Science in the Fall of 2012. In the summer of 2009, Maleshia studied intercooler effectiveness for turbo-expansion cooling applications under the supervision of Dr. Lin-Shu Wang at Stony Brook University. This summer, Maleshia used a Nano-Particle Image Velocimetry technique as a method to track particles and determine their velocities as they are being synthesized under the supervision of Dr. Stephen Tse at Rutgers University. When Maleshia does not have her head engrossed in textbook or is not running from class to class, she actively serves as the Programs Chair for the National Society of Black Engineers, she ministers through dance on the UMBC Perfected Praise Liturgical Dance Ministry, and she sings along with the UMBC Gospel Choir at various engagements. In Maleshia's spare time, she enjoys singing, dancing, playing the acoustic guitar, journaling, writing poetry, and having a good time. Of the many hobbies that she has, Maleshia is very passionate about digital photography. She is an avid photographer and loves capturing the moments that are significant and are to be cherished.

Monroe Kennedy

Monroe Kennedy was born on June 26, 1991 in Cleveland, Ohio. He is currently entering his junior year at the University of Maryland Baltimore County and is majoring in mechanical engineering with a minor in physics. He is the president of DEVICE, a design-engineering club. During the summer of 2009 he performed research in the area of regenerative braking as it applied to robotics. During the spring of 2010 he performed research in the area of cube satellite structural design. He plays the piano, saxophone and violin. He also likes to play basketball, and he enjoys horseback riding and ice-skating.

Kevin Ling

Kevin Ling is a full time superhero with dreams of ridding the world of deadly diseases. Coming from the quiet town of Winchester, Massachusetts he has dedicated himself to his job. He receives his training as a chemical engineer at Lafayette College, where he is a rising junior. In order to expand his knowledge in this dangerous field, he works in the laboratory of Dr. Prabhas Moghe under the mentorship of Joesph Kim. He has the opportunity to study stem cell microenvironments and how biomaterials in combination with soluble factors can

regulate the fate of stem cells. He hopes to utilize his newly acquired skills in the field of tissue engineering. When not fighting crime, Kevin spends his time running, playing frisbee or watching movies.

Emmanuel José Méndez Acevedo

Emmanuel ("Manny") was born and raised in the beautiful island of Puerto Rico, on the 6th of June 1989. He is a rising senior, pursuing a B.S. in Chemical Engineering with a minor in Pharmaceutical Engineering in the University of Puerto Rico at Mayagüez. He has research experience in the extraction and production of biodiesel from microalgae. He is currently working alongside Dr. Fernando Muzzio in the Pharmaceutical Department at Rutgers University as part of the Research in Science and Engineering program. He is a joyful, loving, funny person who loves to surf, play tennis, read and is actively involved with the Golden Key Honour Society. I am very grateful for being given the opportunity of participating in the RISE program since it has provided me with the motivation and confidence to pursue a Ph.D. and unforgettable friends.

Adam Midouin

Adam Midouin was born on December 18, 1989 in Brooklyn, New York. He moved to Toms River, New Jersey in 1992 and has resided their since. He currently attends The College of New Jersey and plans to graduate with a degree in Biomedical Engineering in 2011. Adam enjoys playing sports, especially basketball, and producing hip-hop and house music. He intends to attend medical school and obtain a doctorate in the field of geriatrics.

Stephanie Mitnaul

Stephanie Mitnaul was born in Oceanside, California but was raised below the Mason-Dixon Line most of her life. In Fall 2010, she will be a rising senior at the University of South Carolina (Go Gamecocks!) pursuing a degree in Biomedical Engineering. Extra-curricular activities during her life span have ranged from running track, playing the piano and cheerleading. Currently she is a member of the National Society of Black Engineers (NSBE) where she serves as President and Alpha Kappa Alpha Sorority, Incorporated (Skee-Wee!). On her down time, she enjoys what most women love to do... SHOPPING! With her experience in RiSE at Rutgers, Stephanie has learned many personal and professional skills that have taught her to never strop striving until her good is better and her better is best.

Myreisa Morales Cruz

Myreisa Morales was born in Arecibo, Puerto Rico. She is studying for her Bachelor degree in Chemistry at the University of Puerto Rico, Rio Piedras campus. There she works in a Bio Chemistry laboratory doing research in the encapsulation of proteins via nanoprecipitation method. This summer at the Lawrence Williams Laboratory, Myreisa discovered the world of the organic chemistry synthesis and enjoy it. Her goal is to be an Organic Chemistry Professor to make others fall in love with science. She thanks the RISE summer research program, Dr. Williams Lawrence and his research group for giving her the opportunity to have an experience in other area of Chemistry, and for the great summer she had.

Brett Noel

Brett Noel was born in Livingston, New Jersey on December 3rd, 1990. Currently living in East Brunswick, New Jersey, he expects to receive a Bachelor of Science degree in Mechanical Engineering in the spring of 2012 from the New Jersey Institute of Technology. In addition to being focused on academics, he enjoys partaking in a range of activities; from running track and playing other various sports to enjoying time with friends and family. This summer Brett had the opportunity work in Dr. Fernando Muzzio's lab in the Chemical and Biochemical Engineering Department at Rutgers University. From his experience at RISE, he was not only able to improve his research skills and prepare for graduate school, but also make friends and new memories along the way.

Mosadoluwa Obatusin

Mosadoluwa Obatusin (Dolu for short) was born and raised in Ibadan, Nigeria but resides in Bergenfield, New Jersey with his family. He is a Biomedical Engineering major at the New York Institute of Technology and wants to be a Cardiothoracic Surgeon specializing in minimally invasive robotic surgery. This summer he is working with micro-fluidic devices which will be used to specifically monitor systemic inflammation during and after heart surgery involving cardiopulmonary bypass. Although this is his first research experience, he has participated on several projects cutting across different disciplines. Over the course of the research experience, he has learned firsthand what integrating various engineering disciplines with biological and medical applications truly entails. In the pursuit of a career as a cardiothoracic surgeon, he will obtain an MD/PhD degree while learning as much as he can in order to position himself where he can tackle the challenges of applying new technology to the problems that physicians often find inadequately treated.

Michelle Oyeka

Michelle Oyeka was born in San Antonio, Texas and raised in the Greater Dallas Fort Worth Area. As the oldest child of her Nigerian immigrant parents, Michelle was taught at an early age to value education, imagination, and curiosity. Bearing those in mind she procured a full scholarship from the Gates Millennium Scholars foundation, of which she is still an active member and attends Duke University in Durham North Carolina. This coming spring she will receive her B.S. in Psychology with a concentration and certificate in Neuroscience. As a member of the Rise program during the summer of 2010, she worked carefully under the tutelage of Dr. Tracy Shor understanding the role of alcohol consumption on the process of neurogenesis in the area of the brain called the hippocampus. With this knowledge Michelle hopes to pursue a career and eventually earn her PhD in Public Health and behavioral sciences and remains thankful to all the people in the RISE program who helped to create opportunities for her to succeed in.

Bruno Pinto

Bruno Pinto was born in Newark-New Jersey, but was raised in Brazil and New York City. He will hopefully graduate from Hunter College (New York-NY) in the spring of 2011, with a double BA in physics and mathematics. As the president of the Society of Physics Students at Hunter College and as a MARC scholar, Bruno has been heavily involved in research and organizing science events. He currently works with Prof. Andrew Baker and he is very thankful to his mentor and the other members of the group, Chealsea Sharon and Bob Linder, for teaching him about the universe. Bruno's studies of the kinematics of molecular gas in the centers of nearby ultra luminous infrared galaxies have been a great experience. He hopes to pursue a PhD in a physics related field upon graduation.

Greg Prisco

Greg Prisco was born and raised in Central New Jersey. He is a rising senior at the College of New Jersey majoring in Biomedical Physics. In his free time, Greg likes to snowboard, longboard, mountainboard, and read, mainly the works of his favorite author Stephen King. He plans to pursue a graduate school education in the general area of interdisciplinary biology or medical sciences. Greg worked in Dr. Shinbrot's lab this summer working with computational models detailing cell morphology. He would like to thank everyone from Dr. Shinbrot's lab, the directors of the RISE/REU programs, and all the participants for a wonderful summer experience.

Erika Ramirez

Erika Ramirez just recently graduated from Bloomfield College with a Bachelors degree in Science, in the field of Chemistry with a concentration in Biochemistry. Having spent half of her life in her native country Colombia,

Erika came to United States when she was only ten years old. Since then, she has dedicated her time to pursuing higher educational and a professional career, as she prepares to apply for a master's program in Chemistry. At Bloomfield College Erika was involved in several community service programs, as well as, holding part of numerous leadership organizations. It was through the office of career services that she found out about the Research in Science and Engineering Program at Rutgers University, even though the program took place after her graduation Erika ventured to apply. She would like to thank everybody that was responsible for her acceptance because she was given the opportunity of working in Dr. Dismukes laboratory at the Waksman Microbiology building on Busch campus, this experience has helped enhance her research expertise, but more importantly the brand new techniques she has learned and will take with her for the years to come. She would also like to specially thank her mentor Dr. Burrows and all of the other members of the laboratory group for making this the best summer research experience she has ever had.

Christie Rodríguez

Christie Rodríguez was born in Puerto Rico on September 22, 1989 were she has lived all her life. She is currently pursuing a bachelor's degree on Industrial Biotechnology at the University of Puerto Rico at Mayaguez. She plans to continue studies at the PhD level on Molecular Biology upon finishing her Bachelors on Spring of 2012. Christie has been conducting research at the University of Puerto Rico at Mayaguez in the General Engineering Department since her high school senior year. Her current research focuses on using magnetic particles for targeting medicine and photodynamic therapy. She currently receives research scholarships from the Department of Energy, Alliance for Minority Participation, and CREST an NSF sponsored grant. She also forms part of her University's honor role and the Varsity's Softball Team, which won the championship this past season. Her most recent achievement is entering the Minority Access to Research Careers (MARC) program at her university for this upcoming school year. Her hobbies include singing, hearing music, reading, and playing sports. This summer she has been conducting research in Dr. William Wadsworth's Lab in UMDNJ. She is very grateful to RISE and Dr. Wadsworth and his lab for an amazing summer experience.

Eva Nelly Rubio Marrero

Eva Nelly Rubio Marrero is a student from the University of Puerto Rico, Mayagüez Campus. She is a rising senior in Industrial Biotechnology and her plans after graduating in May 2011 are to pursue a Ph.D in Molecular Biology in the United States. Ever since she was little science has always been her passion and she knows that it is something that will never be diminished, for this reason, she is determined to follow her dream and attend graduate school. This summer, she had the opportunity to do research in Dr. Li Cai laboratory and worked with the graduate student Mohammed Islam studying the regulation of the gene *Foxn4*, which is important for the differentiation of horizontal cells in the eye retina. Eva is an active person in her community being part of the Lion's Club and participates in student associations at her university. One of her hobbies is to play volleyball and pass time with her friends. Eva is a person with many goals and when she is determine about something, she gives it all of her efforts to accomplish it.

Eduardo Sanabria-Figueroa

Eduardo Sanabria-Figueroa was born in Moca, Puerto Rico on May 14, 1990. However, he has lived all his life in the city of Aguadilla. Since very little, he has been very curious and joyful. He loves music, sports (go volleyball!), and food. Currently, he is a rising senior of the University of Puerto Rico at Aguadilla, majoring in Biomedical Sciences. As an extroverted individual, he loves extracurricular activities. Eduardo is a bass on the choir of his college, active member of the American Chemical Society and Honors Program, mentor for freshman students as part of the Minority Science and Engineering Improvement Program, and the president of the Beta Beta Beta National Biological Honors Society – Zeta Lambda Chapter. His experience in Dr. Federico Sesti laboratory (Department of Physiology and Biophysics – Robert Wood Johnson Medical School at the University of Medicine and Dentistry of New Jersey) during the summer of 2010 as part of the Research in Science and

Engineering program has worked as a life-changing experience in the middle of the road that conducts him towards his goal: PhD in Pharmacology.

Ethan Sebasco

Ethan is a rising senior pursuing his bachelor's degree in Molecular Biology at Montclair State University. He lives near Clinton, NJ. Ethan has played trumpet in every ensemble he can for eleven years now, and still loves the expressive freedom that only music can bring. With his work alongside Dr. Paul R. Copeland, Ethan has gained a new appreciation for his chosen field of study, and hopes to expand his ever-growing experience as a researcher for his future career. After graduating in May of 2011, Ethan plans to pursue his PhD in Molecular Biology, with a focus on cancer prevention and treatment.

Nicole Sermabeikian

Nicole Sermabeikian is from the lovely state of New Jersey. She attends The University of Delaware and is majoring in Mechanical Engineering with a minor in Biomedical Engineering. She has special interests in biomechanics and tissue engineering. Nicole is involved in many clubs on campus including a competitive Indian Fusion dance team, Delaware Kamaal, where she is a choreographer and dancer. She is intrigued by and loves to learn about different cultures. Nicole is also a member of Engineers Without Borders where she is working on projects in both Cameroon and Guatemala. Nicole gives her upmost gratitude to the RISE program for giving her such an amazing opportunity to expand and use her knowledge in the engineering field.

Antonio Ray Smith

Antonio Ray Smith is 19 years old and was born on June 26, 1990 in Omaha, Nebraska. Antonio was raised in Omaha, Nebraska, but after 10 years he moved to Bastrop, Louisiana. Antonio is a very artistic, intelligent, humorous and athletic young man. He played football in high school and won three back to back state championships. I forgot to mention that he holds a record of 45-0. Yes, he and his team are undefeated!! He graduated from high school with honors and a high GPA. He is now a junior that attends Grambling State University College. He is now pursuing a B.S. in Electronics Engineering Technology. Antonio is associated in many programs which are CMAST (Center of Mathematical Achievement in Science and Technology), Sigma Alpha Pi (National Society of Leadership and Success), and Earl Lester Cole Honors College. So far he has presented two poster presentations and one PowerPoint presentation at various symposiums. Antonio also received a scholarship from the CMAST program for having outstanding grades. After completing all baccalaureate requirements in Electronics Engineering Technology, Antonio's future plans are to pursue graduate and professional studies in order to attain the terminal degree in Engineering. Now Antonio is participating in the RISE summer research program at Rutgers University, where he is studying power management of Slocum gliders with Dr. Mandayam over in the WINLAB department.

Victoria Stephanelli

Originally from Fair Lawn, New Jersey I am currently a bioengineering student at the University of Maryland, College Park. I was originally drawn to bioengineering because it offered a perfect balance between biology and physics—my two favorite subjects. Its application-based focus was also very appealing. Currently, my research interests are in the field of biomechanics, and I ultimately aspire to earn a PhD and a research position in this exciting area.

Evelyn Strombom

Evelyn Strombom is a rising junior at Swarthmore College, pursuing an honors major in Biology and minors in Economics and Latin American Studies. This summer she is participating in an REU with the Chemical Engineering Department under the direction of Dr. Troy Shinbrot. Prior research experience includes quantifying neurite fasciculation, Rutgers University Biomedical Engineering Department, funded by NJ Commission on Spinal Cord Research; investigating the use of polyacrylamide hydrogels to study ductal cancer growth geometries, BioMaPS Institute Summer Scholar, NSF grant; researching chaotic mixing, slug and Marangoni Pattern formation in 2D liquid layers, RU Chemical Engineering, NSF grant; assessing the electrostatic basis of sandstorm lightning, RU Chemical Engineering, NSF grant; exploring insulin amyloid formation, RU Biochemisty and Microbiology; and evaluating change in expression of fatty acid taste receptors in mice exposed to temperature change, Biology Department, Swarthmore College.

Kevin Trout

Kevin was born and raised in rural Wadena, Minnesota. In the spring of 2011, he plans on graduating from The College of St. Scholastica in Duluth, MN with Bachelor's degrees in Biology and Biochemistry. Kevin enjoys broadening the scope of his education through honors courses and a minor in psychology. He has been accepted into the Ronald E. McNair Postbaccalaureate Achievement Program, which prepares low-income, first generation, and underrepresented students for doctoral education. Kevin would like to thank the McNair Scholars Program for the support this past year. He plans on continuing his education to the doctoral level and doing research with applications to medicine. The people at Rutgers have provided Kevin with an excellent research experience in biomedical engineering, and he appreciates the guidance from the RiSE program and his lab members throughout the summer.

Alexander Ucci

Alexander Ucci was originally born and raised in Clark, New Jersey and moved to Brick Township, New Jersey in 2000. A rising senior at Ramapo College of New Jersey, he is currently a chemistry major with a minor in both Spanish studies and international business. Alex is currently the President of the Chemistry Club at Ramapo as well as the Vice President of Omicron Delta Kappa, a national leadership honor society. He is also a tour guide with the Admissions Department at Ramapo College and is a member of Kappa Sigma International Fraternity; involved in many community service projects on and off-campus. During the school year at Ramapo, he also conducts research in organic chemistry in the synthesis of peptides to study the biological process of phagocytosis. After graduation, he plans to attend graduate school and attain his Ph.D in an area of chemistry ultimately conducting research in industry or at a university. This summer, Alex had the pleasure of working closely with Dr. Jing Li and Dr. Yonggang Zhao in the study of microporous metal organic frameworks (MMOFs). Synthesized MMOFs contain tiny pores that allow to them to be applicable particularly to gas storage. This rewarding experience at Rutgers helped him prepare himself for graduate school as well as expose him to yet another area of chemistry he could potentially pursue in his future endeavors.

Wallace Torres

Wallace Torres was born in Bayamon, Puerto Rico on September 22nd, 1989, but from the age of eight was raised in Switzerland, New Jersey, and Rio de Janeiro. He is currently a rising senior at the Cooper Union for the Advancement of the Science and Art, where he studies chemical engineering. As a member of REU-SOPS, he has worked in Dr. Fernando J. Muzzio's lab, under the supervision of William Engisch studying the behavior of continuous powder feeders as a result of powder properties, feeder tooling, and other refelling parameters. He hopes to one day move out west and apply the knowledge and skills he has acquired in the pharmaceutical and biotechnological industries.

2010 Summer Program Staff

Research in Science & Engineering (RISE)

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

Jerome A. Langer, Ph.D., Director
Associate Professor, Dept of Molecular Genetics, Microbiology & Immunology, UMDNJ-Robert Wood Johnson Medical School; Associate Dean for Faculty Affairs, UMDNJ-RWJMS

REU in Cellular Bioengineering (REU-CB)

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

REU in Structured Organic Particulate Systems (REU-SOPS)

Henrik Pedersen, Ph.D., Director
NSF Engineering Research Ctr, Professor and Chair, Dept. of Chemical and Biochemical Eng., Rutgers

Ms. Aisha Lawrey, Associate Director
Assoc. Dir, Education & Outreach, NSF Engineering Res. Ctr for Structured Organic Particulates

Administrative Staff

Rutgers Graduate School-New Brunswick
Ms. Dawn Lopez, RiSE Program Coordinator
Ms. Kathy Kronemeyer, Administrative Assistant

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

Ms. Linda Johnson, REU-CB Program Coordinator

Ms. Joseline Williamson, ERC Administrative Assistant

Teaching Fellows

Mr. Aditya Vanarase, PhD Candidate in Chemical Engineering
Mr. Richard Mishler, PhD Candidate in Chemistry & Chemical Biology
Ms. Yan Yan, PhD Candidate in Neuroscience & Cell Biology

Resident Advisors

Ms. Lydia Louis, PhD Candidate in Toxicology
Mr. Andrew Rodriguez, PhD Candidate in Industrial & Systems Engineering