RISE at Rutgers/UMDNJ
Research In Science and Engineering

2011 Summer Research Symposium

August 3, 2011

Sponsored by:

Rutgers Graduate School-New Brunswick

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

Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, August 3, 2011

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

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

Andrew G. Campbell, Ph.D.
Associate Professor, Medical Science
Molecular Microbiology & Immunology
Brown University

"My Journey as a Scientist:
Where You Start Does Not Limit How Far You Can Go"

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

Sponsored by:

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

REU in Cellular Bioengineering

REU in Structured Organic Particulate Systems (SOPS)

PLENARY SPEAKER

ANDREW G. CAMPBELL, PHD
Associate Professor of Medical Science
Molecular Microbiology & Immunology

"My Journey as a Scientist: Where you start does not limit how far you can go"

Dr. Campbell received his B.S. degree from York College of the City University of New York (CUNY) and his C. Phil and Ph.D. degrees from the University of California at Los Angeles (UCLA). He was a University of California President's postdoctoral fellow in the department of Biochemistry & Biophysics at UCSF. Dr. Campbell returned to UCLA as a postdoctoral fellow, studying nucleic acid metabolism in the kinetoplastid, Crithidia fasciculate, and later studied the biology of HIV in the SCIDHu mouse model. Dr. Campbell joined the faculty at Brown University as Assistant Professor of Medical Science and is currently Associate Professor of Medical Science (M.A. ad eundem gradum promotum) and pursues his interest in host-pathogen interactions by studying the biology of parasite and viral pathogens. His work has been funded by the American Foundation for AIDS Research (AmFAR), the National Science Foundation (NSF) and the National Institutes of Health (NIH). He served as director of the Brown University Graduate Program in Pathobiology, which ranked as the number one biology graduate program at Brown in the recent National Research Council ranking of graduate programs. Dr. Campbell also served as the first coordinator of the Brown University – Marine Biological Laboratory (MBL) inter-institutional Graduate Program and as president of the New England Association of Parasitologists. He has served as external grant and program reviewer for NSF and as reviewer for NIH and as a member of the Minority Affairs Committee of the American Society for Cell Biology. Currently, he is PI and Program director of the NIH funded Brown University Initiative to Maximize Student Development (IMSD) Program.

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 33 scholars this summer. These students, selected from over 300 applicants, represent 25 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM disciplines as well as the behavioral sciences and communications. 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 second 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)

School of Communications and Information (SCI)

Office of Women in Science, Engineering in Math (WiSEM)

WINLab

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

External Support

Merck Research Laboratories

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(FASEB/MARC Program)

New Jersey Space Grant Consortium

NIH MARC Program

Howard Hughes Medical Institute

NSF – Northeast Alliance for Graduate Education & the Professoriate

NSF Innovation through Institutional Integration (I3) Program

NSF Research Experiences for Undergraduates (REU) Program

NSF CAREER Award (Prof. Andrew Baker)

U.S. Department of Education McNair Scholars Program

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. Last, but not least, we thank Dr. Charles Roth and Ms. Linda Johnson for collecting and organizing the Summer Research Symposium booklet.

Guest Speakers

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

Responsible Conduct of Research – Case Studies: What Would You Do?
Jerome A. Langer, Ph.D.
Associate Professor, Molecular Genetics, Microbiology & Immunolog and Associate Dean for Faculty Development, UMDNJ-Robert Wood Johnson Medical School

Intellectual Property and Technology Transfer
Dr. D. J. Nag
Rutgers Office of Technology Commercialization

Graduate School: How to Get In, Get Funding and Meet Success
David Shreiber, Ph.D., Associate Professor, Biomedical Engineering, Rutgers
Jeffrey Fox, PhD candidate, Chemical and Biochemical Engineering, Rutgers
Ian Gaudet, PhD candidate, Biomedical Engineering, and IGERT Fellow, Rutgers
Mehdi Ghodbane, PhD candidate, Biomedical Engineering, Rutgers
Rachel Sparks, PhD candidate, Biomedical Engineering, 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
Deborah Silver, Ph.D.
Professor, Electrical & Computer Engineering; Director, Professional Science Masters Program, Rutgers

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

Jose Fernandez-Colon, Ph.D.
Senior Research Scientist, Signum Biosciences

Tanya Borsuk, Ph.D.
Easton Associates

Alicia Abella, Ph.D.
Executive Director, Innovative Services Research Department
AT&T Research Labs

Nancy Vranich, Ph.D
Vice President/ Medical Director, Medical & Scientific Affairs
AgencyRx

SUMMER PROGRAM STAFF

Research in Science & Engineering (RISE)

Evelyn S. Erenrich, Ph.D., Director
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Visiting Associate Professor, Dept of Chemistry & Chemical Biology

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

REU in Cellular Bioengineering (REU-CB)

Charles M. Roth, Ph.D., Director
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
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Ms. Aisha Lawrey, Associate Director
Education & Outreach, NSF Engineering Res. Ctr for Structured Organic Particulates

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

Teaching Fellows

Ms. Ramaydalis Keddis, Dept. of Environmental Sciences
Dr. Swati Mishra, Dept. of Biomedical Engineering
Ms. Roselin Rosario, Dept. of Chemistry & Chemical Biology

Resident Advisors

Mr. Brandon Bogusz	PhD Candidate in Food Science
Ms. Lydia Louis	PhD Candidate in Toxicology
Mr. Oleg Milberg	PhD Candidate in Biomedical Engineering

SUMMER RESEARCH PROGRAM PARTICIPANTS

Kimaada Allette[1]
Patricia Alvarado[1,3]
Marietta Alvarez[1,3]
Roger Arhin[1]
Natalie Austin[1,2]
Kimberly Box[1*]
Adrian Clarke[1]
Michael Clark[2]
Ana Correa[1]
Sage Dunham[1]
Liliana Fernandez[1,3]
Salim Ghodbane[1,2]
Lauren Henderson[1]
Alfred Irungu[1,3]
Selimar Ledesma-Maldonado[1*]
Joseph Leveille[1]
Wanze Li[1,3]
Christopher Lowe[2]
Sarah Mailhiot[2]
Danielle Mazza[1,3*]
Michael McCoy[1,2]
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Lexi Rene[1]
Victoria Weber[1]
Katrina Wunderlich[1]
Joseph Zhagnay[1]

*8- week participant departing before final Symposium

SPONSORING PROGRAMS

[1]Research in Science & Engineering (RiSE) at Rutgers/UMDNJ
[2]NSF REU in Cellular Bioengineering
[3]NSF REU in Structured Organic Particulate Systems

POSTER PRESENTATIONS

Poster Session A

10:45 AM – 11:30 AM

Poster #	Name	Title
1A	Kimaada Allette	*Identification of RNA polymerase ω subunit in Chlamydia trachomatis*
2A	Marietta Alvarez	*Powder mixing efficiency of a resonant acoustic vibratory mixer*
3A	Natalie Austin	*The effects of collagen 2D substrates and 3D matrices on neuronal precursor cell behavior*
4A	Michael Clark	*Characterizing adhesion of reactive astrocytes to peptide-grafted collagen biomaterials*
5A	Sage Dunham	*Spinel catalyzed flame synthesis of graphene and carbon nanotubes*
6A	Salim Ghodbane	*In vitro screening of hepatocyte defatting compounds using a hepatocyte cell line*
7A	Alfred Irungu	*Tablet dissolution characterization via computational image processing*
8A	Wanze Li	*Evaluation of Lab-Scale Manually- Agitated Granular Powder*
9A	Sarah Mailhiot	*Improved Stem Cell Viability within a Semipermeable Membrane-Sealed Microfluidic Device*
10A	ValaRae Partee	*Activity of Bacteria in Air*
11A	Jonathan Porras	*Redox-neutral α carbon-hydrogen bond functionalization of nitrogen heterocycles via intramolecular 1,5 hydride shift*
12A	Alexander Proctor	*Parametric Analysis of Fluidized Bed Drying of Pharmaceutical Materials*
13A	Dylan Richards	*Pou3f2 motif in progenitor-specific gene expression during Gallus gallus embryonic retinal development*
14A	Michelle Sempkowski	*Effects of liposome size and surface modification on cancer cell targeting and macrophage association*
15A	Lexi Rene	*Lens modeling of the galaxy cluster MACSJ0451.9+0006*
16A	Katrina Wunderlich	*A study in the synthesis of* meta-*substituted compounds*
17A	Danielle Mazza	*Measuring fluorescence output of alginate-chitosan nanoparticle phases*
18A	Kandyce C. Perry	*Development of a LC-MS/MS based method to quantify proteins in Cyanothece spp.Miami043511 for hydrogen production optimization*

POSTER PRESENTATIONS

Poster Session B

11:45 AM – 12:30 PM

Poster #	Name	Title
1B	Patricia Alvarado	*Effect of material properties and operating conditions on variability of feed rate in a continuous powder feeder*
2B	Roger Arhin	*G-quadruplex stabilizing compounds as anticancer agents*
3B	Adrian Clarke	*Synthesis and characterization of graphene oxide and transition metal dichalcogenides in the form of thin films*
4B	Ana Correa	*Functional genomics of salt resistance in* Chlamydomonas reinhardtii *with applications in microalgal biofuel production*
5B	Liliana Fernandez	*Taste Masked Caffeine Using Gelatin B and HPMC Polymeric Film*
6B	Lauren Henderson	*Preparation and characterization of liposomal form of prostaglandin E2 for treatment of pulmonary fibrosis*
7B	Joseph Leveille	*Oxidative stress of KV2.1 holds significant evidence towards the mechanism of Alzheimer's disease*
8B	Christopher Lowe	*Engineered microenvironments for neural stem cells*
9B	Michael McCoy	*Combined effects of carmustine and STAT3 siRNA silencing in glioblastoma spheroids*
10B	Marisha Perkins	*Oxygen-Methylation of the Aldehyde Precursor for a 14-Membered Macrolide Antibiotic*
11B	Izmarie Poventud-Fuentes	*Effects of albumin nanoparticles' physical characteristics on tumor penetration*
12B	Eric Refour	*Investigation of the effect of varying aluminum volume fraction in three phase piezoelectric composites and the discussion of percolation*
13B	Diara Santiago	*Surfactant protein-D regulation of macrophage phenotype is controlled by Nitric Oxide-mediated modification*
14B	Gabriel Suarez	*Elucidating high content organizational features of nuclear proteins in stem cells cultured in 3-D scaffolds*
15B	Victoria Weber	*"You Need to Contact Your Local Library Directly:" Referrals in the Virtual Reference Environment*
16B	Joseph Zhagnay	*Distinct roles of CUGBP1 isoforms during neurogenic phase of neocorticogenesis*
17B	Kimberly Box	*SNP Mapping to identify a novel morphogenesis gene in C. elegans*
18B	Selimar Ledesma-Maldonado	*The role of NIX in adipocyte differentiation*

ABSTRACTS

Poster Session A

1A Kimaada Allette
Long Island University- Brooklyn Campus

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

Identification of RNA polymerase ω subunit in *Chlamydia trachomatis*.

The bacteria *Chlamydia trachomatis* is responsible for sexually transmitted infections. Because of its intracellular developmental process, it poses difficulties for researchers trying to understand it. The goal of this project is to provide evidence that an omega (ω) factor of the RNA polymerase is present in *Chlamydia trachomatis*. In general, the ω factor aids in the folding of the RNA polymerase's β′ subunit and thus, the assembly of the β′ subunits with α, α, β to form a functional core enzyme in the conformation of α, α, β, β′ and ω. Through BLAST analysis, our lab has found a putative ω subunit in *Chlamydia* that has a resemblance to *E.coli* ω subunit. We are in the process of expressing the putative ω with α, β, β′ and σ 66 in *E. coli* BL21 with or without ω. Whether the protein is true ω or not will be judged by its ability to aid in the yield of the recombinant *Chlamydial* RNA core enzyme.

2A Marietta Álvarez
University of Puerto Rico- Mayagüez

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

Powder Mixing Efficiency Of A Resonant Acoustic Vibratory Mixer

Powder blending is critical in the manufacturing of solid dosage forms within the pharmaceutical industry. Minimizing the active pharmaceutical ingredient (API) content uniformity variability is necessary to guarantee a high product quality and performance. The resonant acoustic vibratory mixer is a new laboratory-scale technology that increases efficiency in achieving blend uniformity of pharmaceutical powders. This mixer works with a new approach that uses low frequency, high intensity acoustic energy to create a fluidized bed and dispersion of material. The main task was to evaluate the mixing performance of pharmaceutical powders in the resonant acoustic (vibratory) mixer, *Resodyn*™ LabRAM, with respect to different process parameters and material properties. A total of 54 experiments were performed for different blends in the acoustic mixer, which were generated from a three-level fractional factorial design of five factors. The material properties were: three different particle size distributions and flow properties from 3 APIs (micronized APAP, Caffeine, and Granulated APAP); API concentration (3, 10 and 30%); and fill level (25, 50 and 75%). Two different grades of microcrystalline cellulose were used based on particle size distributions (Avicel PH 102 and PH 200). The operating conditions were: time of mixing (1, 2, and 4 min) and acceleration (25, 50, 75 Gs). Near-Infrared Spectroscopy (NIR) was used to characterize blend uniformity by quantifying API concentration in the blends obtained. Based on an analysis of variance (ANOVA) for the materials and parameters used, the RSD (Relative Standard Deviation) and mean variance decreases with increasing API concentration and acceleration. Since a lower RSD indicates less variability, a higher acceleration results in better mixing. Time of mixing and fill level are not statistically significant to the mixing performance for the parameters

used. The fill level, time of mixing and acceleration are statistically significant to changes in temperature. Efficient mixing and low temperature rise is obtained by using less mixing time at higher acceleration.

3A Natalie Austin
University of Maryland, Baltimore County

Mentors: Michelle Previtera, Ph.D., Devendra Verma, Ph.D., Rene Schloss, Ph.D.
Department of Biomedical Engineering
Rutgers the State University of New Jersey

Noshir Langrana Ph.D.
Department of Biomedical Engineering and Mechanical and Aerospace Engineering
Rutgers University

The effects of collagen 2D substrates and 3D matrices on neuronal precursor cell behavior

The prevalence of spinal cord injuries have incited research interests in deriving ways to repair and replace damaged neurons. Our novel contribution to this pool is the use of biodegradable and biocompatible collagen 2D substrates and 3D matrices, to observe their influence on the proliferation and differentiation of neuronal precursor cells (NPCs). Glia and neurons are two main types of cells found in the spinal cord. After injury, the body has a response to proliferate and differentiate glia to create the glial scar. Unfortunately, glia can prevent complete recovery of the spinal cord by hindering neuronal growth. In addition, the growth of the neurons is insignificant to repair the damaged site. The design of an optimal hydrogel whose mechanical cues influence the NPCs to proliferate would be used to take a limited number of NPCs and propagate the population in order to replace damaged neurons. Dissociated neurospheres (neuronal stem cells and their progeny) were plated on compliant substrates to promote NPC proliferation and differentiation. Substrates and matrices formed from collagen hydrogels with various stiffness and concentration will be used for NPC plating. We stained the cells with KI-67, a ubiquitous proliferation marker, to assess NPC proliferation. We also stained the cells with differentiation markers Nestin, MAP2, and DAPI , that stain for NPCs, neurons, and total cells respectively, to assess the ratio of NPCs and neurons, to total cells within in each plate. We expect the cells to adhere to the plates as studies have shown. We also expect to find neuronal cell differentiation, as studies have shown that neuronal cells are prone to differentiation on softer matrices. The differentiation of NPCs into neurons *in vitro*, would lead us a step closer to finding the most effective ways to successfully regenerate neuronal spinal cord cells.

4A Michael Clark
University of Louisville

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

Characterizing adhesion of reactive astrocytes to peptide-grafted collagen biomaterials

Reactive astrocytes act to impede neuron regeneration during central nervous system (CNS) injury. They flood to the injury site creating a glial scar, a physical and chemical barrier that blocks the injury site from the rest of the body, and thus prevents neuron regeneration. One current study aims to induce astroyctes to migrate and orient parallel to the path of intended axon regeneration in the neuron so that they may act as a guiding barrier and facilitate neuron regeneration. For this to be achieved, however, the cellular adhesion of astrocytes on collagen must be observed. This study characterizes astrocyte adhesion on both native and grafted collagen, with native collagen as a control. Three peptides used to graft collagen are the bioactive sequences RGD and KHIFSDDSSE, known to promote cell adhesion, and the scrambled

sequence RDG, used as a grafted control. Four groups were studied: immortal astrocytes, both reactive and native, and primary astrocytes from rat pups, both reactive and native. Astrocytes were made reactive in media containing the additive, dibutyryl cylic AMP. Astrocytes were plated in 24-well plates onto the collagen substrates and allowed to settle and attach for 1 hour. Wells were rinsed with PBS, and the remaining cells were fixed, stained with DAPI, and imaged. Four fields were imaged for each well. The cells in each field of view were then counted and totaled for each well. It is expected that the most cells will adhere to RGD and KHIFSDDSSE grafted collagen, while the fewest cells will adhere to RDG grafted collagen. Native collagen will likely promote cell adhesion in between these two extremes. It is also expected that there will be a difference in adherence between activated astrocytes and native astrocytes for both the immortalized and primary cell lines.

5A Sage Dunham
Westminster College

Mentors: Stephen Tse, PhD., and Mr. Nasir Memon
Department of Mechanical and Aerospace Engineering
Rutgers University

Spinel catalyzed flame synthesis of graphene and carbon nanotubes.

Carbon nanotubes (CNTs) and graphene are important allotropes of carbon, characterized by their excellent electronic and physical properties. Cost efficient and controlled synthesis of these substances is of vital importance for their use in a wide range of technologies. In this work, three metal oxide spinels ($NiAl_2O_4$, $CoAl_2O_4$, and $ZnFe_2O_4$) are examined as catalysts for the growth of graphene and CNTs. The spinels are first synthesized by a co-precipitation method in an alkaline solution, and then characterized by X-ray diffraction (XRD) and deposited upon a variety of substrates. XRD results for the catalysts show a spinel crystallite size of approximately 4 nm for $NiAl_2O_4$, 9 nm for $CoAl_2O_4$, and 28 nm for $ZnFe_2O_4$. These substrates are placed into a novel open atmosphere methane-hydrogen multiple inverse diffusion flame, where species, including CNTs and few layer graphene, are grown. The quality of the resulting product is determined by Raman spectroscopy and field emission scanning electron microscopy (FESEM). Raman spectroscopy and FESEM show the presence of small diameter CNTs for all three metal oxide spinels, on both quartz and copper substrates, suggesting that spinel catalyzed growth of CNTs may be possible on a large array of thermally stable substances. Experiments for the catalytic growth of graphene are on-going, with early indications that their production may be inhibited by the small spinel particle size.

6A Salim Ghodbane
The College of New Jersey

Mentors: Nir Nativ
Rene Schloss, Ph.D.
Martin L Yarmush, M.D. Ph.D.
Department of Biomedical Engineering
Rutgers University

***In vitro* screening of hepatocyte defatting compounds using a hepatocyte cell line.**

The only successful treatment for end stage liver disease is orthotropic liver transplantation (OLT). However, in the past decade, there has been a severe shortage of livers available for transplantation that results in approximately 2,000 people on the waiting list to die each year. Nearly half of the livers rejected from the donor pool are due to steatosis, abnormally high hepatic intracellular triglyceride levels. We are attempting to find a method of metabolic preconditioning that would reduce intracellular triglycerides in steatotic livers to levels acceptable for transplantation. We developed a system to study

this phenomenon *in vitro* by inducing micro steatosis in a dose dependent manner by supplementing the media with free fatty acids. We found 11 candidate factors that promote lipid export and/or oxidation in hepatocytes. These factors were then screened on a hepatocyte cell line, HepG2 C3A, *in vitro* in a high throughput experiment to find the optimal "defatting cocktail" that result in the greatest reduction in lipids while preserving hepatocyte function. Cell function was quantified by staining for various markers of cell function. These include staining for viability using calcein and ethium homodimer, mitochondria polarization using Jc-1 staining, and radical oxygen species with MitoSox Red stain. Additionally, we monitored albumin and urea secretion levels. Using this system, we have identified that some compounds, such as L-Carnitine, cause a significant decrease in triglyceride levels. In the future, we would like to utilize these compounds in an *ex vivo* perfusion system in order to decrease the triglycerides in steatotic livers. If a treatment for steatotic livers can be developed, the liver donor pool will be nearly doubled, thus saving thousands of a lives a year.

7A Alfred M. Irungu
University of Maryland, Baltimore County

Mentors: Alberto Cuitiño, Ph.D and Yuriy Gulak, Ph.D
Department of Mechanical and Aerospace Engineering
Rutgers University

Tablet dissolution characterization via computational image processing.

In an effort to create effective products that both meet tough patient requirements and tougher FDA regulations, pharmaceutical companies spend countless hours and millions of dollars, during the drug design cycle. All of this is in attempt to quantify the performance of their products. In the case of tablets, optimization of the drug design process could prove to be a cost effective investment for the companies. Currently, the design processes is especially limited by dissolution tests that amount to little more than basic measures of tablet dissolution speed. And although these tests are important in gauging the performance of the tablet, the manner in which they are conducted, and the fact that they offer no insight into the mechanism behind dissolution, renders them an inaccurate means of quantifying performance. Through the characterization of dissolution by means of computational image processing, it is not only possible to quantify the interplay between physiochemical interactions and tablet structure, but this is possible with greater speed and accuracy. By employing techniques such as this, companies can save both time and money; discovering that drug performance can be more directly linked to manufacturing processes and decisions made during the design phase.

8A Wanze Li
Rutgers University

Mentors: Dr. Athanas Koynov, Department of Chemical Engineering, Rutgers University
Dr. Alberto Cuitiño, Department of Mechanical and Aerospace
Rutgers University

Evaluation of Lab-Scale Manually- Agitated Granular Powder

Throughout the process of manufacturing pharmaceutical tablets, one of the most critical material properties to control is the homogeneity of the powder blend. Most mixers are designed for mass production powder mixing. More active ingredients are required in order to start an experiment. As with the process of developing a new drug, the active ingredients are expensive. We decided to find a way to reduce the cost of actives and at the same time still produce powder blends of high level of homogeneity.
The lab-scale agitated powder granular method is an efficient alternative in small volume mixing for powder-based products. The method is used to determine the effects of different loading fills and mixer geometry. In this work, we chose acetaminophen as the active substance because of its poor flow

property. In order to improve the ability of forming a tablet and enhance the performance of drug flow, microcrystalline cellulose is the excipient of choice for the study. In each batch, we blend a twenty gram mixture and 5%, 7.5%, 10%, 12.5%, 15% acetaminophen. As for the choice of mixer, a cylindrical mixer cup and a regular cup with a forty five degree angle are used to compare the performance of mixing. Results indicate that, of these two parameters, loading fill and mixer geometry become significant factors through the study of powder mixing. A mixer cup with 45 degree angle enhances the mixing performance when compared with a regular cylindrical mixer cup. Based on our experimental results and calculations, we discovered that a mixture with a larger amount of acetaminophen will mix better. In that case, we found a linear relationship between the amount of acetaminophen and the result of the powder blend homogeneity.

9A Sarah Mailhiot
Rensselaer Polytechnic Institute

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

Improved Stem Cell Viability within a Semipermeable Membrane-Sealed Microfluidic Device

Stem cell behavior is regulated in part by the environment, or microniche, that surrounds the cell. These microniches may be recapitulated in vitro using microfluidic devices. However, culture requirements for cell laden microfluidic devices that are needed to overcome diffusion limitations introduce factors that affect cell viability, cell proliferation, and morphologic behavior. Currently , microdevices are sealed to an impermeable substrate and nutrients are either delivered through diffusion from inlet and outlet holes, which limits the size and complexity of devices, or more often through active perfusion, which adds an additional mechanical variable to the environment. In a previous study, our lab developed a novel method to improve fibroblast viability in microfluidic devices by sealing devices with a nanoporous membrane, which allows essentially free diffusion from culture media into the devices. In the current study, we evaluate the potential of membrane sealed devices for the culture of stem cells, a particularly shear and nutrient sensitive cell type. More specifically, we compare the viability of mouse embryonic stem cells, human H1 neural stem cells, and rat mesenchymal stem cells in glass sealed, membrane sealed, and unsealed devices at 24 hours, 2 days, 3 days, and 7 days. The cell viability was quantified by imaging DAPI- stained cells with epiflourescence microscopy using a 4x objective lens and counting the cells. The results thus far show greater cell viability in membrane sealed devices for H1 Neural Stem Cells at 24 hours and 2 days as compared to glass sealed devices. Characterizing the culture requirements of different stem cell populations in these systems will assist in designing custom microniches. The future studies could include paracrine and autocrine signaling as well as how the geometry of the microniche affects stem cell behavior.

10A ValaRae Partee
University Of Georgia

Mentors: Donna Fennell, Ph.D., Valdis Krumins Ph.D.
Department of Environmental Sciences
Rutgers, The State University of New Jersey

Activity of Bacteria in Air

While increasing effort is applied to study the microbial ecology of air, relatively little is known about

whether airborne bacteria are metabolically active. The purpose of this project is to characterize the bacterial community structure in atmospheric samples and to evaluate sample growth on various substrates. This project is an attempt to evaluate the functional- and species- diversity of airborne bacteria in various environments. 1 m^3 air samples were collected from various sites across New Jersey using Biosamplers (SKC) and Supor filters (Pall).. The sites were selected to represent suburban (Cook College campus, New Brunswick, NJ), urban (Rutgers Camden campus), forested (Rutgers Pinelands Field Station, New Lisbon, NJ) and marine-influenced (Rutgers Marine Field Station, Tuckerton, NJ) air masses. The biosampler liquid was divided into four aliquots and enriched in minimal media with 1mM of one of the volatile organic compounds (VOC): methanol, ethanol, acetic acid, and acetone added as a growth substrate. The bacterial communities collected on the filters and in the enrichments were studied using denaturing gradient gel electrophoresis (DGGE). The communities in the enrichments showed a different physical appearance. Current findings support the hypothesis that microorganisms are present in air and can metabolize different VOC. Further research will attempt to determine whether the bacteria are active while airborne. This research has implications for global carbon cycling, atmospheric bioremediation, bacterial transport, and global climate.

11A Jonathan A. Porras
Marist College

Mentors: Daniel Seidel, Ph.D. and Mr. Matthew Richers
Department of Chemistry and Chemical Biology
Rutgers University

Redox-neutral α carbon-hydrogen bond functionalization of nitrogen heterocycles via intramolecular 1,5 hydride shifts.

Relatively unreactive carbon-hydrogen (C-H) bonds α to nitrogen in nitrogen heterocycles are functionalized via redox-neutral methods. Redox-neutral methods serve to cause chemical transformations without the need for harsh oxidants or reducing agents. For this work, the functionalization took place through an intramolecular 1,5 hydride shift with a dipolar intermediate to form a new ring system. This work evaluates the electronic preference of the reaction for application in larger, more complicated syntheses, through utilizing an *o*-(2-methyl-piperadyn)yl-benzaldehyde as a starting material. A new substituted tetrahydroquinoline product was synthesized wherein the more substituted regioisomer was favored, as was made evident by proton nuclear magnetic resonance spectroscopy.

12A Alexander Proctor
The Cooper Union for the Advancement of Science and Art

Mentors: Benjamin Glasser, Ph.D. and Xue Liu, Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers University

Parametric Analysis of Fluidized Bed Drying of Pharmaceutical Materials

Fluidizing bed drying is widely used in the pharmaceutical industry to remove moisture from granules or powders after the wet granulation step in manufacturing. In this work, fluidized bed drying was examined for Dibasic Calcium Phosphate Dihydrate ($CaHPO_4$) powder. We have tested the impact of air temperature, initial water content, air flow rate, and loading weights on the drying process. The moisture content inside the samples was measured using both a loss-on-drying (LOD) method and a Near-Infrared (NIR) spectrograph. Our results indicate that the drying rate can be enhanced by either increasing the

temperature in the drying air or increasing the air's velocity. When performing a test with high initial moisture content, three stages could be distinguished during drying: a pre-heating stage, a constant drying rate stage, and a falling rate stage. With a decrease in the initial amount of moisture, it was observed that the constant drying rate stage reduced in duration. We believe that this is a product of the porosity of the material and the pore size distribution inside the powder. To investigate the effect of particle size on the drying process we sieved some samples from the tests into three size classes: coarse, medium, and fine, and examined the drying process based on each individual size class. Our results can help improve our understanding of the fluidizing bed drying process, and therefore shed light on some fundamental drying mechanisms.

13A Dylan J. Richards
Furman University

Mentors: Ms. Ying Li
Mr. Mohammed Islam
Dr. Li Cai, Ph.D.
Department of Biomedical Engineering
Rutgers University

POU3f2 Motif in Progenitor-Specific Gene Expression during *Gallus gallus* Embryonic Retinal Development

The complex of transcriptional regulatory networks is a major challenge in understanding how the regulation of gene expression influences cell-type specification, such as in the central nervous system (CNS) embryonic development. Specifically, the exploration of active enhancers in retinal development has yet to be fully understood. Using a bioinformatic approach, we have recently identified a 22bp motif of retinal enhancer element found in mouse (*Mus musculus*) and human (*Homo sapien*) genomes, which acts as a binding site for the POU3f2 protein, a known *trans*-acting element in the embryonic retinal development. The purpose of this study is to confirm the gene regulatory activity of this 22bp motif in chicken embryos (*Gallus gallus*). The predicted motif was inserted into a plasmid construct containing green fluorescence protein (GFP) as a reporter with a minimal β-globin promoter. This reporter system, in addition to the CAG-DsRed control plasmid, was then injected into the embryonic chicken retina with electroporation technique to transfect the retinal stem/progenitor cells. The transfected retina will be examined for GFP expression that was resulted from the motif activity and later for specific cell-type GFP expression. The proportion of each cell type will be quantified by retinal cell-type specific staining and the GFP expression. The insight gained from this study will allow us to further explore and understand the processes that control development, and contributing to the knowledge needed to progress injury and regenerative-based medical therapies.

14A Michelle Sempkowski
The College of New Jersey

Mentors: Mr. Amey Bandekar
Stavroula Sofou, Ph.D.
Department of Biomedical Engineering
Rutgers University

Effects of liposome size and surface modification on cancer cell targeting and macrophage association

Therapeutic drugs, which aim to combat the invasion and metastasis of malignant cancer cells, often cause toxicity within healthy cells as a result of their inability to be selective for cancer cells. Previous studies have shown that liposomes can be used as biocompatible vehicles for cancer therapy by

encapsulating the drug itself and targeting the fast-dividing malignant cells. Molecular targets common to both healthy and cancer cells are overexpressed in cancer cells, potentially enabling the surface modification of a liposome to be accordingly modified to improve their selective killing efficacy. Here we show that altering liposome size and surface structure results in different cell binding and internalization by cancer cells and by macrophages. Phosphatidylcholine- and phosphatidic acid-based liposomes were prepared to be unilamellar and 100 nm, 200 nm, 300 nm and 400 nm in diameter. Additionally, the vesicles were either kept in their zwitterionic form, or modified to have polyethylene glycol (PEG) chains, anti-HER2/neu antibodies or peptides and/or positive charge. As determined by way of encapsulated fluorescent markers, we expect that liposomes prepared with polyethylene glycol (PEG)-conjugated lipids and anti-HER2/neu antibodies or peptides will most effectively bind and be internalized by HER2/neu expressing cancer cells. It is also expected that the extrusion of liposomes to 100 nm diameter will reduce the degree to which J774 macrophages bind and deactivate the liposomes, suggesting that a liposome diameter of 200 nm or greater may be potentially detrimental to the *in vivo* viability of the vesicle. Together, our results have the potential to reveal the combination(s) of structural features at which liposomes can exhibit optimal targeting and blood circulation, even in the presence of macrophages, to reduce the level of toxicity experienced by normal functioning organs and minimize the dosage needed to kill the cancer cells.

15A Lexi René
Brooklyn College, The City University of New York

Mentors: Andrew J. Baker Ph.D. and Mr. Amitpal S.Tagore
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Lens modeling of the galaxy cluster MACSJ0451.9+0006

A dusty galaxy is the product of merging galaxies; this merger leads to an increase in the star-formation rate causing supernovae to occur more frequently and producing dust to hide the galaxy at optical wavelengths. Observing dusty galaxies shows how massive elliptical galaxies were formed today. Dusty galaxies are hidden at visible wavelengths but the dust is heated by processes within the galaxy and this heated dust re-radiates at longer wavelengths which puts the constraint on astronomers to use radio data to view these galaxies. Submillimeter galaxies are a particular type of dusty galaxy which the Submillimeter Common-User Bolometer Array (SCUBA) observed at a wavelength of 0.85mm; these galaxies were discovered by Smail et al. (1997). To view these dusty galaxies we use gravitational lensing which can be referenced as nature's magnifying glass for outer space. Our research sets out to model the galaxy cluster MACSJ0451.9+0006 by using gravitational lensing. We will measure the mass distribution of the galaxy cluster by using the software programs Gravlens and Lensmodel. The main parameters being varied in the code are Einstein radius/ mass, the x and y coordinates of the lensing galaxy, ellipticity, the angle of ellipticity, shear, and the angle of shear. The coordinates produced by the code need to simultaneously fit the coordinates of the image, the lensing galaxies and the cluster itself. Through an iterative process we will create an accurate model of MACSJ0451.9+0006. Upon completion of the modeling we will have determined to what extent MACSJ0451.9+0006 is lensing a particular dusty galaxy in a previous mapping of dusty galaxies in the same concentrated area.

16A Katrina Wunderlich
The College of New Jersey

Mentors: Leslie Jimenez, Ph.D.
Department of Chemistry & Chemical Biology
Rutgers University.

A study in the synthesis of *meta*-substituted compounds

The ability to create a compound and its analogs readily has significant implications for medicinal chemists. Selectively substituting the *meta*-position of an aromatic compound functionalized with an *ortho/para* director has proven difficult. Reported here is a new synthetic methodology to create a series of these *meta*-substituted aromatic compounds. By placing bromine and/or chlorine in the *ortho* and *para* positions with respect to an *ortho*/*para* director, the *meta* position can be functionalized. In the first step of a two step method to produce *meta*-substituted benzenes, the electrophile was added to the 5-position using electrophilic aromatic substitution or the 3-position using lithiation. In the second step the compound was catalytically dehydrogenated. Preliminary results using 2, 4-dibromoanisole as the starting reagent indicate that the alkoxybenzene is more readily substituted in the 6 position when utilizing electrophilic aromatic substitution. Electrophilic aromatic substitution of 2, 4-dichlorotoluene in the 5-position has been met with limited success with a variety of functional groups. Preliminary results indicate that lithiation of the 2,4-dicholortoluene in the 3 position has been successful. All product characterization was completed using ^{1}H and ^{13}C nuclear magnetic resonance (NMR). Future research should be done to pursue methodologies to successfully substitute the alkoxybenzenes in the *meta* position.

17A Danielle Mazza
Ramapo College of New Jersey

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

Mr. Kapil Deshpande
Graduate School of Chemical and Biochemical Engineering
Rutgers University

Measuring fluorescence output of alginate-chitosan nanoparticle phases

In order to verify the formation of multiple phases of nanoparticle formations in mixed solutions of alginate microspheres and chitosan nanoparticles, a method of quantification must be developed. To achieve this, a fluorescence spectrometer was used to measure the fluorescence output of nanoparticle samples in response to a pulsed xenon light source – the intensity of the fluorescence signal and area under the emission peak indicated the degree to which microspheres had attracted the nanoparticles and other spheres, as compared to free chitosan and alginate which had not adsorbed to each other. Possible nanoparticle phases of formation are: 1) dispersed non-haloed, in which the particles are freely suspended in solution, 2) agglomerated, where large masses of alginate and chitosan are formed, or 3) haloed, in which most chitosan nanoparticles adsorb to the surface of the alginate microspheres to form independent colloidal units. By testing solutions in succession from a large alginate-chitosan ratio to a small one, it was found that a relatively large such ratio (>5.6) maintained the dispersed non-haloed phase, solutions with a moderate ratio (5.6 – 0.175) formed an agglomerated phase, and a low ratio (<0.175) ultimately began the haloed phase. Dispersed samples gave low

fluorescence readings because the particles are freely and uniformly suspended, while agglomerated samples gave high fluorescence output because of the large masses of fluorescent particles in solution. Haloed samples gave moderate readings, which indicate that the colloidal particles formed are smaller and less bulky. This data will be used to further investigate other alginate-chitosan ratios which are past the critical point of nanoparticle halo formation and to create a phase diagram of the three nanoparticle phases studied in this experiment.

18A Kandyce C. Perry
Spelman College

Mentors: Nicholas Skizim, and Charles Dismukes, Ph.D.
Department of Chemistry & Chemical Biology
Waksman Institute of Microbiology
Rutgers University

Development of a LC-MS/MS based method to quantify proteins in C*yanothece* spp.Miami043511 for hydrogen production optimization.

Energy security and cyanobacteria may prove to have a symbiotic relationship one day. Cyanobacteria are blue-green organisms that conduct photosynthesis, and many strains can perform nitrogen fixation. Nitrogen fixation is the process of reducing atmospheric nitrogen to ammonia, a form that can be used as a nutrient for the organism. Oxygen, naturally produced as a waste product from photosynthesis, inhibits the ability of the bacterial enzyme—nitrogenase—to reduce nitrogen and produce hydrogen as a byproduct. Therefore, nitrogenase must function under dark and anaerobic conditions in unicellular nitrogen fixing organisms. In this study, we have developed an extraction method for the proteome of *Cyanothece* spp. Miami 043511 and quantified proteins involved in the biological pathways of supplying energy to the process of nitrogen fixation under dark and anaerobic conditions. We anticipate our results to indicate which proteins are present in the lowest abundance and identify them as targets for future genetic manipulation to over express those proteins. This approach of understanding enzyme concentration and tailoring expression levels to optimize hydrogen production can be used to maximize the efficiency of hydrogen production by cyanobacteria and allow these organisms to serve as renewable energy vessels for a more carbon neutral society.

ABSTRACTS

Poster Session B

1B Patricia M. Alvarado
University of Puerto Rico at Mayaguez

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

Effect of material properties and operating conditions on variability of feed rate in a continuous powder feeder

In manufacturing processes involving large capacities, continuous processing is considered a viable and preferable choice. The main advantages to the pharmaceutical industry are that continuous processes (i) only need an extension of time to increase capacity, (ii) can operate efficiently with in-line controllers, and (iii) use smaller equipment resulting in reduced capital costs. An important step in a continuous process is controlled powder feeding. This project will study the fundamental and a practical understanding of the impact of powder material properties, device design, and operating conditions, on the variability in powder feed rate to allow for optimal operation. A loss-in-weight feeder will be used with different types of powders, screw/screen configurations, and feedrate setpoints to develop a response surface of the feed flow variability. Understanding the influence of basic processing operations on mixing is enhanced by effective and fast sensing technologies. The feedrate is monitored by a catch scale,that can accurately record powder mass flows at high sampling rates. By comparing the distribution of the original unfiltered data with the filtered data it is possible to further optimize the filtering procedure.

2B Roger Arhin II
CUNY Lehman College

Mentors: Daniel Pilch, Ph.D. and Malvika Kaul, Ph.D.
Department of Pharmacology
UMDNJ-Robert Wood Johnson Medical School

G-quadruplex stabilizing compounds as anticancer agents

G quadruplex DNA has been experimentally determined to potentiate the mitigation of oncogene expression. We explored the structure of a putative quadruplex forming sequence, *bmi1,* and its ability to bind with a quadruplex-specific drug. To address this, we conducted a UV-melting experiment at 295nm. The analysis showed that *bmi1* has a hypochromic transition in potassium ion buffer at 78.04°C. As a key to identifying how this quadruplex is formed, a circular dichroism spectral analysis was employed to study the structure of *bmi1*. Result from this analysis showed that *bmi1* has a parallel motif. In addition to structural information, circular dichroism allowed us to determine the molecualrity of this quadruplex sequence. A concentration dependence assay of *bmi1* was consistent with a monomolecular quadruplex. We sought to determine whether a quadruplex specific-drug, SR-10-71, will bind to *bmi1*. UV-analysis showed a highly stable drug-DNA interaction. Fluorimetric titration enabled the stoichiometric characterization of the *bmi1*—SR-10-71 interaction. Herein, the fluorescent nature of SR-10-71 allowed us to measure the spectral properties of the drug—DNA interaction. A 3:1 ratio of the drug and DNA was deduced from this analysis. Current studies are ongoing to determine the drug's binding affinity.

3B Adrian Clarke
Massachusetts Institute of Technology

Mentors: Manish Chhowalla, Ph.D., Hisato Yamaguchi, Ph.D., Damien Voiry, Ph.D.
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

Synthesis and characterization of graphene oxide and transition metal dichalcogenides in the form of thin films

Electronic devices are a driving force in technology, especially for emerging technologies in power electronics and information technology, however they are limited by the optoelectronic characteristics of their materials. Developing novel formulations of existing materials may extend some of the limitations inherent in each device. Here, we develop thin mono- and multilayer films with tunable optoelectronic properties using chemical exfoliation. Materials explored are graphene oxide(GO), molybdenum disulfide (MoS_2), and niobium diselenide ($NbSe_2$). Optoelectronic properties are tuned by changing the level of concentration of each substance and/or annealing in high temperature (200 to 350°C) vacuum. Materials are intercalated with lithium to exfoliate them into single layers, and then deposited onto a membrane of approximately 15 cm^2 via vacuum filtration. Films are cut from the membrane and deposited onto a small substrate of either glass or silicon and characterized to determine their optoelectronic properties. Results of characterization have shown that MoS_2 and $NbSe_2$, after annealing at temperatures above 200°C, display photovoltaic properties, however GO does not. Annealing also increases the absorbance (opacity) of all materials. Raman spectroscopy has shown that GO has a highly non-uniform oxygen distribution, which may be useful in determining effective ways of reducing GO to graphene, a material with extraordinary electrical properties. On layered combinations of MoS_2 and GO it also shows that MoS_2 deposited on top of GO may change the electrical characteristics of both materials, however further analysis is necessary. Continued exploration of tuning methods is necessary to determine if the optoelectronic properties of each material can be exploited effectively.

4B Ana Iris Correa Muler
University of Puerto Rico, Mayaguez

Mentors: Debashish Bhattacharya, PhD, and Jeferson Gross, PhD
Department of Ecology, Evolution, and Natural Resources
Rutgers University

Functional genomics of salt resistance in *Chlamydomonas reinhardtii* with applications in microalgal biofuel production

Algal biofuels are an emerging renewable energy source. Lipids stored by microalgae could be extracted for biodiesel production. This process is not accomplished cost-effectively, among other reasons, because microalgae are grown on open-air ponds which could be contaminated limiting nutrient availability. To prevent contamination, the ponds could be enriched with salt to allow only halotolerant microalgae to grow. *Chlamydomonas reinhardtii* are freshwater microalgae which, although not considered for biofuel production, are a useful model for understanding salt-resistance physiology. A progenitor colony was

grown and divided into 7 populations, five of which are evolving to adapt to salt concentrations close to 600mM or seawater condition. Currently, these populations of approximately 400 generations are growing at 200mM. During adaptation genomic mutations accumulate changing gene expression. Hence the genome, transcriptome, and degradome will be isolated and sequenced on the Illumina platform to be compared to the progenitor. The degradome is composed of mRNAs regulated by small RNA molecules that base-pair to it, tagging for cleavage. These small RNA molecules will also be sequenced and studied. Presently, functional genomics of the progenitor grown under normal and salt-stress conditions are been performed for comparison. Sequence differences are expected due to salt-resistance which would provide changes in metabolism.

5B Liliana Fernandez
Albright College

Mentors: Dr. Paul Takhistov
Department of Food Science
Rutgers University

Phong Huynh
Department of Food Science
Rutgers University

Taste Masked Caffeine Using Gelatin B and HPMC Polymeric Film

Taste of oral pharmaceuticals is one of the biggest problems in patient compliance. Another problem in drug delivery is swallowing pills or capsules, which is something affected by age, handicap, or type of illness. Taste masked polymeric film or Oral Strip Technology, a new method of drug delivery, has been formulated to address both of these problems. In this research two types of polymeric films, layered and composite, were developed using E4M (HPMC), Gelatin Type B and maltose as a sweetener. The taste masking abilities of each film were tested on human volunteers and preliminary results show that the composite type of film was more effective in masking the taste of caffeine.

6B Lauren Henderson
Oakwood University

Mentor: Tamara Minko, Ph.D.
Earnest Mario School of Pharmacy
Rutgers University

Preparation and characterization of liposomal form of prostaglandin E2 for treatment of pulmonary fibrosis

Pulmonary fibrosis is a fatal disease that does not have any FDA approved treatment and can be induced by the drug bleomycin. Research studies have shown that liposomes are an instrumental form of drug delivery because of their physical characteristics of hydrophilic and hydrophobic phospholipid bilayers making them an ideal candidate for drug delivery by inserting drugs into their hydrophobic membrane or hydrophilic core. Studies have proven that Prostaglandin E2 limits fibroblast proliferation and collagen secretion and shows that pulmonary fibrosis prevents Prostaglandin E2 from effectively working. We hypothesize that delivery of exogenous Prostaglandin E2 into the lungs with lung fibrosis will limit the progression of the disease preventing high mortality from pulmonary fibrosis. In this experiment, the cytotoxicity of A549 cells with bleomycin will be studied to determine the dosage of bleomycin to administer to the SKH1-hr hairless mice to induce pulmonary fibrosis and then QRT-PCR will display the gene expression. The genotoxicity of liposomes will show the genetic damage of Prostaglandin E. to the liposomes. For future study, once the liposomes with the drug are characterized and prepared, various

tests will be run to show the effectiveness of treatment of pulmonary fibrosis using an aerosol formulation of liposomal prostaglandin E delivered by inhalation.

7B Joey J. Leveille
College of St. Scholastica

Mentors Frederico Sesti Ph.D. and Edith Hernandez Ph.D.
Department of Physiology & Biophysics
UMDNJ-Robert Wood Johnson Medical School

Oxidative stress of KV2.1 holds significant evidence towards the mechanism of Alzheimer's disease.

Alzheimer's disease is the most common neurodegenerative disorder. The study of mammalian specific KV2.1 potassium (K+) ion channels may hold the key to our understanding of neurodegenerative mechanisms and regulation of these disorders. An increase of reactive oxygen species (ROS) is prominent in aging individuals and those with neurodegenerative disorders. It is hypothesized that potassium (K+) ion channels in neuronal tissue in mammals are subject to modification in the presence of reactive oxygen species (ROS), which in turn leads to decreased channel excitability and cell death. This study seeks to determine the effect of oxidative stress on mammalian specific KV2.1 K+ ion channels. We will use a neuroblastoma cell line expressing KV2.1 to examine the effect of oxidative stress on cell viability. In addition, we will examine the impact of a KV2.1 mutation at C73A on cell resistance to oxidative stress. The results of these studies will lead to a better understanding of Alzheimer's and many other neurodegenerative diseases.

8B Christopher Lowe
University of Massachusetts Amherst

Mentors: Dr. Prabhas Moghe and Mr. Aaron Carlson
Department of Biomedical Engineering
Rutgers University

Collaborators: Dr. Alex Niemark and Mr. John Landers
Department of Chemical and Biochemical Engineering
Rutgers University

Engineered microenvironments for neural stem cells

The human central nervous system has a limited ability to repair itself following injury, and thus damaged tissues must be replaced from an alternative source. Neural stem cells (NSCs) have been demonstrated to differentiate into various cell types key to the development of the nervous system. NSCs are a promising source of cells, however, cell survival, integration and the differentiation process remain key obstacles to their implementation. A bioactive, transplantable system that promotes the growth and differentiation of NSCs can provide a viable environment for the introduction of NSCs into an afflicted system. An environment that mimics the topography, surface chemistry and presence of growth factors that are present in the natural extracellular matrix (ECM) can be the basis for a therapeutic system. The incorporation of carbon nanotubes (CNTs) can lend additional benefits to a scaffold environment based on their mechanical, structural and conductive properties. To that end, my REU project is focused on the design of scaffolds based on CNTs and biodegradable polymers. We hypothesize that the combination of fibrous scaffold architecture and CNTs will enhance NSC differentiation to neuronal lineages relevant for CNS repair. In this study, we will incorporate CNTs into fibrous scaffolds with variable architectures via an electrowetting technique and characterize NSC viability and neuronal differentiation within these materials. Through this study we expect to determine the role of CNTs in our electrospun scaffolds and their effect on NSC differentiation and axon length. Insights gained from this research can be further

incorporated into future nano-fibrous scaffold microenvironments and optimized for nervous system reconstitution and repair.

9B Michael McCoy
University of Missouri-Columbia

Mentors: Leora Nusblat, M.S., Department of Biomedical Engineering
Margot Zevon, Department of Biomedical Engineering
Charlie Roth, Ph.D., Department of Chemical & Biochemical Engineering
Rutgers University

Combined effects of carmustine and STAT3 siRNA silencing in glioblastoma spheroids

Multicellular spheroids can be used for modeling solid tumors and provide a method for performing *in vitro* analyses of drug treatments. U87-MG glioblastoma cells were used to create 3D spheroids to mimic the microenvironment of brain tumors, specifically in assessing the efficacy of a combination of STAT3 short interfering RNA (siRNA) with carmustine. Spheroids prepared using the hanging drop method were treated with STAT3 siRNA using Lipofectamine 2000 for 6 hours, at which time varying concentrations of carmustine were added. Cell viability was monitored over a period of four days using live/dead and MTS assays. Calcein-AM, ethidium homodimer, and DAPI were used to stain cells, and images were taken using confocal microscopy. Spheroids were also cryosectioned in 20 μm slices, stained, and then imaged. MTS assays were performed on all of the time points as an assay of cellular metabolism to complement results obtained from live/dead imaging. Confocal microscopy, in conjunction with cryosectioning, provided measureable results on the cell viability of the interior of the spheroid. Additionally, in instances when the spheroid's diameter was sufficiently small, cryosectioning was unnecessary and confocal imaging alone was satisfactory in providing spheroid viability. Cells transfected with siRNA for STAT3 and treated with carmustine had less viable cells than the non-transfected control, though transfection was limited to cells at the periphery. We expect for this effect to be maximal at 48 hours.

10B Marisha Perkins
University of the Virgin Islands

Mentors: Lawrence Williams, PhD and Mr. Libing Yu
Department of Chemistry and Chemical Biology
Rutgers University

Oxygen-Methylation of the Aldehyde Precursor for a 14-Membered Macrolide Antibiotic

Within the last 60 years, macrolactone glycosides (macrolides), a class of natural products composed of macrocyclic lactones to which one or more deoxysugar residues are attached, have gained recognition as powerful antibiotics. Erythromycin, the first macrolide introduced as an antibiotic for humans, is used clinically to treat certain bacterial infections. Our group has been developing a series of synthetic strategies to prepare derivatives of erythromycin with modification of the macrolide precursor developed by our group. One synthetic route involves the aldehyde precursor, in which the hydroxyl functional group is methylated. Several strategies were tested throughout this study for the oxygen-methylation of the aldol product. However, appropriate *O*-methylation of the aldol was completed using Meerwein's Salt (Me_3OBF_4) and proton sponge in dichloromethane. This reaction proved to be efficient based on time, absence of by-products, and greater than 90% yield of the desired methoxy product. In future research, the synthetic route (*O*-methylation) determined by this study will be used in the synthesis of several of the Erythromycin derivatives proposed by our group. This preparation of the methyl ether allows us to further test the generality of our group's findings and is the basis for the attachment of an important group (methoxy) at C-6.

11B Izmarie Poventud-Fuentes
University of Puerto Rico, Mayagüez

Mentors: Margot Zevon
Dominik Naczynski
Prabhas Moghe, Ph.D.
Charlie Roth, Ph. D.
Department of Chemical and Biochemical Engineering
Rutgers University

Effects of albumin nanoparticles' physical characteristics on tumor penetration

Tumor penetration is a major barrier in drug efficacy for cancer therapy. Various factors, including the tumor's dense extracellular matrix, hypoxic environment and poor vascular network, hinder drug delivery; current treatments generally access only the external surface of the tumor mass. Albumin nanoparticles can be used as a new tool for the development of delivery and imaging system. The primary focus of this project is to identify the key determinants of tumor penetration using albumin nanoparticles in *in vitro* models. Albumin nanoparticles (ANPs) encapsulating rare earth (RE) elements were fabricated by complex coacervation using either 10 mM or 2 mM NaCl concentration to modulate the aggregation process. The average size (diameter) of ReANPs obtained using a Zetasizer was 107 nm and 198 nm, respectively. U87 tumor cell spheroids were treated with the ReANPs to determine the effect of the diameter of these nanoparticles on tumor penetration at the 3, 24, 48 and 72 hours of treatment. The degree of penetration was examined by cryosectioning of the treated spheroids and confocal microscopy. The incorporation of the REs enables in situ imaging. We hypothesize that ReANPs with smaller diameters will show increased penetration over time, due to lower steric hindrance within the extracellular matrix. Controlled nanoparticle sizing will be validated as an important factor governing tumor penetration, which can be used to design drug delivery regimen with improved biological efficacy.

12B Eric Refour
University of Georgia

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

Investigation of the effect of varying aluminum volume fraction in three phase piezoelectric composites and the discussion of percolation

Hollow ceramic spherical beads are currently used in acoustic liners to absorb jet engine noise. However, because these liners are passive, they can only absorb acoustic energy within a limited frequency range. The use of piezoelectric materials (i.e, materials that can produce a voltage when stress is applied or vice versa) may be a viable replacement for these materials for noise attenuation. Previous work has focused on the use of simple, homogenous piezoelectric materials such as lead zirconate titanate (PZT). However, these materials are brittle and have poor mechanical properties. Composite piezoelectric materials could address both issues: noise attenuation and mechanical brittleness. These materials have enhanced mechanical strength and can be tuned to address wider frequency bands. In this work, we examine the piezoelectric strain coefficient and the dielectric constant of a three phase PZT-epoxy-aluminum (Al) composite, to determine the volume fraction(s) of Aluminum at which percolation, a conductive pathway created by the conductive particles within the composite, occur. The volume fraction of PZT is held at 0.3, while the volume fraction of Aluminum is varied (0.01, 0.09, and 0.17). The samples are fabricated using a sol-gel and cold press technique, wherein the samples are polarized at ~0.2 kV/mm. The piezoelectric strain coefficients and dielectric constants were measured to be 0.6, .0.17, 1.12 pC/N and

24.65, 50.10, and 62.83 respectively. Through further investigation of higher Al volume fractions in the three phase PZT-Epoxy-Al composite, the percolation threshold and percolation limit can be identified.

13B Diara A. Santiago González
University of Puerto Rico, Río Piedras campus

Mentors: Andre Gow, Ph.D. and Chang -Jiang Guo
Department of Pharmacology and Toxicology,
Ernest Mario School of Pharmacy, Rutgers University

Surfactant protein-D regulation of macrophage phenotype is controlled by Nitric Oxide-mediated modification

Surfactant protein-D (SP-D) belongs to the pulmonary collectin family and plays a critical role in regulation of lung innate immunity and host defense. The oligomeric state of SP-D is critical to the regulation of macrophage stimulation, and is determined by two cysteine residues at the N-terminus. These cysteines are readily modified by Nitric Oxide (NO), to form SNO, and activate pro-inflamatory signaling. It is the goal of this project to determine the effect of SP-D and SNO-SP-D on macrophage phenotype. Raw264.7 cells (mouse macrophages) were treated with LPS (100 ng/mL) to induce the acute M1 macrophages phenotype or IL-4 (10 ng/mL) to induce the alternative M2 macrophages phenotype. The M1 and M2 macrophage were also incubated with or without SP-D over-expressing bronchael alveolar lavage (BAL) or SNO-BAL to investigate SP-D and SNO-SP-D effects on macrophage phenotype. The gene expression of IL-1β, CCL2, iNOS and Arginase was determined by RT and real-time quantative PCR assays. NOs activity assessed by Nitric Oxide Analyzer, and arginine was measured in cell lysates. The surface expression of Dectin-1 was determined by flow-cytometric analysis. Our data show that SP-D inhibits gene expression of pro-inflammatory mediators IL-1β, CCL2 and iNOS in the presence of LPS. SNO-SP-D stimulated the expression of IL-1β, CCL2 and iNOS. SP-D inhibits NO production in M1 macrophages, while SNO-SP-D shows no effect. IL-4 and SP-D enhance the surface expression of Dectin-1. Dectin-1 was decreased in LPS or SNO-SP-D treated cells. These data indicate that SP-D regulates macrophage to an M2 phenotype. SNO-SP-D shifts the macrophage phenotype to M2. The understanding of macrophage phenotypic alteration in the lung may produce a strategy of therapeutic approach for the pulmonary disease, such as chronic obstructive pulmonary dysplasia (COPD).

14B Gabriel Antonio Suárez
Interamerican University of Puerto Rico

Mentor: Sebastián Vega, PhD Candidate
Department of Chemical and Biochemical Engineering
Rutgers University

Advisor: Prabhas Moghe, Ph.D.
Department of Biomedical Engineering
Rutgers University

Elucidating high content organizational features of nuclear proteins in stem cells cultured in 3-D scaffolds

The effective control of stem cell differentiation through the rational design of biomaterial scaffold architectures is critical to the use of implantable materials for regenerative medicine. Recent studies have shown that scaffold fiber geometry plays an important role in directing stem cell orientation, promoting an increase in organized matrix deposition and stem cell differentiation. The Moghe lab has proposed using high content imaging of nuclear and cytoskeletal organization to parse longer term stem cell phenotypes,

however, the intracellular structural features of stem cells in three-dimensional biomaterial scaffolds remain to be elucidated. In this study, tyrosine-derived polymers were electrospun to fabricate fibrous scaffolds with different fiber diameters and orientations. Varying degrees of random and parallel nanofiber alignments were obtained for large (5.01±1.43μm) and small (2.48±0.40μm) fiber diameters. Human mesenchymal stem cells were cultured in mixed adipogenic/osteogenic induction media on the various fibrous scaffolds and multi-dimensional descriptors of two nuclear proteins, nuclear mitotic apparatus (NuMA) and nuclear speckle marker (SC35), were quantified at 24h and 72h post-seeding following confocal fluorescence imaging-based profiling approach. Key changes in the early organization of nuclear proteins elicited by different geometric configurations of the biomaterial scaffolds were identified. Insights from this study will help to determine the nuclear organization-based profiling to parse and predict long-term substrate-induced lineage commitment as modulated by combinations of growth factors and biophysical environments.

15B Vicky Weber
Ripon College

Mentors: Marie L. Radford, PhD.
School of Communication and Information
Rutgers University

Susan Wengler
School of Communication and Information
Rutgers University

"You Need to Contact Your Local Library Directly:" Referrals in the Virtual Reference Environment

Virtual reference services (VRS) have become increasingly important modes for delivery of online library assistance. Virtual reference (VR) allows users to get their reference questions answered in a convenient way, either by the librarian providing assistance or by a referral to a library or subject expert who can help them. This research aimed to find the frequency of referrals in VR, the types of questions referred and the destinations to which users were referred. 297 randomly selected transcripts were randomly selected from 296,796 sessions from June 2010-December 2010 from QuestionPoint live chat VRS and Qwidget Instant Message (IM) VRS. Qualitative analysis revealed that referrals were found to be present in 82 transcripts (27.6%). Policy and procedural questions were the types of questions most frequently referred with 37 of the 82 referrals (45%). It was also found that 55 of the 82 referrals (67%) referred the user back to their home library. From this pilot study, a preliminary coding scheme was developed to refine the analysis of the full corpus of 560 transcripts. The data from the pilot study indicates that VR practitioners and consortia members need to find a way to more effectively address local policy and procedure questions.

16B Jose Zhagnay
Stony Brook University

Mentors: Mladen-Roko Rasin, M.D., Ph.D., and Aditi Dubey
UMDNJ-Robert Wood Johnson Medical School

Distinct roles of CUGBP1 isoforms during neurogenic phase of neocorticogenesis.

Development of projection neurons during neocorticogenesis is a highly regulated process. However, the molecular mechanisms underlying subtype and laminar specification of developing neocortical projection neurons are not yet well understood. Here, we show that CUGBP1, an mRNA binding protein with two isoforms, is enriched as neurogenic phase of neocorticogenesis progresses, and is involved in

specification of neocortical projection neurons. Immunohistochemistry analysis showed expression of CUGBP1 in both ventricular zone (VZ) and cortical plate (CP) of developing neocortices during neurogenesis. In particular, CUGBP1 co-localized with PAX6, a marker of radial glia progenitors in VZ, and with TUJ1, a marker of postmitotic differentiating neurons. Using quantitative RT-PCR coupled to laser capture microdissection of stripes of the developing mouse neocortex, we found differential spatial expression of CUGBP1 isoforms. The longer CUGBP1 isoform had higher expression in CP, where postmitoic neurons are found. This data suggested that two isoforms can potentially have different roles. Indeed, *in vivo* silencing of distinct CUGBP1 isoforms by *in utero* electroporation of isoform specific shRNAs indicates opposing effect of knockdown of long isoform of CUGBP1, and knockdown of both isoforms on radial glia progenitors and postmitotic neurons. Taken together, these data indicate distinct CUGBP1-isoform specific roles during neurogenic phase of neocorticogenesis.

17B Kimberly Box
University of Kansas

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

SNP Mapping to identify a novel morphogenesis gene in *C. elegans*

The actin cytoskeleton is required during embryonic development in *C. elegans* for proper cell polarity that permits epidermal cells to migrate and enclose the developing embryo. Failure to properly polymerize actin results in lack of enclosure, and embryonic lethality. Branched actin formation initiates when the WAVE/SCAR protein complex activates the Arp 2/3 complex. There are five known genes in the WAVE/SCAR complex that when mutated will produce the Gex (gut on the exterior) phenotype. A mutant strain, *pj1* outcross 3, contains a new Gex mutation. The goal of this research is to use SNP mapping to determine where this mutation is on chromosome I and in which gene the mutation lies. Preliminary results indicate that the mutation is located in segment 13 of chromosome 1. Identifying the gene mutated in *pj1* will provide a new gene to be examined for its role in actin formation and morphogenesis.

18B Selimar Ledesma-Maldonado
University of Puerto Rico-Mayaguez Campus

Mentors: Victor Jin Ph.D. and Po-Hao Chen
Department of Pharmacology
UMDNJ-Robert Wood Johnson Medical School

The role of NIX in adipocyte differentiation.

Obesity is a known societal problem and it has been shown that there is a correlation between obesity and type II diabetes. Obesity is characterized by an increased mass of white adipose tissue. Scientific research suggests that autophagy is involved in adipocyte differentiation. Inhibition of autophagy may interfere in adipocyte differentiation, leading to reduction in obesity and its negatives complications. However, the exact mechanism by which autophagy is implicated in adipogenesis is not clear. Our previous data suggested that NIX is upregulated and might be post-translationally modified during autophagy activation in adipocyte differentiation. We want to determine if the post-translational modification is phosphorylation. We tested our hypothesis by exposing the cells to lysis buffer, phosphatase inhibitor and phosphatase at two different phases: before ("Day 0") and after ("Day 10") differentiation. Using a Western Blot assay we examined the presence or absence of the NIX bands after phosphatase treatment. The preliminary results suggest that NIX is phosphorylated, and there is a correlation between phosphorylation and adipocyte differentiation. However, further experiments are needed to confirm these observations.

BIOGRAPHIES

Kimaada Allette

Kimaada Allette was born in Brooklyn, NY. She expects to graduate in Spring 2013 with a Bachelor's degree in Biochemistry. This summer she has been excited to be participating in the RISE Program at Rutgers, working in the laboratory with Dr. Fan alongside Dr. Bao, and participating in the activities organized by the RISE Program. In addition her summer was spent socializing with her fellow participants (friends) along with exploring Rutgers, UMDNJ, New Jersey and the surrounding areas in her spare time.

Patricia Marie Alvarado Santiago

Patricia was born on August 17, 1989 in the beautiful island of Puerto Rico. One of the most important goals in her life is to became a professional and that the reason that her is studying Chemical Engineering in the University of Puerto Rico at Mayagüez, with a minor in Pharmaceutical Engineering. She has research experience in the Analytical and Pharmaceutical Laboratory and is an active member of the AIChE (American Institute of Chemical Engineers) and IIQPR (Institute of Chemical Engineer of Puerto Rico). She is currently doing research in the Department of Chemical and Biochemical Engineering studying continues process in controlled powder feeding as part of the RISE program. Patricia is social, joyful, lovely person and like to listen music, dance, play volleyball, play guitar and spent time with her family. Her future goal is to pursue a Ph.D. in Pharmaceutical Engineering and she is sure that this experience is going to enrich her academic, professional and personal life.

Marietta Álvarez

Marietta Álvarez was born in Arroyo, Puerto Rico on March 22, 1989. She was raised in Guayama, were she lived for most of her early years. Currently, Marietta studies Chemical Engineering at the University of Puerto Rico-Mayagüez Campus and expects to graduate next year with a certificate in Pharmaceutical Engineering. After graduation in May 2012, she plans to go to graduate school and obtain a PhD related to pharmaceutical engineering. During this summer she has been working at the Chemical Engineering's labs with Dr. Fernando Muzzio and Juan G. Osorio in a project related to powder mixing and continuous manufacturing. As her first Summer Internship experience, it has been an enriching and incredible opportunity for which she is very grateful.

Roger Arhin II

Roger Arhin was born in Ghana, West Africa. He is currently studying biochemistry at Lehman College and anticipates graduating in the spring of 2012. His interest in organic chemistry and biochemistry coupled with the desire to "make money" influences his future prospects of pursuing a PhD in pharmaceutical engineering. He is an avid reader and primarily enjoys fiction. One of his few aspirations is to become a screen writer. He has hopes of working for the U.N and joining the NAVY in the future. Roger counts his experience in RISE as something sort of a blessing. He is working with Dr.Pilch this summer to develop drugs that can inhibit the growth of oncogenes.

Natalie A. Austin

Natalie A. Austin was born in Accra Ghana, but she currently lives in Edgewood, Maryland. Natalie is a junior at the University of Maryland, Baltimore County and is a chemical engineering major. This summer, Natalie is enjoying research in Dr. Langrana's lab, studying the effects of substrate stiffness on cell differentiation. Natalie, as a result of this program, is becoming more confident in her plan to pursue a biomedical engineering degree in graduate school. Natalie likes to eat an assortment of foods, play tetris on Facebook, and hang out with all the wonderful people she met this summer. Natalie will leave this experience with a deeper understanding of what it means to do research.

Kimberly Box

Kimberly Box was born in Wichita, Kansas. She now attends school at the University of Kansas and is on track to graduate in May of 2012 with a B.S. in Genetics. After obtaining her undergraduate degree, she plans to take a year off before gaining entrance into an M.D./Ph.D. program. In that year, she hopes to complete more research in her lab at her home university and experience volunteering in a hospital environment. This summer she has been enjoying working in Dr. Martha Soto's Pathology lab.

Michael Clark

Michael was born and raised in Louisville, Kentucky. Yearning to make a better life for himself after seeing how exacting physical labor has been on his family, he decided to attend the University of Louisville and study Bioengineering; he will be graduating with a Master's degree in 2013. The RISE program has provided him with great insight into the world of research; insight that he can compare to what he has seen working in the biomedical device industry. Michael is currently contemplating pursuing a doctorate degree and is grateful that the RISE program is providing him with knowledge that he can use to make this decision. Michael has also become more cultured through making friends with students from Puerto Rico, Austria, and the Virgin Islands. He is grateful for the opportunity to work in Dr. Shreiber's lab with his mentor Jeff Fox. He learned many valuable lab techniques and practical research methodologies through his lab experiences at the RISE program.

Adrian Clarke

Adrian is from Ronkonkoma, NY, in the heart of Long Island, although he was born and spent several years of his childhood in Brooklyn, NY. As a mechanical engineering major at MIT, Adrian is interested in electric vehicles, alternative energy, and sustainable development. He is currently entering his third year in college. In his free time Adrian enjoys biking, tinkering with mechanical design projects, and playing intramural sports with his fraternity brothers at Theta Chi's Beta Chapter. He also enjoys exploring the rich culture and college-town nightlife of Boston. He hopes that, as his first research experience, RiSE will help him decide if scientific and engineering research is the right choice for his future career.

Sage Dunham

Originally from northern Idaho, Sage Dunham is currently studying Chemistry at Westminster College in Salt Lake City, Utah. Sage has previously worked in the field of Biochemistry, studying thermophilic proteins, and in Analytical Chemistry, studying the composition of synthetic marijuana. This summer Sage worked in the research group of Dr. Stephen Tse, studying the effect of carbon doping on TiO_2 nanoparticles and the growth of graphene on spinel catalysts.

Liliana Fernandez

Liliana Fernandez is a rising senior and chemistry major at Albright College in Reading, Pennsylvania. She has been the president of the Albright Chapter of the American Chemical Society for the past two years. She is currently working under Dr. Takhistov with Phong Huynh as her mentor in the Research in Science and Engineering program.

Sal Ghodbane

Sal Ghodbane is one of the top two or three undergraduate biomedical engineers globally, according to his own personal ranking system. He currently attends the College of New Jersey and plans to graduate in the spring of 2013. Sal is the scholarship chair of Sigma Pi Fraternity International Theta Delta Chapter. Being that he was captain of his high school varsity soccer team and a previous New Jersey State Champion, Sal now plays for the TCNJ club soccer team.

Diara A. Santiago González

Diara A. Santiago González was born in Bayamón, Puerto Rico. She is a rising senior pursuing a B.S in Chemistry at the University of Puerto Rico, Río Piedras campus. Diara has had prior research experience. Last summer she worked at the University of Kentucky on a collaborative project between the Departments of Toxicology and Food Science. She also worked at her home university in an organic chemistry laboratory in which she studied new Diel-alders reactions. This summer she worked in a laboratory in the Department of Pharmacology and Toxicology at Rutgers University where she was exposed to new techniques and ideas. After graduation she planes to purse a PhD degree in the USA. Diara enjoyed her experience in RiSE, which included learning new techniques and meeting great people.

Lauren Henderson

She was born in Dayton, Ohio. She is a biochemistry major currently attending Oakwood University. Studying for the MCAT and doing research in the Ernest Mario School of Pharmacy has been the main focus for the summer. Upon completion of undergraduate studies, she plans to obtain her Ph.D/M.D.

Alfred Irungu

Originally from the Republic of Kenya, Alfred Irungu currently resides and attends school in Baltimore, Maryland. As a junior, Mechanical Engineering major at the University of Maryland, Baltimore County, there has been a great emphasis placed on research throughout his undergraduate career. Alfred's current research interests lie in the fields or robotics, and specifically, its application to biomechanics. Upon completion of undergraduate studies, Alfred intends to pursue a graduate degree in Mechanical Engineering.

Joey Leveille

Joey Leveille was born in Duluth Minnesota on May 15, 1989. He expects to graduate in the winter of 2011 with a bachelor's degree in biology with a minor in chemistry. Joey loves to snowboard, skateboard, Golf, play volleyball, wakeboard, mountain bike, and is obsessed with longboarding, as many have probably noticed. Joey completed his lifelong dream to surf this year at the RISE program. Many people make fun of Joey's accent, even though it is the proper way to speak English and the Puerto Ricans know it. Joey is currently working at a group home for those who have undergone a traumatic brain injury, and hopes to expand his medical career by becoming either a physician's assistant or a medical doctor. Joey is planning on visiting many of his new friends in his upcoming time off.

Wanze Li

Wanze Li is from Middlesex, New Jersey. After graduating from Middlesex High School, she decided to continue her studies at Rutgers University majoring in Chemical Engineering for the class of 2012. In addition to being an avid swimmer, she joined the Varsity Women's Tennis Team at Rutgers University for two years. Her personality is very outgoing and competitive. Even though she spends a lot time in sports, she still successfully balances her time for classes, activities, and jobs. For the past three years, she was on the dean's list, a member of multiple honor societies such as OXE (Chemical Engineering Honors Society), and a member of AICHE and SWE. For the Summer of 2011, she was the only Rutgers student selected as an Undergraduate Research Associate in the RISE/REU program. Her research topic is the evaluation of lab-scale agitated granular powders. The program provides her with an opportunity to improve her lab skills and ultimately get a unique insight into the efforts needed to eventually pursue a Ph.D. Additionally, she also demonstrates her leadership as a mentor for the GSET program during the Summer. After college, she wants to work in the pharmaceutical industry and eventually come back to school to get a Ph.D in Chemical Engineering.

Chris Lowe

Chris Lowe is a rising senior at UMass Amherst and will be graduating with dual bachelors degrees in Chemical Engineering and Biochemistry in May 2012. He is significantly involved with the American Institute of Chemical Engineers both in his local UMass chapter and at the national level where he serves on a national student executive board. He spent the summer working with neural stem cells in the lab of Dr. Prabhas Moghe and is looking to pursue research in tissue engineering or an engineering position in the pharmaceutical industry when he finishes his studies. Outside of the classroom, he's an avid skier who is plagued with slopeside day dreams even in the midst of summer. In addition, born and raised in Massachusetts, Chris is a diehard (2011 Stanley Cup Champion) Boston Bruins fan. Other than that, he's a pretty laid back guy working hard and having a great time doing it.

Sarah Mailhiot

Sarah Mailhiot is a rising Junior majoring in Biomedical Engineering. She attends Rensselaer Polytechnic Institute in Troy, New York. She is in a BS/MS program and is planning on starting her Master's Thesis this fall. She is the vice president of the RPI Crew Team and a member of the Ski Club. Her summer research is in Dr. David Shreiber's lab and she works with Shirley Masand. This summer she is researching how sealing a cell laden microdevice laden with a semipermeable membrane effects cellular viability as compared to a cell laden device sealed with a solid substrate. After graduation, she plans to go into industry but eventually wants to come back and get a Ph.D in Biomedical Engineering.

Selimar Ledesma Maldonado

Selimar Ledesma-Maldonado was born in Caguas, Puerto Rico. Actually she lives in Carolina, Puerto Rico. This August she will be a senior student on Industrial Microbiology at the University of Puerto Rico, Mayaguez Campus. She has previous researches at her University in Puerto Rico in combinatorial chemistry and proteomics. It is her first Internship and in this Summer Program she is working with Dr. Jin in the Pharmacology Department at UMDNJ. This experience has help her to growth in the professional and personal aspect. Her future plans are to complete a PharmD.

Danielle Mazza

Born and raised in northern New Jersey, Danielle is currently a rising senior at Ramapo College of New Jersey in Mahwah. She is pursuing a B.S. in Chemistry, as well as a Business Essentials Certification and a minor in Italian. As a student in the School of Theoretical and Applied Science's Honors Research Program, she has done research studying the use of transition metal catalysts as hydrogen transfer agents on unsaturated organic substrates. She plans to continue this research during her senior year, as well as a special project studying chemical components of different cosmetic products as part of her College Honors Program curriculum. In addition to her studies, she works in the chemistry lab and College Honors office, and tutors students in general and organic chemistry. She is also involved in several clubs and organizations, and enjoys making the most of her undergraduate career. After graduation, she plans to pursue a Ph.D. or enter the cosmetic chemistry industry as a research and development scientist while pursuing a master's degree in cosmetic science. She had the pleasure this summer of working in Dr. Nina Shapley's laboratory with her mentor, Kapil Deshpande, researching and developing a quantification method of nanoparticle "halo" formation using fluorescence spectrometry. This experience has greatly improved her research skills while developing her curiosity and passion for science – she thanks everyone she has worked with this summer and the RiSE program for providing this wonderful opportunity!

Michael McCoy

Michael was born in Springfield, Missouri and has two younger brothers and one younger sister. He will be graduating in May of 2012 from The University of Missouri-Columbia with a Bachelor's Degree in Biological

Engineering. Inspired by the diligence and the hard work of his father, he hopes to achieve the highest level of education possible and attend graduate school in Tissue Engineering or Synthetic Biology. The RISE experience has provided Michael with necessary technical skills and confidence in his choice to continue his research experience and pursue a graduate degree. Dr. Roth and his graduate student Leora Nusblat have mentored and shown Michael the fascinating field of neurobiology and how to approach novel strategies for brain tumor treatment. He is thankful for this experience as well as having the opportunity to see research in a professional and academic setting.

Ana Iris Correa Muler

Ana Iris Correa Muler is majoring in Industrial Biotechnology at the University of Puerto Rico, Mayaguez. After graduation, she plans to work for a PhD in Biophysics because of her interest in bioenergy research. Besides research, she enjoys designing and participating in community service projects. Although in her free time she might be immersed reading a book, she loves to travel and explore different countries and cultures.

ValaRae Partee

ValaRae Marie Partee was born in Reno, Nevada and raised in Atlanta, Georgia. She has currently finished her freshman year of college at the University of Georgia. Based on her love of nature and plants, she has chosen to major in Environmental Engineering and minor in Horticulture. ValaRae has several hobbies including, but not limited to, drawing, photography, and learning musical instruments. In her spare time, she hangs out with her friends and family. ValaRae is funny, outgoing, intelligent, and open-minded and she is always open to new adventures and experiences.

Marie Perkins

Born on the beautiful island of St. Croix, Virgin Islands, Marisha Marie Perkins is a junior Chemistry major attending the University of the Virgin Islands. She is currently a MARC (Minority Access to Research Careers) research fellow at her home institution. She has served as the captain of the UVI cheerleading team for the past two years. Recently, she has been awarded the Barnett Frank Sophomore Class Award for obtaining the highest GPA of UVI's sophomore class. Previously, she has worked as a research intern at the Pacific Northwest National Laboratory in Washington State, studying chemical processes in radiochemistry. During the academic year, Marisha conducts research which studies the antibacterial effects of local plant extractions on the bacteria Serratia Marcescens, under the mentorship of La Verne Brown, PhD. This summer, she worked under the guidance of Lawrence Williams, PhD conducting research in organic chemistry, studying oxygen methylation of an aldol product.

Kandyce Christine Perry

Kandyce Christine Perry is a RISE-ing third year Environmental Science major at Spelman College in Atlanta, GA hailing from the west side of Detroit, MI. She is interested in environmental topics that include but are not limited to the following areas: green technology, renewable energy, sustainability, recycling, and water conservation. After graduating from Spelman in 2013, Kandyce will attend a graduate program to further her studies. Although she has not yet defined her ultimate endeavors, she is confident that she will use her success to positively benefit the world and give back to those who will come after her. Aside from her everyday strides to promote environmental responsibility, Kandyce enjoys shopping, dancing, listening to music, and watching sports. Kandyce leaves RISE with insight into the world of graduate school and with new lab techniques that she will take back to school.

Jonathan A. Porras

Jonathan Porras is a senior biochemistry major with a minor in philosophy at Marist College in Poughkeepsie, New York. He is President of the Marist College Fencing Club, as well as webmaster for the student chapter of

the American Chemical Society. This summer he studied redox-neutral C-H bond functionalizations of nitrogen heterocycles under the advisement of Dr. Daniel Seidel. Jonathan was awarded a Summer Undergraduate Research Fellowship from the New Jersey Space Grant Consortium (a NASA - Sponsored Program). During his time at Marist, Jonathan is a laboratory assistant for the organic chemistry teaching labs, performs preparatory work for the organic chemistry labs, and researches conducting polymers under the mentorship of Dr. Jocelyn M. Nadeau. When he's not in the lab or working on his en garde stance for fencing, Jonathan enjoys immersion into Japanese culture (which was amplified by his recent trip to Japan) with anime (Japanese animation), manga (Japanese comic books) and cosplaying (donning costumes of various Japanese anime and manga characters). After RiSE and Marist, Jonathan hopes to pursue further studies in chemistry, with the prospect of entering the field of scientific writing so he can share his love of chemistry with chemists and non-chemists alike!

Izmarie Poventud-Fuentes

Izmarie was born on May 25, 1990 in Mayagüez, Puerto Rico. She likes to spend time with her family, go to the beach and dance. She is a rising senior, pursuing a B.S. in Industrial Biotechnology at the University of Puerto Rico, Mayagüez. Her main research interest is in drug delivery systems; after graduating, she plans to further studies in the biomedical field. For the summer, she is working as a RiSE student in Dr. Moghe and Dr. Roth's lab. Under the mentorship of Margot Zevon, Izmarie is doing research to compare how the physical characteristics of albumin derived nanoparticles affect the tumor penetration. Through this summer experience she expects to get more familiarized with the research environment and acquire new skills that will help her to achieve her professional goals, but also she's making new friends and is having a good time with them.

Alexander Proctor

Alexander Proctor was born in Stamford, Connecticut and raised in North Babylon, New York. For elementary school he traveled throughout the country and finally settled in North Babylon starting with middle school. Alex currently studies Chemical Engineering at The Cooper Union for the Advancement of Science and Art. He enjoys playing music and reading in his spare time as well as playing the occasional video game. Alex's first research experience was in his freshman year of college and he has been interested in the research community and process ever since. He believes that research is extremely important in our society because all of the potential for good it has for humanity. Alex knows that this experience at RISE will place him ever closer to achieving his goals.

Eric Refour

Eric Montez Refour was born and raised in Atlanta, Georgia. Inspired by the abilities engineers possess to develop tools to improve society, Eric has chosen to pursue a major in Mathematics and Computer Systems Engineering. Entering his third year at the University of Georgia, Eric is currently planning to extend his academic studies into graduate school. By participating in RiSE, Eric is given a great opportunity to enhance his professional and academic credentials for his future endeavors. Outside of his academic life, Eric enjoys helping others, meeting new people, and of course, drinking coffee with his dear grandmother.

Lexi René

Lexi René was born in Montréal, Quebec raised in Brooklyn, New York. She attended two of the best performing arts schools in New York City as a vocal major. Entering college Lexi choose the esteemed major of mathematical sciences. As a Research Initiative for Scientific Enhancement (RISE) student at Brooklyn College she pursues a research career in Applied Mathematics. In November 2010 she attended the Annual Biomedical Research Conference for Minority Students (ABRCMS). During the summer of 2011 she completed her first research project in Astrophysics as part of the Research in Science and Engineering program a summer Research Experience for Undergraduates. Lexi is going to graduate from Brooklyn College Fall 2012 with plans to pursue a PhD in Applied Mathematics.

Dylan Richards

Dylan Richards is from Irmo, SC, just outside of Columbia, where he was born. He is a senior biology major at Furman University in Greenville, SC. The REU in Cellular Bioengineering/RiSE has helped him bridge over from Biology to be more concentrated in Biomedical Engineering, as he hopes to attend graduate school in that area. At his home school, he is excited to expand his membership and be the president of Beta Beta Beta, the biological honors society. However, biology is not the only ambition in Dylan's future; he is an active member of the Furman University Percussion Studio, music director of the FUtones - Furman's co-ed acapella group, as well as very involved in the French department. Though this summer experience has been a top-notch summer program and very beneficial for his experience in the laboratory, Dylan plans to further his studies in the Southeast, where snow is rarely in the winter forecast.

Michelle Sempkowski

Michelle Sempkowski was born in East Brunswick, NJ and has lived there ever since. As much as she refuses to accept her bittersweet fate, she will be graduating in the Spring of 2012 with a Bachelor's of Science degree in Biomedical Engineering with a Mechanical Engineering concentration. In addition to working in Dr. Stavroula Sofou's laboratory and studying liposomes as drug delivery carriers, she spent much of her summer visiting the jersey shore (beach) and avoiding the Jersey Shore (television cast). Her gratifying REU experience at Rutgers University has not only allowed her to feel confident in her pursuit of a PhD in Biomedical Engineering, but has allowed her unknown enthusiasm for research to blossom. She feels blessed to have experienced this, but knows it would have been impossible without the help of those around her, including her friends, family, and mentors.

Gabriel Antonio Suárez

Gabriel Antonio Suárez was born in Rio Piedras, Puerto Rico. He currently studies Biotechnology at Interamerican University of Puerto Rico, where he also works as a math and science tutor. Some of his greatest ambitions include: pursuing a PhD in Bioengineering, publishing a book, discovering some mathematical interesting equations and in the long run, becoming a professor who inspires new generations of scientists. Some of his hobbies are hiking, skiing, playing tennis, piano and guitar. The RISE summer research experience at Rutgers has built the confidence and skills necessary to pursue his PhD degree.

Vicky Weber

Vicky Weber is a rising senior at Ripon College in Wisconsin majoring in Communication with minors in Politics & Government and Nonprofit Business Management. She is the lone social scientist in the RiSE program; she plans to pursue a career in library and information science. Her research is in the School of Communication studying referrals in virtual reference interviews under Marie L. Radford, PhD. She's had a broad undergraduate research career, including studying the rhetoric of global warming with her advisor at Ripon College and promotional road maps at Chicago's Newberry Library. At Ripon, Vicky works in the government documents department of the library, co-manages the campus writing center, serves as secretary of her fraternity, makes costumes for the theatre, does speaking engagements as a member of the Speakers' Bureau and knits presents for her friends. An avid New York Yankees fan, the highlight of her summer has been going to Yankee Stadium for the first time.

Katrina Wunderlich

Katrina Wunderlich was born in Wisconsin, raised in Indiana, and has been living in Jersey ever since. She has attended The College of New Jersey (TCNJ) for the last three years. She hopes to graduate from TCNJ in Fall 2012 with a degree in Chemistry and Secondary Education and a minor in psychology. This summer, through RiSE, she was able to further her passion for Chemistry by conducting organic research with Dr. Leslie Jimenez. She is very grateful for the opportunities this summer provided her.

Jose Zhagnay

Jose Zhagnay was born in New York, New York. He is always in a happy mood. Currently, he is a junior pursuing a B.S. in Biology at Stony Brook University. Jose found his passion for research while working with Dr. Marisa Cotrina. This summer he has the pleasure to work with Dr. Rasin, investigating the role of RNA binding protein during neocortical development.