



UNIVERSITY
AT ALBANY

State University of New York

Collegiate Science
Technology
Entry Program

Student Research Journal 2007

Collegiate Science Technology Entry Program

Special thanks to the New York State Department of Education for funding the University at Albany C-STEP Program. Additionally, we are grateful for financial and technical support from the Louis Stokes Alliance for Minority Participation (LSAMP), Alliances for Graduate Education and the Professoriate (AGEP), and the University at Albany Graduate Office. Also, thanks to Greta Petry, C-STEP Abstracts editor; Bonny Curless, graphic designer; and Gale Butler, C-STEP program secretary.

Message from the Director

I am delighted to serve as the Collegiate Science Technology Entry Program (C-STEP) Director at the University at Albany.

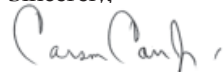
There is a need for the world to produce more scientifically and technically trained individuals. The C-STEP program, funded by the New York State Department of Education, is one of the ways in which the University is providing support in cultivating the academic talents of underrepresented populations to help meet this need. Currently, the technical employment market is witnessing unprecedented growth. We want to encourage as many undergraduates as possible to be prepared for the available opportunities in industry and teaching.

The C-STEP is a comprehensive effort to encourage underrepresented students to pursue their interest in related science careers, as well as law. Our C-STEP includes the following services: supplemental academic advisement; personal counseling; career planning; financial planning and information; culturally enriching activities; field trips; peer mentoring; faculty mentoring; personalized testing and special needs accommodations; study skills workshops; instruction in pre-college math and science; individual tutoring; study group programming; professional and graduate school preparation; cultural, professional and educational field trips to local industries; and an extensive summer research experience for 25 students. Marc Carter, UAlbany C-STEP Coordinator, regulates these services.

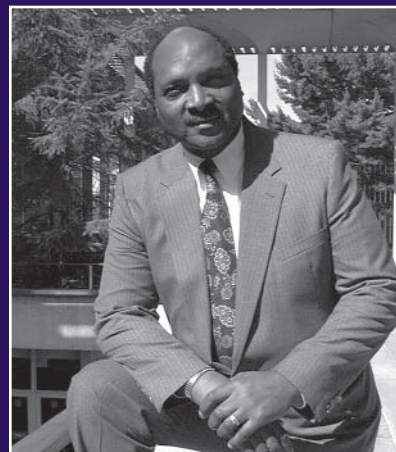
I am extremely pleased with the unique partnership opportunity of students, faculty and the Albany community in supporting the development of our C-STEP. It is this kind of commitment and cooperation which we need to assist us with our goals of producing more trained scientists, physicians, lawyers and educators. Our research placements are at the University at Albany, the New York State Health Department's Wadsworth Center, Albany Medical Center, the Stratton Veterans Administration Medical Center, Rensselaer Polytechnic Institute and the College of Nanoscale Science and Engineering (UAlbany).

I'd like to take this opportunity to thank the many faculty members who gave their time and expertise in order to provide our C-STEP program scholars with a research experience that will help them prepare for the rigors of graduate school.

Sincerely,



Dr. Carson Carr, Jr.
C-STEP Director



Dr. Carson Carr, Jr.
C-STEP Director



Message from the Coordinator

It is my pleasure to present to you the Student Research Journal of the University at Albany Collegiate Science and Technology Entry Program. This journal is a tribute to our summer research scholars who along with their faculty mentors were engaged over an eight- to twelve-week period in scientific discovery. The students who are profiled participated in our program during the summers of 2005 and 2006. The journal represents their scholarly endeavors, academic excellence, and future professional goals.

I congratulate our scholars on a job well done. They have performed with a sense of purpose and inquisitiveness. They are truly scholars. I also must thank the faculty mentors who have graciously dedicated their time and themselves to securing our future in the science, technology, engineering and mathematics fields.

In addition, I must acknowledge our C-STEP support staff and our University community of professionals, for without them this program would not be as success.

Sincerely yours,

A handwritten signature in cursive script that reads "Marc A. Carter".

Marc A. Carter
Coordinator

C-STEP, LSAMP, & AGEP Summer Research Program

The Program

UNIVERSITY AT ALBANY, STATE UNIVERSITY OF NEW YORK

Collegiate Science and Technology Entry Program

**Underrepresented Minorities Pursuing Undergraduate
and Graduate Education**

Academic & Summer Research Opportunities

The University at Albany's C-STEP Program offers services that are designed to increase the retention and graduation rates of underrepresented minorities. The program fosters a climate of institutional support for the success of students with special circumstances at the University at Albany.

Yearly, the C-STEP Program serves 115 University at Albany students who meet the Department of Education's C-STEP eligibility requirements. Student participants are New York State residents who are members of historically underrepresented groups and are interested in scientific, technical, health-related, or licensed professions. They are economically disadvantaged and demonstrate interest and potential for a C-STEP targeted profession.

The University at Albany C-STEP Program continues to achieve its goal of graduating at least 70 percent of its participants by offering the following services: supplemental academic advisement; personal counseling; career planning; financial aid planning and information; culturally enriching activities; field trips; peer mentoring; faculty mentoring; personalized testing and special needs accommodations; study skills workshops; instruction in pre-college mathematics, pre-college science; individual tutoring; study group programming; professional and graduate school preparation; graduate school admissions facilitation; cultural, professional, educational field trips to local industries; and an extensive summer research experience for 25 students.

For more information, visit our Web site: http://www.albany.edu/eop/cstep_letter.html or call: (518) 442-5183.

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Prince Yaw Acheampong



Prince Yaw Acheampong

SCHOLAR'S NAME: Prince Yaw Acheampong
RESEARCH TITLE: Synthesis of (2,2-difluorovinyl)-triethylsilane Compound and its Application to Organic Synthesis
MENTOR: John Welch, Ph.D., University at Albany
Department of Chemistry

ABSTRACT:

The purpose of this research was to investigate the reactivity of a difluorovinyl silyl compound, 4,4-difluoro-3-(triethylsilyl) but-3-en-1-ol [4], as a building block towards organic synthesis. After compound [4] was prepared, it was treated with TASF (F⁻) in the presence of THF as a solvent, at -78°C to 0°C. After checking the reaction was completed by Thin Layer Chromatography (TLC), it was quenched with water, separated, and purified. NMR was used to determine the formation of new compounds. Four different aldehydes, acetaldehyde, para-nitribenzaldehyde, 2-ethylbutylaldehyde, and octylaldehyde, were used as substrates for the new synthesis. The successful preparation of compound [4] enabled use of this material as a synthetic building block. Treatment of the compound [4] with fluoride ion (F⁻) caused the cleavage of the silicon-carbon bond leading to electrophilic attack and carbon-carbon bond formation with electrophiles, such as aldehydes. In the course of this work, four new compounds were synthesized, yielding 85 percent with acetaldehyde, 82 percent with para-nitribenzaldehyde, 74 percent with 2-ethylbutylaldehyde, and 80 percent with octylaldehyde. In the future, we plan to use these synthesized compounds to create a ribose sugar for pharmaceutical use.

Future Career Plans:

I aspire to be a medical doctor. Also, the University at Albany's Summer Research Program has boosted my interest in pursuing a Ph.D.

HOMETOWN:
Bronx, N.Y.

MAJOR/MINOR:
Chemistry/Mathematics

GRADUATION DATE:
May 2006

INSTITUTION:
University at Albany



Adedoyin Adebogun

HOMETOWN
Brooklyn, N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
University at Albany

Adedoyin Adebogun

SCHOLAR'S NAME: Adedoyin Adebogun

RESEARCH TITLE: Development of HIV-1 Nucleocapsid Protein Inhibitors

MENTOR: Rabi Musah, Ph.D., University at Albany
Department of Chemistry

ABSTRACT:

Currently, drug protocols are ineffective for the HIV infection because the viral proteins mutate and evade the drugs. One way to solve this problem is by developing drugs that target highly conserved proteins, essential for viral replication. Nucleocapsid protein in HIV-1 is a possible target. It has been demonstrated in previous studies that covalent modification of this protein by potential drugs inhibits its functioning and renders the resulting viruses non-infectious. We have synthesized electrophilic molecules designed to covalently modify this protein. The purpose of our work is to use High Performance Liquid Chromatography, mass spectrometry, and protein sequencing to investigate the mechanism and nature of the modification.

My research activity this summer was to analyze the reaction mixture comprised of HIV-1 nucleocapsid protein and a small molecule electrophile. My research assignment also included the clean separation of the components involved in the reaction complex.

Methods I used include the use of Higher Performance Liquid Chromatography (HPLC) to cleanly separate the reaction adducts, followed by mass spectral analysis to determine the nature of the covalent modification of the protein.

Future Career Plans:

My plan for the future is to pursue a career in the pharmaceutical sciences and get involved in developing and designing new drugs for diseases. My research this summer has added to my interest in this field.

Marc-Anthony Armand

SCHOLAR'S NAME: Marc-Anthony Armand

RESEARCH TITLE: Ion Beam Synthesis of Magnetic Nanoparticles in Silicon

MENTOR: Mengbing Huang, Ph.D., University at Albany
College of Nanoscale Science and Engineering

ABSTRACT:

In my project, I explored the formation of magnetic nanoparticles via ion implantation in silicon for advanced memory device applications. The objective was to establish a correlation between the structural properties of nanoparticles and their magnetic behaviors. The idea behind this experiment is to increase the amount of memory on chips. The need to increase memory on chips is extremely important. Considering our current status of memory devices, Dynamic Random Access Memory (DRAM), we can see that this technology needs to improve due to certain problems in the device. In my experiment, we introduced Magnetic Random Access Memory (MRAM). This technology is the way of the future and it has many advantages over DRAM. There was also a technical barrier of the device that we were trying to solve; we tried different approaches to solve the problem.

Future Career Plans:

After graduation, I plan to obtain a Ph.D. in engineering.



Marc-Anthony Armand

HOMETOWN:
Brooklyn, N.Y.

MAJOR/MINOR:
Electrical Engineering

DATE OF GRADUATION:
May 2006

INSTITUTION:
Stony Brook University



Odianosen Vinc-Lewis Alonzo Ayewoh

HOMETOWN:
Severn, Md.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
University of Maryland,
Eastern Shore



Sophia Cidoine

HOMETOWN:
Milton, N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
University at Albany

Odianosen Vinc-Lewis Alonzo Ayewoh and Sophia Cidoine

SCHOLARS' NAMES: Odianosen Vinc-Lewis Alonzo Ayewoh;
Sophia Cidoine

RESEARCH TITLE: The Effects of Heavy Metals on *Saccharomyces cerevisiae* Cells.

MENTOR: Douglas Conklin, Ph.D., University at Albany
School of Public Health and Wadsworth Center

ABSTRACT:

The purpose of our research was to see the effects that various heavy metals of different concentrations would have on *Saccharomyces cerevisiae* (yeast) cells. The various heavy metals selected for this experiment are known carcinogens and also pose diverse household and work-related toxic threats. We used yeast cells because they are good human models and can be easily grown. Therefore, the hope is that the growth patterns from these yeast cells can be correlated to humans and provide more insight to cancer studies.

We tested more than 5,000 yeast strains, each of which has a specific gene knocked out (removed) from it. This is done so that we are able to see whether the yeast cells are resistant (grow well) or sensitive (grow poorly) to the heavy metals, and how they act in response to the lack of certain genes. We used 57 plates; these plates contained 96 different yeast strains, and each strain had one gene knocked out. The yeast was then spotted on the heavy metal plates which were in concentrations of: 3mM CoCl₂, 5mM CoCl₂, 15mM FeSO₄, .1mM CdCl₂, and regular plates as a control. The plates were set to grow in a specialized 30°C (room temperature) room for three days. After manually entering the data into spreadsheet format, we were able to clearly see which genes were knocked out of the strains, their function, and we could then identify (by color code) whether or not they were resistant or sensitive.

We discovered that cadmium in this concentration is extremely toxic, and most of the cells didn't grow well. One that did grow, however, got into the cell via manganese transport, telling us that manganese may help in combating cadmium poisoning. In our iron concentration, we observed that most of the cells grew in that concentration, but some of the ones that were sensitive involved Syntaxin, showing us that the calcium-dependent fusion is disrupted. The most interesting trend was shown between the cobalt and vacuolar transports. A majority of the

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genes removed had to do with the ATPase pump. When these genes are knocked out, the cell cannot place the toxic cobalt in the vacuole for safekeeping, allowing for the cobalt to contaminate and either kill or make the cell sensitive. This shows a correlation between what affects the cell and specifically what the cell is missing (gene knock out) that causes it to be sensitive or resistant.

Future Career Plans of Odianoson Vinc-Lewis Alonzo Ayewoh:

I intend to go to graduate school in pursuit of my Ph.D. in neuroscience. I would like to attend Duke University or the University of Minnesota. My plan is to study neuroscience, specifically neuropharmacology or behavioral studies. After I graduate, I would like to work in the private sector for a large pharmaceutical firm, or act as a principal investigator for a government-funded laboratory. My ultimate goal is to either be head of research for a biomedical company or to be the director of my own lab, probably dedicated to neuroscience and psychological research.

Future Career Plans of Sophia Cidoine:

My intentions after graduation are to attend medical school in Georgia, where I plan to specialize in obstetrics. I would like to work in an underserved area to give back to the communities that are in need of good health care.



Brandon Borde

HOMETOWN:
Valley Stream, N.Y.

MAJOR/MINOR:
Mechanical Engineering

ANTICIPATED DATE OF GRADUATION:
May 2009

INSTITUTION:
University of Maryland,
Baltimore County

Brandon Borde

SCHOLAR'S NAME: Brandon Borde

RESEARCH TITLE: SEM Column Electron Optic Model

MENTOR: John Hartley, Ph.D., University at Albany
College of Nanoscale Science and Engineering

ABSTRACT:

The column from a scanning electron microscope is used as part of a tool whose primary function is data collection. However, the column can also be used to write data. My research is based on an ongoing project to integrate the column and thermionic electron source from an old SEM with a vacuum chamber, with the product being a tool for lithography and electron optics.

Once integrated, the source and column must be operated under parameters that will yield a favorable electron beam. Instead of testing different combinations of settings on the actual column, it would be more efficient to model the column and source using a software package. My project was to create this model and find which operational settings would yield the best beam. After successful completion of the model, we concluded that the filament of the source should be heated to around 2300K, with the grid at a more positive potential than the filament. For the column, we also concluded that the spot size became better as we decreased the working distance while varying the strength of the projection lens.

Future Career Plans:

Upon my graduation, I plan to attend dental school. Ideally, I would like to find a D.D.S./Ph.D. program so that I may continue pursuing a career in scientific research. If not, I will obtain my Ph.D. first, and then move on to attaining my D.D.S. I plan on practicing oral surgery or becoming an orthodontist while conducting research in the design of oral prosthetics. Once I have finished my educational career, I hope to also open my own practice as an oral surgeon or orthodontist.

Laliz Carew

SCHOLAR'S NAME: Laliz Carew

RESEARCH TITLE: **The Relationship between Patient Nurse Engagement and Adherence Behaviors in Patients with HIV/AIDS**

MENTOR: **Judy K. Shaw, M.S., ANP-C, a certified HIV nurse practitioner and doctoral candidate**

ABSTRACT:

Recent research has shown that adherence to medication is a very important factor when it comes to patients with HIV/AIDS. Adherence is a huge factor in controlling the HIV/AIDS disease; it minimizes complications of secondary diseases like renal and heart disease, as well as thrush. It is especially important for patients living with HIV/AIDS because of the threat for viral resistance development and the development of drug-resistant strains.

For the purpose of this study, adherence means taking medication at the correct time and dose, keeping clinic appointments, having tests done when needed, and keeping up to date on other health-maintenance activities, such as yearly physicals, flu vaccinations, and good nutrition. Also, for the purpose of this study, patient-nurse engagement means a relationship between the patient and nurse based on mutual respect, caring behaviors, and trust that results in the patient's feeling well-cared for by the nurse. There is no pharmaceutical involvement in this study. It is being funded by the Delta Pi Chapter of Sigma Theta Tau International Honor Society of Nursing.

The purpose of this non-experimental quantitative study is to examine whether there is a relationship between the way patients feel about their nurses and whether their nurses have an effect on how they take medications and keep appointments. The hypothesis is that there is a relationship between the way patients feel about their nurses and how well HIV/AIDS patients take medication and keep appointments. This study was conducted by using a convenience sample of 70 patients with HIV/AIDS. They were recruited by using word of mouth, fliers, and letters requesting support from health care leaders in HIV/AIDS care. The subjects were self-referred in two northeastern cities in the United States (Albany, N.Y., and Boston, Mass.).

The subjects participated in this study by completing a questionnaire consisting of three tools. The first was the demographic form, which consisted of questions about the ages, gender, education, financial status,

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Laliz Carew

HOMETOWN:
Bronx, N.Y.

MAJOR/MINOR:
Nursing

DATE OF GRADUATION:
May 2006

INSTITUTION:
State University of New York
College at Brockport

sex, sexual preference, and number of people living in the household. The second was the Oncology Patient Perception of the Quality of Nursing Care Scale (OPPQNCS), which measures the quality of nursing care from the patient's perception. It also comprises four subscales that include responsiveness, individualization, coordination, and proficiency. The third was the Medical Outcome Study (MOS); this form is a general health survey that is comprehensive yet short enough to be practical for use in large-scale studies of individuals in an outpatient setting. These tools were chosen because they are standardized and have proven reliability and validity related to the major variables, which are engagement and adherence.

All answers to the questions were given anonymously. The data obtained from the questionnaire were analyzed by using the Statistical Package for the Social Science (SPSS) version 11.0 for Windows 95/98. Results were reported in aggregate form.

Future Career Plans:

I plan to work as a nurse, and in the future, pursue a Ph.D. in nursing.

Rose Destin

SCHOLAR'S NAME: Rose Destin
RESEARCH TITLE: Chemical Dependency Rehabilitation Program Outcome Monitoring
MENTOR: Paul Postiglione, LCSW-R, Stratton VA Medical Center

ABSTRACT:

The Chemical Dependency Rehabilitation Program at Stratton VA Medical Center provides behavioral treatment services to veterans dealing with addiction problems. This research aims to evaluate the program's effectiveness, efficiency, and patients' satisfaction levels through analyzing data collected in six months or a year.

The effectiveness of the program was determined using three criteria: the completion rate, the engagement rate, and the length in treatment of each patient. The efficiency was found by looking at the screening turnaround time per counselor, and different surveys were used to find the patients' satisfaction levels.

The outcome of this study shows an improvement in effectiveness compared to previous years, a very efficient performance from staff, and mainly positive feedback from the patients. These results imply that the program is successful, and offers adequate services to the veterans.

Future Career Plans:

Upon graduation, I plan to attend medical school to pursue a career as a primary care physician and work with the underserved population in the United States or any other place in need. I aim to help the less fortunate by providing them with medical assistance and education that can enable them to maintain a healthier lifestyle.



Rose Destin

HOMETOWN:
Kingston, N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
University at Albany



Fedena Fanord

HOMETOWN:
Fort Lauderdale, Fla.

MAJOR/MINOR:
Chemical Engineering/French

DATE OF GRADUATION:
May 2005

INSTITUTION:
Rensselaer Polytechnic Institute

Fedena Fanord

SCHOLAR'S NAME: Fedena Fanord

RESEARCH TITLE: Influence of Boundary Layer/Mass Transport Phenomena on the Response Time of a Cantilever-based Mass Sensor

MENTOR: John Welch, Ph.D., University at Albany
Department of Chemistry

ABSTRACT:

Among infectious diseases, tuberculosis remains the leading cause of death in the world. Antigens are covalently deposited to the surfaces of the cantilever and antibodies in the surrounding solution attach to the cantilever in a binding reaction. Since the cantilever oscillates, there may exist boundary layer/mass transport phenomena that affect the response time of the mass sensor. A mathematical model was created, illustrating the diffusion and reaction properties of this system. The number of unknown variables was reduced by dimensional analysis, which resulted in an expression for the Damköhler number. The Damköhler number was used to determine necessary parameters to ensure reaction-limited antibody transport.

The value of this dimensionless number indicates whether antibody transport is reaction-limited or diffusion-limited. In order to eliminate problems, we want reaction-limited antibody transport. Correlations were used to determine the necessary parameters to reach our objective; as a result, the fluid must have a velocity with a magnitude of 10^{-5} m/s to ensure reaction-limited antibody transport.

Rapid detection is the key to eradicating this disease. We investigated the development of a rapid and highly sensitive detection method for this disease. Assuming that we want the fluid to take one minute to flow through the channel, its length would have to be 2.3×10^{-3} m or 0.23 cm. This number is extremely small, but an increase in the velocity by a magnitude of 100 would lead to a more feasible result. Thinning out the boundary layer will increase the velocity. The ultimate goal of the project was to detect more than one disease with the mass sensor by bonding different antigens on an array of cantilevers. A design for the methodology by which the fluid will be administered into the device was made once an appropriate velocity was determined.

That experience was my first exposure to the research process and the field of biotechnology. It was one of the few times that I was given the opportunity to apply the things that I have learned in the classroom to real-world problems. I am grateful that I was given such an opportunity.

Future Career Plans:

I am currently attending the University of South Florida as a Ph.D. student in chemical engineering. As a graduate student, I plan to explore the involvement of transport processes in the delivery of medicines to targeted areas and other applications of chemical engineering processes in medical technology. After completing my graduate studies, I plan to pursue a career in the pharmaceutical industry in the research and development of drug-delivery systems for new products.



Melanie Flores

HOMETOWN:
Brookhaven N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
University at Albany

Melanie Flores

SCHOLAR'S NAME: Melanie Flores

RESEARCH TITLE: Analysis of Genes that Modify Toxicity of Alkylating Agents

MENTOR: Thomas J. Begley, Ph.D., University at Albany
School of Public Health and Wadsworth Center

ABSTRACT:

An organism's deoxyribonucleic acid (DNA) can be damaged by numerous environmental and cellular alkylating agents to generate base lesions. The two alkylating agents examined in this research included methyl methane sulfonate (MMS) and the cigarette smoke derivative dimethyl nitrosamine (DMNA). The purpose of this research was to examine DNA damage and the specific repair enzymes needed in the bacteria *Escherichia coli* (*E. coli*) after damage. *E. coli* has evolved an adaptive response to DNA alkylation damaging agents that includes the enzymes Ada, AlkA, AlkB, and AidB. In this research, two different libraries of *E. coli* were used, W3110 and 5725, and groups of gene deletion strains were treated with MMS and DMNA. In the experiment of the 5725 cells, the wild-type cells had all the repair enzymes, AlkA, AlkB, and Ada. Each repair enzyme was removed, one at a time, and analyzed. The cells deficient in AlkA and AlkB were killed by a low dose of MMS. Cells deficient in Ada were killed by a high dose of MMS. These results indicate the adaptive response in *E. coli* as an effective method for repairing DNA damage, and that AlkA and AlkB are the primary enzymes used after MMS damage. The four types of W3110 cells had (1) a gene knockout of the AlkB protein and an empty vector (2) the knockout supplemented with AlkB, (3) the knockout supplemented with the mouse homolog, mAbh2, and (4) the knockout supplemented with mAbh8. The empty vector and mAbh8 supplemented cells treated with MMS died off, with a low dose of MMS, but the mAbh8 cells were more resistant than the empty vector cells. The mouse homologs of the AlkB enzyme were adequate in MMS repair. The mAbh8 enzyme was able to repair low levels of MMS, whereas mAbh2 was able to repair high levels of MMS. These results suggest that mAbh2 is more active than mAbh8. In conclusion, our results indicate that cells contain specific DNA repair activities to repair alkylation damage from MMS, while experiments are ongoing with dimethyl nitrosamine.

Future Career Plans:

Upon graduation, I plan to attend medical school and pursue a career as an obstetrician/gynecologist, or pursue a graduate degree in forensic biology.

Vanessa George and Collette Brown

SCHOLARS' NAMES: Vanessa George; Collette Brown

RESEARCH TITLE: Application of Self-Directed Teams to Forensic Science DNA Analysis

MENTOR: Mark Dale, director, DNA Academy

ABSTRACT:

We conducted a literature search of 63 articles and practitioner reviews to determine the criteria needed to put together a high-performance team to analyze DNA more rapidly and efficiently in order to reduce the number of DNA analyses processed at a given time. We focused on team performance metrics such as productivity, quality, and worker satisfaction. We began our research by identifying the issue, the huge backlog in the DNA databank. We then familiarized ourselves with the process of DNA analysis by shadowing the students at the DNA Academy as well as conducting independent readings. We then completed a literature search in order to find existing research for self-directed teams in science.

Our research provided background information needed for the implementation of high-performance teams in forensic science.

Future Career Plans of Vanessa George:

My goal is to obtain work experience in corporate America while I figure out specifically what I want to do as a career. As of now, I intend to pursue a degree in fashion, focused more on the business side of the industry.

Future Career Plans of Collette Brown:

Currently attending medical school in the Caribbean.



Vanessa George

HOMETOWN:
Brooklyn, N.Y.

MAJOR/MINOR:
Psychology/Criminal Justice

DATE OF GRADUATION:
May 2006

INSTITUTION:
University at Albany



Collette Brown

HOMETOWN:
Queens, N.Y.

MAJOR/MINOR:
Biology

DATE OF GRADUATION:
December 2005

INSTITUTION:
University at Albany



Mary V. Graham

HOMETOWN:
Wingdale, N.Y.

MAJOR:
Mathematics

MINOR:
Computer Science/Theater

DATE OF GRADUATION:
May 2005

INSTITUTION:
University at Albany

Mary V. Graham

SCHOLAR'S NAME: Mary V. Graham

RESEARCH TITLE: Density Functional Studies with Spintronics and Molecular Electronics

MENTOR: James Raynolds, Ph.D., University at Albany College of Nanoscale Science and Engineering

ABSTRACT:

Previous theories have predicted Silicon-Manganese (SiMn) to be non-magnetic. However, magnetic silicon doped with manganese has recently been achieved at very high temperatures (Bolduc et al, *Physical Review*, B 71 033302 (2005)). Unfortunately, the fundamental mechanisms behind this discovery are not well understood. Therefore, we performed Density Functional Studies on various silicon-based spintronic materials to analyze their various ground state properties.

Through the use of the Vienna Ab-Initio Simulation Package (VASP), a computational program used to solve the equations of Density Functional Theory, we were able to look at some elastic properties of SiMn, such as total energy versus lattice constants. Most importantly, we investigated strain effects on magnetism. Through this we found that local atomic arrangement affects strain, and that compressive strain increases magnetic movement.

Future Career Plans:

My goals for the future are to complete my Ph.D. in nanoscience and nanoengineering at the University at Albany, and, immediately after graduation, continue doing research at a semiconductor industrial giant, such as IBM. Eventually, after gaining years of industrial experience, I would like to end my career as a tenured professor at an accredited research university.

Edvard Adrian Gumbs



Edvard Adrian Gumbs

SCHOLAR'S NAME: Edvard Adrian Gumbs

RESEARCH TITLE: A Comparison of the Solution Properties of Native and Cys to Ser Mutants of Bovine γ B-crystallin

MENTOR: Jayanti Pande, Ph.D., visiting associate professor, University at Albany Department of Chemistry

ABSTRACT:

Cataracts, generally believed to be an age-related disease, also occur in children. Cataracts in children have been found to be associated with genetic mutations in the eye-lens proteins, called crystallins. Among crystallins, the γ -crystallins contain a large number of cysteine residues (6-7 per 20kD). Redox reactions of cysteines have been implicated in both forms of cataracts. To understand the importance of individual cysteines in such reactions, we have made several singly-substituted Cys to Ser mutants of bovine γ B-crystallin. We present preliminary spectroscopic studies of wild-type and two Cys to Ser mutants of γ B-crystallin, and examine the solution properties of these proteins, using spectroscopic and molecular modeling studies. Results from the spectroscopic studies confirmed that the structural integrity of the two mutants, C32S and C109S, remained virtually unchanged relative to the wild-type protein. We compared the excimer fluorescence of pyrene-labeled γ B-crystallin and the mutants to evaluate whether there were changes in protein-protein interactions due to the mutation. Modification of the wild-type and mutants with 4,4'-dithiodipyridine (4-PDS) suggested that the reactivity of individual cysteines was influenced by their location in the protein. Thus, our preliminary studies constitute the first step towards understanding the importance of Cys residues in γ B-crystallin.

Future Career Plans:

Upon graduation, I look to gain acceptance into a year-long research internship and/or a master's of biomedical science program to further my academic endeavors. During this period, I will also apply to medical school and hope to matriculate into an M.D./PhD. program in fall 2008. In addition to being a practicing physician (in the field of surgery), I would also like to continue pursuing biomedical research at a teaching hospital, as well as commit some part of my life to volunteering in medical missions with Doctors Without Borders. I also have a passion for health policy, especially for the elderly in the United States, so I am considering the possibility of pursuing a civic/political career.

HOMETOWN:
Iselin, N.J.

MAJOR/MINOR:
History/Premed

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
Cornell University



Lori Hoggard

HOMETOWN:
Brooklyn, N.Y.

MAJOR/MINOR:
Psychology

DATE OF GRADUATION:
June 2006

INSTITUTION:
Brooklyn College,
City University of New York

Lori Hoggard

SCHOLAR'S NAME: Lori Hoggard

RESEARCH TITLE: Relationship among Trauma, Self-Efficacy, and Medication Adherence Behaviors in Veterans and Non-Veterans with HIV/AIDS

MENTOR: Judy Shaw, M.S., ANP-C, a certified HIV nurse practitioner and doctoral candidate

ABSTRACT:

I was investigating the relationship among trauma, self-efficacy, and medication adherence behaviors in veterans and non-veterans with HIV/AIDS. The main focus was to determine if trauma affects medication adherence, and whether there is a difference between veterans and non-veterans in regard to the frequencies and sorts of trauma experienced, levels of self-efficacy, and levels of medication adherence.

There were three sites involved in the study: Stratton VA Medical Center, Albany Medical Center, and the Miami VA Medical Center. I conducted the data collection at the Stratton VA Medical Center. I administered the questionnaires to the participants. Participants were literate, HIV-positive, and were taking HIV medications. Half of the sample was comprised of HIV-positive veterans (Albany and Miami VA Medical Centers) and the other half was comprised of HIV-positive non-veterans (Albany Medical Center). The Statistical Package for the Social Sciences (SPSS) was used to conduct the statistical analysis.

Future Career Plans:

I recently graduated from Brooklyn College with a bachelor's degree in psychology. I plan to take a year off after graduation before enrolling in a psychology Ph.D. program to gain more research experience. I hope to attend Stony Brook University, Rutgers University, University of Connecticut, Brooklyn College, or the University of Maryland, Baltimore County, Duke University, or Syracuse University. During my year off, I hope to serve as a research assistant so that I can gain invaluable research skills. While pursuing my doctorate, I plan to investigate health disparities and the biopsychosocial factors leading to these disparities. I would like to conduct research in an academic and health setting, and also teach at the university level.

Murfat Ibrahim

SCHOLAR'S NAME: Murfat Ibrahim
RESEARCH TITLE: Development of HIV-1 Nucleocapsid Inhibitors
MENTOR: Rabi Musah, Ph.D., University at Albany
Department of Chemistry

ABSTRACT:

Currently, drug protocols are ineffective for the HIV infection because the viral proteins mutate and evade the drugs. One way to solve this problem is by developing drugs that target highly conserved proteins, essential for viral replication. Nucleocapsid protein in HIV-1 is a possible target. It has been demonstrated in previous studies that covalent modification of this protein by potential drugs inhibits its functioning and renders the resulting virions non-infectious. We have synthesized electrophilic molecules designed to covalently modify this protein. The purpose of our work is to use High Performance Liquid Chromatography, mass spectrometry, and protein sequencing to investigate the mechanism and nature of the modification.

We will conduct an analysis of a reaction mixture comprised of HIV-1 nucleocapsid protein and a small molecule electrophile by HPLC, separation of the reaction adducts, followed by mass-spectral analysis to determine the nature of the covalent modification of the protein.

Future Career Plans:

My plan for the future is to contribute to the improved health of people in underrepresented areas. I will accomplish this by either being directly involved in helping those people through my becoming a medical doctor, or indirectly by developing drugs.



Murfat Ibrahim

HOMETOWN:
Brooklyn, N.Y.

MAJOR/MINOR:
Chemistry/Biology
w/ Biochemistry minor

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
Brooklyn College



Natacha Jean-Louis

HOMETOWN:
Brooklyn, N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
University at Albany

Natacha Jean-Louis

SCHOLAR'S NAME: Natacha Jean-Louis

RESEARCH TITLE: Actin Nitration Mediates Endothelial Function

MENTOR: Arnold Johnson, Ph.D., Stratton VA Medical Center

ABSTRACT:

It is hypothesized that nitration of tyrosine residues in β -actin increases permeability of pulmonary microvessel endothelial cell monolayer (PMEM). We can test this with the mutation of tyrosine-198 to phenylalanine (lacking site for nitration) in β -actin, and comparing the barrier function of the endothelial cell layer transfected with mutant actin to endothelial cells transfected with wild-type actin. Permeability will be measured by an albumin clearance assay in which the amount of Evans Blue dye labeled albumin is determined by spectroscopy. The inability of phenylalanine nitration results in the expectation of normal barrier function in cells transfected with mutant actin.

Future Career Plans:

After graduation, I plan to attend medical school. As a doctor, I would go into obstetrics and pursue a practice of my own or with a partner. I would prefer to provide my services to those in underserved communities and, if able to save enough money from my practice, perhaps open a nonprofit free clinic in Haiti. If I were to go into research, I would like to make some groundbreaking discoveries as well as mentor impressionable students like myself.

Andrea Johnson

SCHOLAR'S NAME: Andrea Johnson

RESEARCH TITLE: Employee Privacy in the Work Place

MENTOR: Martin Fogelman, Ph.D., University at Albany
School of Business

ABSTRACT:

When individuals normally think about research, the first thing that comes to mind is a science lab and individuals completing experiments, wearing a lab coat and goggles. The research that I did was entirely different because I am a business major. My research mainly dealt with gathering large amounts of information, reading it, and summarizing what I had read. I accomplished this by going to the library every day to look up information on the topic and reading numerous articles in hopes of relating the content in the article to the topic that I was researching.

In the research that I completed, there were not results. In the future, the plan is to create an empirical study, which will involve questionnaires along with an interactive conversation with selected individuals to analyze each aspect of the employee's motivation in hopes of finding a precise way of measuring how employees are actually motivated.

Future Career Plans:

I am hopeful that the study will provide an explanation of the elements in the work place or personal aspects that motivate employees to do the work that they do day after day. My research opportunity has had a wonderful effect on me. It has allowed me to consider new geographical regions for the future in regard to employment positions. It has also allowed me to view the opportunities that are available to individuals who decide to continue their education by obtaining their Ph.D. My goals for the future are to find a career position in the accounting or auditing department of a successful business in the United States. Then, I plan to open my own accounting firm and establish a scholarship fund for African-American females who grew up in a one-parent home.



Andrea Johnson

HOMETOWN:
Hartsville, S.C.

MAJOR/MINOR:
Business Administration

DATE OF GRADUATION:
May 2006

INSTITUTION:
Clafin University



Alex Logono

HOMETOWN:
Utica, N.Y.

MAJOR/MINOR:
Biology

DATE OF GRADUATION:
December 2006

INSTITUTION:
University at Albany

Alex Logono

SCHOLAR'S NAME: Alex Logono

RESEARCH TITLE: Genetics of West Nile Virus Infection of Insect Hosts

MENTOR: Robert L. Glaser, Ph.D., University at Albany
School of Public Health and Wadsworth
Center Division of Genetic Disorders

ABSTRACT:

West Nile Virus (WNV) is mosquito-borne flavivirus, and is an example of an emerging infectious agent of global significance. WNV and other closely related flaviviruses such as dengue, yellow fever, and Japanese encephalitis viruses are a significant cause of human infectious disease. In 2003, WNV was present in mosquito and bird populations (its normal reservoirs in the wild) in 46 U.S. states, and human WNV infections caused more than 9,800 illnesses and 100 deaths. WNV is transmitted predominantly by *Culex* mosquitoes. It is well established that interactions between the genes of the mosquito vector and genes of WNV are important in determining vector competence, i.e., the ability of a specific mosquito species to transmit WNV to a vertebrate host. Identifying the relevant mosquito genes and elucidating how they affect virus proliferation and transmission, however, is limited by the difficulty of doing functional genetic screens in mosquitoes. The long-term goal of these studies is to overcome this limitation by developing the fruit fly, *Drosophila melanogaster*, as a "surrogate" mosquito to expedite the discovery and functional analysis of insect genes important for WNV replication and transmission. The first specific aim of this research was to insert a WNV replicon marked with the luciferase gene into the *Drosophila* germline by P element-mediated germline transformation. The second specific aim was to determine if luciferase enzyme assays work in *Drosophila* extract.

Four transgenic strains of *Drosophila* containing the West Nile Virus replicon were obtained from more than 2,000 injected embryos. It was also determined that *Drosophila* extracts do not inhibit luciferase activity nor do they show autoluminescence, which would interfere with the assay. Finally, preliminary analysis of initial transformants suggests that the West Nile Virus replicon can be expressed from the *Drosophila* germline.

Future Career Plans:

My future studies will focus on the suitability of using these transgenic flies for large-scale genetic screens to identify the gene important for West Nile Virus proliferation in insect hosts. As a person of color, it has been a great opportunity for me to work directly with one of the famous scientists during my summer research, and I was able to acquire scientific knowledge and practical research methodology. The summer research I conducted has given me a great new opportunity in life; it is a gateway to my career goal as a medical doctor. To achieve my goal, my plan is to continue to do more scientific research and gain more hands-on experiences from my work, which will eventually qualify me to succeed in my study at medical school and my future career.



Tarhonda Moore

HOMETOWN:
Macon, Ga.

MAJOR/MINOR:
Biology/Premed

DATE OF GRADUATION:
May 2006

INSTITUTION:
Paine College

Tarhonda Moore

SCHOLAR'S NAME: Tarhonda Moore

RESEARCH TITLE: Expression and Purification of Human trm9: A Putative Methyltransferase Used in Response to Cellular Stress

MENTOR NAMES: Thomas J. Begley, Ph.D., University at Albany
School of Public Health and Wadsworth Center

ABSTRACT:

The cells in our bodies are constantly under stress, and in many cases, the cause of this stress is exposure to low dosages of alkylating agents. These alkylating agents are chemicals that attack cellular molecules such as DNA and proteins. If there is a high dosage present, they can actually kill cancer cells, but while killing cancer cells, they are destroying DNA as well. People are exposed to alkylating agents both exogenously and endogenously. Our cells are exposed to alkylating agents all the time, and due to this exposure to alkylating agents, cells become stressed. When they become stressed, they begin to respond through a two-step process called transcription and translation. This process can be regulated by stress, and one of the ways in which the cell may become under stress is when the yeast trm9 protein is removed from the wobble base of tRNA. According to studies, the yeast trm9 protein is responsible for the methylation of the wobble bases in tRNA, and if this yeast trm9 protein is removed, then the cell's sensitivity will increase. The increase in sensitivity suggests that the cell is under stress, and that the methylation of the wobble bases from the yeast trm9 protein is needed to help prevent cellular stress. It is known that the yeast trm9 protein is a tRNA methyltransferase that can be used in response to cellular stress, but the goal is to see whether or not the human trm9 protein could be used in response to cellular stress. However, in order for the human trm9 protein to be tested to see if it can be used in response to cellular stress, it must first be expressed and purified, but there are many small steps and procedures that must be conducted to reach the goal of an expressed and purified human trm9 protein.

Future Career Plans:

I plan to attend medical school after graduation.

Edmond Obeng-Gyimah

SCHOLAR'S NAME: Edmond Obeng-Gyimah
RESEARCH TITLE: Biochemical Characterization of Human Rad52 Protein
MENTOR NAMES: Ravindra Gupta, Ph.D., University at Albany
Department of Biological Sciences

ABSTRACT:

The repair of damaged DNA is essential to the prevention of mutations, chromosomal aberrations, and the loss of genetic material in order to enhance the maintenance of genome integrity. Different types of DNA damages are possible but the most genotoxic is double strand break (DSB). DSBs are implicated in various cancers. Our lab is interested in enzymes that repair DSBs and the factors affecting their activities. My study focused on the Human Rad52 (HsRad52) enzyme, which has been currently shown to repair DSBs through the homologous recombination pathways (Jaspal and Gupta et al 2004). I standardized the conditions essential for Rad52's optimum activity and also tested for factors that impede its activity.

Strand exchange experiments were usually employed. The experiments were performed using an 83-mer oligonucleotide, which we called G16 (16 percent GC content). By using two complementary G16 strands, we were able to produce a double strand DNA through thermal annealing. We prepared a reaction mixture, which contained 3 μ M G16 single strand, 2.5 μ M G16 double strand and 0.5 μ M HsRad52. Our reaction mixture also contained 25mM Mops (pH6.8)/1mM DTT/0.1mg BSA per ml/ 0.1mM MgCl₂. We initially incubated all the reagents, except the duplex DNA, for 10 minutes at 37°C and then added the duplex and increased magnesium concentration to 1mM. The reaction mixture is again incubated for 10 and 30 minutes time points. At each time point, SDS is added to stop the reaction. The samples were examined by 12 percent non-denaturing gel. Mismatches were also introduced into G16 to find out how this affects Rad52 activity. The experiments were the same, except that substrate DNAs were less homologous.

Our data showed that Rad52 works best in 1mM magnesium concentration reaction mixture and that the single strand to duplex DNA ratio has to be almost 1:1 for optimum activity. Also protein concentration of 0.5 μ M proved to be ideal. Another interesting result was that Rad52's activity is paralyzed by mismatches. When two A-T mismatches were introduced, the enzyme's activity reduced from 27 percent to about 2 percent. Activity was not present when four mismatches were introduced.

Future Career Plans:

I plan to obtain an M.D. from the Albert Einstein College of Medicine in New York. It is my hope to assist in developing drugs to combat top killers, such as cardiovascular disease and cancer.



Edmond Obeng-Gyimah

HOMETOWN:
Bronx, N.Y.

MAJOR:
Biochemistry/Molecular Biology
and Chemistry

DATE OF GRADUATION:
May 2006

INSTITUTION:
University at Albany



Laura M. Ramirez

HOMETOWN:
Fort Drum, N.Y.

MAJOR/MINOR:
Sociology

DATE OF GRADUATION:
December 2006

INSTITUTION:
SUNY Potsdam

Laura M. Ramirez

SCHOLAR'S NAME: Laura M. Ramirez

RESEARCH TITLE: Critical Demography Project

MENTOR: Hayward Horton, Ph.D., University at Albany
School of Public Health and Department of Sociology

ABSTRACT:

The purpose of this project is to create a unique data set called the United States Metropolitan AIDS Data (USMAD), a sophisticated analysis of HIV/AIDS, which can be conducted at a national level. The USMAD is designed to help sociologists understand the nature of HIV and relations to different sociological demographic correlations in metropolitan areas.

As a student assistant, my work was based on manipulating secondary data from the Census Web site and the CDC Web site, which would then be put into the USMAD.

When the project is final, we will be able to assess community demographics and their relation to HIV/AIDS in the community. These results will help in creating programs for HIV/AIDS prevention.

The research helped me to develop the potential I have to go to graduate school and to succeed. It helped strengthen my confidence in my academic abilities so that I continue to push myself. The research also exposed me to new avenues of study in graduate school.

Future Career Plans:

My plans are to work with people in the community and use my educational background in sociology to assist my efforts. I would like to attend graduate school in order to gain knowledge and further myself in a career that involves helping people.

O'Neal Severin

SCHOLAR NAME: O'Neal Severin

RESEARCH TITLE: Cloning and Expression of a Unique Homing Endonuclease from cyanophage S-PM2

MENTOR: David Shub, Ph.D., University at Albany
Department of Biological Sciences

ABSTRACT:

Self-splicing introns called group I and group II introns were believed to be found in only mitochondrial and chloroplast genomes. Today, it is well established that these self-splicing introns are present in representatives of many types of organisms.

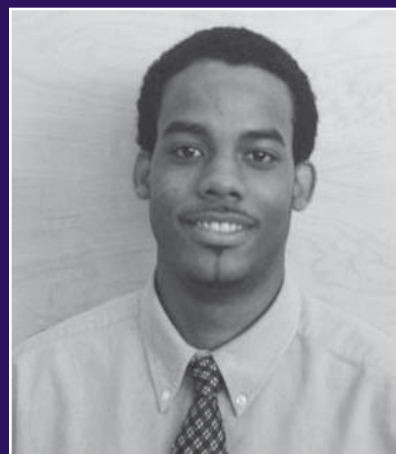
This research is aimed at group I introns. Most of these self-splicing introns contain an endonuclease gene that initiates the transfer of introns, including the endonuclease, into another allele. These endonucleases specifically cleave DNA of intronless versions of the cognate gene at or near the site of intron insertion. The intron uses a double-strand break/repair mechanism to integrate to an intron-minus allele. Because the endonuclease directs the intron into intron-minus alleles of homologous genes, they are referred to as "homing endonucleases." The homing endonucleases are grouped into four classes based on the presence of conserved amino acid motifs.

An intron that was recently described in Dr. Shub's lab is the first case where an endonuclease is not inserted in the intron but rather just downstream of the intron-containing gene. This endonuclease does not belong to any of the already characterized homing endonuclease gene families. However, like typical homing endonucleases, this endonuclease is able to cut an intronless allele at its intron insertion site, stimulating a homologous recombination that results in an intron-positive allele flanked with the endonuclease gene. We propose that this new class of endonuclease may be a member of a new gene family.

The object of this project is to clone and express this novel endonuclease gene in order to obtain large amounts of protein that can be purified and used for biochemical and structural studies. We will perform PCR, using primers that anneal to flanking sequences of the gene. The gene fragment will then be ligated into a plasmid expression vector, pBAD/Myc-HISA. The vector will then be transformed into the E.coli strain.

Future Career Plans:

Upon graduation, I would like to attend graduate school and pursue a Ph.D. in pharmacology. I wish to use my acquired research skills and knowledge through my field of study to help combat the major diseases we still face today.



O'Neal Severin

HOMETOWN:
Bronx, N.Y.

MAJOR/MINOR:
Biology

DATE OF GRADUATION:
December 2006

INSTITUTION:
University at Albany



Elroy Tatem

HOMETOWN:
Bronx, N.Y.

MAJOR/MINOR:
Electrical Engineering/Mathematics

DATE OF GRADUATION:
May 2006

INSTITUTION:
Union College

Elroy Tatem

SCHOLAR'S NAME: Elroy Tatem

RESEARCH TITLE: Electronics of Electron Microscopes

MENTOR: Bradley Thiel, Ph.D., University at Albany
College of Nanoscale Science and Engineering

ABSTRACT:

My project was to troubleshoot and repair a malfunctioning electron microscope. It was a JEOL transmission electron microscope used by many researchers, professors, and students for high-resolution imaging. The transmission electron microscope could not reach its maximum voltage potential of 200KV, which is necessary for driving the electron gun. After analyzing the circuitry, the problem was found to be within the high-voltage tank, where the voltage is generated. More specifically, the fault was in the Cockroft-Walton voltage multiplier circuit.

Future Career Plans:

I plan to continue studying emerging technologies. I eventually would like to market my ideas and ultimately found a university where students learn how to affect change in the world using their gifts in mathematics and the physical sciences. I also have theories that deal with photons and their effects on the structure of an atom, which is of the nano- and pico-scale region. I would also like to conduct research on weather formations and storm drafting on a macro scale. Some people may look at my goals and ask exactly what category I fit into, but no one is ever going to be remembered if they are just a biologist, or just a physicist... one should be able to show good reasoning in depicting the world as it is viewed in all realms.

I would like to get my Ph.D. in nanoengineering. I would also like to teach myself the fundamentals of biology as it applies to nanotechnology and chemistry.

Valerie Thomas

SCHOLAR'S NAME: Valerie Thomas

RESEARCH TITLE: Genetics of Lead-Induced Changes
in *Drosophila Melanogaster*

MENTOR: Helmut Hirsch, Ph.D., Distinguished Teaching
Professor, University at Albany
Department of Biological Sciences

ABSTRACT:

My research consisted of testing the effects of lead on *Drosophila melanogaster*. The methodology used was to collect the *Drosophila* that had been reared on distilled water (control) or Lead Acetate (experimental). We placed 75 recombinant inbred *Drosophila*, aged five to seven days old, in the *Drosophila* Activity Monitor (DAM) for seven days to track their activity. The DAM was placed in a temperature and light-controlled incubator. Their activity was tracked for seven days. The Qualitative Trait Localization technique (QTL) will be used to try to identify which region of genes across lines is affected by lead exposure. It is hypothesized that lead would greatly affect the locomotion of *Drosophila*. Future work will be to analyze the regions identified by QTL, to develop technologies to protect or alter the genes from lead exposure.

Future Career Plans:

Upon graduation, my intention is to pursue an advanced degree in the area of medicine or a Ph.D. in public health. My overall goals are to work in an underserved community as a health care professional. I would like to provide care and share information on the maintenance and/or prevention of diseases that have the greatest effect on our community.



Valerie Thomas

HOMETOWN:
Yonkers, N.Y.

MAJOR/MINOR:
Biology

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
University at Albany



Georgina Torchon

HOMETOWN:
Spring Valley, N.Y.

MAJOR/MINOR:
Actuarial and Mathematical
Science/Economics

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
University at Albany

Georgina Torchon

SCHOLAR'S NAME: Georgina Torchon

RESEARCH TITLE: **The Emergence of a New Regional Innovation Model:
The College of Nanoscale Science and Engineering**

MENTOR: **Ed Cupoli, Ph.D., and Michael Fancher,
University at Albany College of Nanoscale
Science and Engineering**

ABSTRACT:

The President's Council of Advisors on Science and Technology (PCAST) report on Information Technology Manufacturing and Competitiveness explored the importance of the "Research & Development – Manufacturing Innovation Ecosystem" to the nation's information technology sector. Given the technical challenges of atomic-scale manufacturing, escalating global competition and increasing costs associated with each new device generation confronting the semiconductor industry, this study examines the role the College of Nanoscale Science and Engineering at the University at Albany has played in regional economic growth through a new paradigm in industrial collaboration at the dawn of the next industrial revolution - nanotechnology.

The study of the relationship between R&D and manufacturing critical for technology innovation is important to understanding the links that drive regional economic growth. "PCAST identified the research, development, and technology deployment process as not sequential in a single direction, but rather results from an R&D – manufacturing 'ecosystem,' consisting of basic R&D, pre-competitive development, prototyping, product development and manufacturing, with successful avenues of research and development being assisted by an understanding of the manufacturing situation as it presently exists."¹

As the velocity of technology development accelerates, the interdependency between new research and manufacturing becomes critically important. PCAST found that close proximity to strong R&D centers and manufacturing capabilities results in a competitive advantage. The establishment of industrial collaboration through regional technology clusters was also found as being important for technology innovation as well as economic development.²

Future Career Plans:

I hope to continue my research through the fall semester and to complete a comparative data analysis to further support my research and quantify economic growth for the local region. My future goals are to enter the area of actuarial science.

¹ "Sustaining the Nation's Innovation Ecosystems, Information Technology Manufacturing and Competitiveness" President's Council of Advisors on Science and Technology (January 2004)

² "Clusters of Innovation" The Council on Competitiveness reports at www.compete.org/publications/clusters_reports.asp

Luisa Torres

SCHOLAR'S NAME: Luisa Torres

RESEARCH TITLE: The Effects of Retrotransposition on Chromosome Rearrangements in *Saccharomyces cerevisiae*

MENTOR: M. Joan Curcio, Ph.D., University at Albany
School of Public Health and Wadsworth Center

ABSTRACT:

Retrotransposons are mobile elements that replicate through an RNA intermediate and are present in the genomes of essentially all plants and animals. Their movement has been implicated in cancer formation and other inherited disorders. For this research, we focused on the Ty1 element of the yeast *Saccharomyces cerevisiae* and on analyzing the effects of both inhibiting and inducing Ty1 retrotransposition on chromosome size changes. The RTT101 gene was used to select for Ty1 retrotransposition by selecting for cells capable of growing in the absence of Histidine, an essential amino acid. A Canavanine resistance experiment and a translocation experiment were conducted as well to select for chromosome size changes. Although more tests will be needed to further prove this theory, we found a correlation between Ty1 retrotransposition and chromosome size changes. We also found that Ty1 retrotransposition may increase frequency of deletions, although it did not affect the frequency of a specific chromosome translocation.

Future Career Plans:

Upon graduation, I would like to pursue a Ph.D. in molecular genetics or pharmaceutical chemistry. My goal is to continue my research experience as an undergraduate and to encourage other people to do the same.



Luisa Torres

HOMETOWN:
Albany, N.Y.

MAJOR/MINOR:
Biology/Italian

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
University at Albany



Dimitri D. Vaughn II

HOMETOWN:
Syracuse, N.Y.

MAJOR/MINOR:
Chemistry/Math

**ANTICIPATED DATE
OF GRADUATION:**
May 2008

INSTITUTION:
University at Albany

Dimitri D. Vaughn II

Scholar's name: Dimitri D. Vaughn II

Research Title: **Cu (I) Carboxylates as New Reactive Metal Complexes for Buckybowl Binding**

MENTOR: Marina A. Petrukhina, Ph.D., University at Albany
Department of Chemistry

ABSTRACT:

This project contributed to the successful synthesis of two new Cu (I) carboxylates, which will be employed for future use in transition metal complexes of open geodesic polyarenes known as “buckybowls.” X-ray crystal structure was obtained for the $[\text{Cu}(\text{O}_2\text{C}(2,6\text{ bis-CF}_3)_2\text{C}_6\text{H}_3)]$ ⁽¹⁾ molecule, and will be recognized as one of the few Cu (I) carboxylates to do so. Compound 2 $[\text{Cu}(\text{O}_2\text{C}(2,4\text{bis-CF}_3)_2\text{C}_6\text{H}_3)]$ ⁽²⁾ was characterized using infrared spectroscopy, solid UV-vis, and photoluminescence, along with compound 1, but X-ray quality crystals were not achieved. Synthesis was completed by a vastly effective four-step procedure. Step One: Synthesis of starting material; Step Two: Ligand exchange reaction; Step Three: Product purification; and Step Four: gas-phase sublimation-deposition reaction. Analysis of X-ray crystal structure for compound 1 showed a polymer built on Cu-O interactions with dinuclear Cu cells or units. Photoluminescence showed that compound one fluoresces green while compound two fluoresces red. Based on a comparison of a previous Cu (I) carboxylate synthesized in our lab $[\text{Cu}(\text{O}_2\text{C}(3,5\text{bis-CF}_3)_2\text{C}_6\text{H}_3)]$ with CF_3 groups placed at the 3,5 positions, and an X-ray observed Cu (I) helix structure, it was concluded that by exchanging ligands with CF_3 groups placed on different positions of the benzene ring, new Cu(I) carboxylate structures can and will result.

Future Career Plans:

I plan to pursue a Ph.D. either in chemistry with an emphasis on materials, or in the new and exciting field of nanotechnology, possibly a combination of the two. My goals are to continue with academic excellence, perseverance, and a “never-say-die” attitude. I have realized that a good support network that I believe in and trust is central to my success. I plan on helping to make a difference in the lives of others.

Anthony Weathers

Scholar's Name: Anthony Weathers

Research Title: Development of Nanoscale Metrology Tools for Nanoelectronics

MENTOR: Robert Geer, Ph.D., University at Albany
College of Nanoscale Science and Engineering

ABSTRACT:

The main purpose of this research is to develop a procedure for attaching a nanoprobe tip to microcantilevers, and to characterize the resonance response of microcantilevers before and after a nano-tip is attached. First, the microcantilevers and the nanoprobe tips were fabricated, then with the use of an ultraviolet curable adhesive, the nanoprobe tips were carefully attached to the microcantilever. Next, the cantilever with the attached tip went through a series of testing to gather information about the resonance response, size of the nanoprobe tip, and a comparison between a commercial microcantilever and the experimental one with the use of Atomic Force Microscopy and nanomechanical imaging.

The nanoprobe tips were successfully attached to fabricated microcantilevers. While testing the resonance response, it was determined that the resonance amplitude decreased, but resonance frequencies remained unchanged when the tip was added, which is what was expected. The attached tips were suitable for AFM topographic imaging, and were compared with a commercial cantilever. This implied that the attached nanoprobe was successful for imaging, and if a method of removal for the nanoprobe tips were determined, we would be able to replace the damaged ones.

Future Career Plans:

Upon graduation, I plan to work for a year to gain experience. Afterwards, I plan to attend graduate school to get my master's in electrical engineering and later earn an MBA.



Anthony Weathers

HOMETOWN:
Amityville, N.Y.

MAJOR/MINOR:
Electrical Engineering

**ANTICIPATED DATE
OF GRADUATION:**
May 2007

INSTITUTION:
Stony Brook University



Renee Woodburn

HOMETOWN:
Stone Mountain, Ga.

MAJOR:
Human Biology, Health, and Society

DATE OF GRADUATION:
May 2006

INSTITUTION:
Cornell University



Marcus Lambert

HOMETOWN:
Atlanta, Ga.

MAJOR/MINOR:
Biology/Premed

DATE OF GRADUATION:
May 2006

INSTITUTION:
Howard University

Renee Woodburn and Marcus Lambert

SCHOLARS' NAMES: Renee Woodburn; Marcus Lambert

RESEARCH TITLE: TNF Increases Permeability Associated with the Nitration of Actin in Pulmonary Microvessel Endothelial Cells

MENTOR: Arnold Johnson, Ph.D., Stratton VA Medical Center

ABSTRACT:

Acute Respiratory Distress Syndrome (ARDS) is characterized by a breakdown in the pulmonary microvessel endothelial selectivity to protein. This causes pulmonary edema, which is the accumulation of fluid into the extravascular space. Tumor necrosis factor- α (TNF- α) is a mediator of ARDS. We hypothesize that barrier dysfunction is mediated by a TNF- α induced, peroxynitrite (ONOO-) dependent increase in endothelial cell monolayer permeability, which is associated with nitrated actin. Immunoblots are used to measure levels of actin nitration in TNF-treated endothelial cells. Permeability is analyzed in a Transwell system using Evans-blue dye to measure albumin flux across endothelial membranes.

Data showed the following results. Pure actin can be extracted from TNF-treated endothelial cells and their corresponding controls. The TNF-treated lysate has phosphorylation of I κ B α protein while the control lysate does not. This indicates that the TNF treatment was successful. There is an increase in nitro tyrosine/ α -Actin in the pure actin eluates of the TNF-treated endothelial cells. The 0.5 hour treatment with TNF shows a statistically significant percentage increase in nitrated actin by peroxynitrite. $P < 0.05$. There is an increase in nitrotyrosine in TNF-treated cells over untreated control cells. This supports our hypothesis that TNF nitrates actin. The yellow in the TNF-treated cells shows co-localization of actin and nitrotyrosine, which demonstrates that the tyrosine being nitrated is located on the actin residue. There is an increase in cell layer permeability in the TNF-treated cells. This is similar to the data produced using the older permeability assays. We will continue to use the commercially available Transwell system.

Our results imply that after further research, we may be able to determine the pathway by which ARDS develops. Once we know that, we can pinpoint certain locations throughout the pathway where we can stop it so that it does not continue and result in lung dysfunction.

Future Career Plans of Renee Woodburn:

I am now applying to medical school. I would like to spend the rest of my life working with underserved populations as an Ob/Gyn and conducting research on those populations to determine their health care needs.

Future Career Plans of Marcus Lambert:

I plan to obtain a Ph.D. in biomedical sciences upon graduation.

Mission Statement

To expand the horizons of the mind in science, technology, and other Ph.D. fields through research and scholarly activities.



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