



The Ronald E. McNair Post-Baccalaureate Achievement Program
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2002 is the third year of the Ronald E. McNair Post-Baccalaureate Achievement Program and the twelfth year of the University Research Experience Program research symposium effort. This year's joint research symposium presents the work of the students in the program. The goal of these programs is to increase the number of individuals from underrepresented groups entering graduate school and entering the teaching profession.

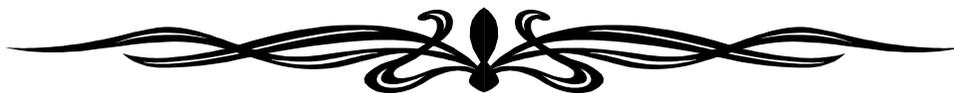


THE RONALD E. MCNAIR POSTBACCALUREATE ACHIEVEMENT PROGRAM

The Ronald E. McNair Post-Baccalaureate Achievement Program, named in honor of the space shuttle challenger astronaut Dr. Ronald E. McNair, was established in 1999 at New Jersey Institute of Technology. Funded by the U.S. Department of Education, the McNair Program encourages low-income, first-generation and underrepresented undergraduate juniors and seniors who are enrolled full-time in the Newark College of Engineering, College of Science and Liberal Arts, College of Computing Science and the Albert Dorman Honors College to consider careers in college teaching as well as prepare them for doctoral study.

The primary goal of the McNair Program is to increase the number of scientists, engineers and mathematicians who come from underrepresented groups who will go on to obtain PhD's and enter the educational field. McNair Scholars engage in research opportunities and other scholarly activities with Faculty Mentors from their academic departments. Results of their research projects are presented at professional meetings, conferences, published in peer review and other professional journals. McNair Scholars have the opportunity to participate in a wide array of workshops, seminars and activities designed to prepare them for doctoral studies. In addition, McNair Scholars are provided with support services such as tutoring, counseling and career guidance.

McNair Scholars have the opportunity to participate in summer research (either at NJIT or elsewhere) in their junior year of study. All Scholars receive assistance for applying to and enrolling in graduate school after obtaining a bachelors degree from NJIT. McNair Scholars may pursue their post-baccalaureate study at any higher education institution in the United States. The Ronald E. McNair Post-Baccalaureate Achievement Program is responsible for tracking the academic and career accomplishments of all Scholars after they graduate from NJIT.



THE UNIVERSITY RESEARCH EXPERIENCE PROGRAM

Established in the 1990-91 academic year the University Research Experience (URE) program at New Jersey Institute of Technology provides technical assistance to EOP and students who have been historically underrepresented in graduate and doctoral degree programs in science, engineering and mathematics. Its undergraduate research component engages students, as early as their freshman year, in research projects with faculty mentors from their academic departments. Early in their academic years, URE undergraduate scholars are able to participate in teaching internships and workshops, and attend professional and disciplinary conferences with their faculty mentors and present their research efforts. In addition, URE provides advisement and assistance with the graduate school application process by helping students identify and apply for research, graduate and teaching assistantships as well as fellowships, grants and other types of federal, state and university financial aid. Additionally, URE provides support services such as counseling, career guidance and mentorship to its undergraduate and graduate students.

Since its inception, the URE program has helped to graduate close to 95 underrepresented and/or financially disadvantaged students with master's degrees in engineering, mathematics, computer science and management. URE continues to provide underrepresented students with the research opportunities and mentorship they need to successfully enroll in and graduate from masters and doctoral degree programs. New Jersey Institute of Technology is committed to continuing this program trend well into the 21st century.



Neezam Ali

Electrical Engineering
McNair Scholar

Mentor: Dr. Timothy Chang
Electrical & Computer Engineering



Biographical Sketch

My name is Neezam Ali, a senior at New Jersey Institute of Technology, majoring in Electrical Engineering. I am originally from the island of Trinidad, in the Caribbean. I came to the United States when I was fourteen and attended Barringer high school in Newark. Growing up in a family where the income was below average, I was taught the value of a dollar at a young age and ever since then, I have vowed never to let my parents face the burden of putting me through college. I have not asked my parents for money to pay for my education and I think this is one of my greatest accomplishments so far. Also, being on the Dean's list since I started college is another accomplishment that I am proud of.

Throughout my years at NJIT, I have been the treasurer of two clubs, which are the Institute of Electrical and Electronic Engineers (IEEE) and the

Caribbean Student Organization (CaribSO). Aside from these clubs, I have been a member of other clubs that include NSBE/BASE, HOST/SHEP, PSA and ISA. In addition, I am a McNair Scholar. During the summer of my junior year I was offered a fellowship from Merck and Company Inc. While working with them I learned a lot about the corporate world. My plans after graduation are dependant on the job market. If I am able to secure a good paying job, I would like to work for at least a year in the Electrical Engineering field and then return to graduate school. On the other hand, if I am unable to find employment, I will get my masters degree in Electrical Engineering. My goal is to work on research in the area of the nerves; however, for now I am interested in learning about the tools used to work on the nerves, which I am currently doing in my research with my mentor.



Research

DC Motor Control

For this project we will interface a DC motor with a flexible beam and a power amplifier circuit, to calculate trajectory and vibration. First we will design and build a Power Amplifier circuit using an OPA512BM chip and another Operational Amplifier of lesser quality and both would be studied and compared. This circuit would be connected to a DC motor. With the use of the power amplifier circuit connected to the DC

motor, we will be able to use the principle of feedback from the motor we would be able to control the rotation of the beam to varied angle and distances. The commands to the arm would be with interface of data acquisition tools. The deflection of the beam would be measured by output from piezoelectric strips, which would be connected to the beam.

The information gathered would be useful in the growing Robotics field. From this information the designers of robots would be able to use the

information to specify gain as well as speed of their robots.





Suravut Chanphanitpornkit

Mechanical Engineering
McNair Scholar

Mentor: Dr Rajesh Dave
Mechanical Engineering



Biographical Sketch

I am currently a Mechanical Engineering student at the New Jersey Institute of Technology, with the expected graduation date of May 2003. My current grade point average is 3.45 major grade point average is 3.69. I have made the Dean's list in the four out of five semesters that I have been at the New Jersey Institute of Technology. Some of the societies that I am a member of are ASME and the

McNair Achievement Program. I am also a candidate for the membership of Pi Tau Sigma. As a McNair scholar, I am conducting research in the flowability of Cornstarch, with Dr. Rajesh Dave as his mentor. Some of the awards that I have received are Newark College of Engineering Merit Scholarship and Richard Tartaglia Memorial Scholarship.



Research

Flowability of Cornstarch

Currently, many pharmaceutical companies are using cornstarch as a filler or incipient in their drug capsules and pills. However, because of its ultra-fine size, it is very cohesive and its flowability is very low. Because of that, there are numerous material handling problems, for example, the starch gets stuck in the machines and pipes all the time, which cause them to jam and cause delays, or possibly break down. Several ways of solving the clogging problem in machines and pipes are used in the industry; for example, vibrating the feeders or adding flow aids. While such solutions work for some cases, they are cumbersome and not fail-safe. In this project, a novel technique is employed to solve the flowability problem. By means of dry

powder coating, where tiny sub-micron particles are mechanically coated onto the surface of the poor flowing powder, the flowability may be improved. The experiments are carried out for coating starch with fumed silica. Two different coating methods are chosen for this purpose, one of which is an innovative method called Magnetically Assisted Impaction Coating (MAIC), while another is a high mechanical energy-processing device. A number of studies are conducted and the improvement in the flowability is quantified using a device called the Powder Tester. The results show the flow improvement as a function of the coating device and its operating parameter.



Marta Gonzalez

Mechanical Engineering
McNair Scholar

Mentor: Dr. Nadine Aubry
Mechanical Engineering



Biographical Sketch

I am currently a senior in the Mechanical Engineering department at New Jersey Institute of Technology (NJIT). During my experience in the university, I developed a strong academic background and have become a good engineering student. I am a member of the Hispanic Organization for Students in Technology; in addition, I am part of the advertisement committee for the Society of Hispanic Professional Engineers during the 98'-99' academic year. I have received honors such as the Dean's List, Cynthia Pruett Scholar, Arthur D' Espies Scholarship, Educational Opportunity Program Academic Performance Award, Who's Who Among Students of Colleges and Universities, and the McNair Achievement Program at NJIT. The McNair research program allowed me to work during the summer and

complete research at the Gesture and Movement Dynamics Lab.

I am currently working on a research project at the Flow Control Lavatory. The project will help pharmaceutical companies to reduce the amount of dust particles that operator inhale during the production of medicines. I completed a Co-op at Datascope Corp. during the Fall 2001, where I developed my skills as an engineer. My assignment was to create and test parts to be use in future products, as well as the modeling, assembling, and drawing on Pro-Engineer software, to send parts for prototype. Recognizing my performance, I received the 2001 Mechanical Engineer Co-op of the year award, by the NJIT Division of Career Development Services.



Research

Clean Air Fluid Mechanics

In the pharmaceutical industry, a great amount of dust is created during the production of medicines. To control the powders that are harmful in the production of medicines an experiment is being conducted. This experiment will include a set up of small jets, air ducts, and exhaust fan that will control the dust created by the powder. Cornstarch is use to make powder because it is not harmful to human health. The first step in the project was to

fabricate a mixing of powders, so that the levels of dust exposure can be measured. To measure the dust exposure, a consistent flow of dust is needed and that has been accomplished by the used of a vibratory conveyor. The conveyor system has been fully tested and provides a consistent flow for at least 40 minutes. Now that the dust can be created, various tests will be developed to determine how effective is the use of small jets in the system.



Mario Ibrahim

Computer Engineering
McNair Scholar

Mentor: Dr. John Carpinelli
Electrical & Computer Engineering



Biographical Sketch

I am currently a senior at the New Jersey Institute of Technology, working towards a Bachelors of Science in Computer Engineering with a minor in Computer Information Systems. I always have been an active member within many groups at the university. Presently, I am a member of Tau Beta Pi, the Engineering Honor Society, Eta Kappa Nu, the Electrical and Computer Engineering Honor Society, and part of the Albert Dorman Honors College. Further, I am a Ronald E. McNair Post-baccalaureate scholar, and an active member in the Society of Hispanic Professional Engineers. In addition, I have also been accepted into the BS/MS Program.

I am currently employed, part-time, as a Technical Associate at Lucent Technologies: The Microelectronics Division. I am also a facilitator for the Motorola 68k microprocessor class, and have also taught Circuits & Systems, Digital Design, and Data Structures & Algorithms. The aforementioned teaching experience has significantly developed my communication skills. My strongest interest lies in the area of computer hardware / software interfaces and I hope to study this area more in depth at the graduate school of Georgia Institute of Technology.



Research

Design & Simulation of a 3-stage, 64 x 64, Time-Space-Time Switching Structure using Very High Speed Integrated Circuit Hardware Descriptive Language

Parallel processing significantly improves overall computer system performance. It demands an effective and efficient switching interconnect system structure. This is vital to communication speed among the multiple processors and shared memory, I/O, and peripheral devices. The interconnections may be implemented in the space or time domain. The space domain consumes a large amount of space area, and becomes impractical when large switches are required. The plummeting cost of

memory makes time domain interconnect implementation an improved solution. However, because of the practical limitations of injecting multiplexed channels into common TDM links for time stage switching, a space stage is inserted. The design, testing and effectiveness of this proposed design is the primary focus of this research. VHDL, hardware simulation software, is used for the validation and verification of the design.



Niveen Ismail

Chemical Engineering
McNair Scholar

Mentor: Dr. Carol Venanzi
Chemical Engineering



Biographical Sketch

I am a junior at New Jersey Institute of Technology in the Albert Dorman Honors College with a major in Chemical Engineering and a minor in Applied Mathematics. As an active student in the NJIT community, I am a member of the Arabic Students Association, American Institute of Chemical Engineers, and the Honors College Recruitment Committee. I am also a Student Assistant Recruiter for the Newark College of Engineering. Outside of NJIT I volunteer at the Islamic Center of Passaic County as a Sunday School Arabic teacher, and also I am member of the Benevolence International Foundation. I have received various awards and honors while at NJIT including the Bauder

Scholarship and Chemical Engineering Merit Award. I have also been inducted into the Phi Eta Sigma Honor Society.

By conducting research at the undergraduate level, I have been able to implement and apply the textbook knowledge previously mastered in a classroom environment. Also, by conducting research I will be able to obtain a glimpse of the procedures involved in researching. My ultimate goal is to obtain a PhD in the field of Chemical Engineering, and conducting research while an undergraduate can help me gain necessary experience that will be of use in graduate school.



Research

Computational Studies of Methylphenidate, a Potential Treatment for Cocaine Abuse

Cocaine abuse has been a growing problem in society for years. Cocaine affects the “rewards” section of the brain by blocking the uptake of dopamine, a protein located in nerve endings, at the dopamine transporter. A cocaine antagonist, i.e. a drug which blocks the cocaine binding site on the dopamine transporter (DAT) while still allowing the uptake of some dopamine by the transporter, would be useful in the treatment of cocaine abuse since it could be used to moderate the amount of cocaine ingested, much as methadone is used by heroine addicts. Methylphenidate has been shown to have some of the properties of a cocaine antagonist without any of the addictive properties of cocaine. In previous studies the methylphenidate

phenyl ring and nitrogen were determined to be basic to recognition at the DAT. But what is its bioactive conformation—the molecular conformation in which it binds to the DAT? If bioactive composition is discovered, then more potent drugs could be designed using this template. Currently, computational chemistry is being used to relate the conformation of methylphenidate and 29 substituted analogs to their energy and biological activity (i.e. affinity for the DAT). The analogs were synthesized in the Deutsch laboratory and their binding affinity was measured in the Schweri laboratory. Currently, the molecular conformations of the analogs are being analyzed in the Venanzi laboratory by comparing torsional

angles. The torsional angles are important since they determine the relative orientation of the phenyl ring and nitrogen. The purpose of comparing the angles is to search for a particular

conformation that may have high affinity for binding to the DAT. This work is funded in part by NIH grant DA11541.



Tracy John

Chemical Engineering
McNair Scholar

Mentor: Dr. Sanjay Malhotra
Engineering Science



Biographical Sketch

My name is Tracy John and I'm currently a senior majoring in chemical engineering. I was born and raised in New Jersey. I live with my two younger sisters and my parents in Piscataway. This is my third year working on research with a professor. My sophomore year, I worked with Dr. Luo in the Undergraduate Research Program on Recovery of Intracellular Materials by Electroporation. I continued to work on this project during my junior year in the McNair Program. Now, I'm working with Dr. Malhotra on Computer Modeling and Physicochemical Study of the Halogenated Analogs of common Cancer Drugs.

At NJIT, I'm involved with the Student Activities Council, Caribbean Student Organization, American Institute of Chemical Engineers, Tau Beta Pi and Omega Chi Epsilon. Along with the participation of these clubs, I have received awards from the university, including the Chemical Engineering Merit award, Dr. Otto H. York Scholarship, Marcalus Memorial Scholarship, NJIT Women's Leadership Award, the Undergraduate Research Experience Award and Donald F. Othmer Sophomore Academic Excellence Award. After graduating from NJIT, I plan to pursue graduate school and a career in research.

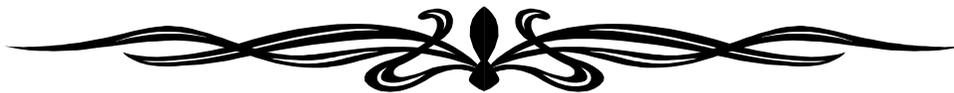


Research

Computer modeling and physicochemical study of the halogenated analogs of common cancer drugs

Various chemotherapeutic drugs such as Decarbazine, Flurouracil, Chloroambucil, Floxuridine etc. are being used in the treatment of Cancer. Several studies have shown that the halogenated analogs of nucleic acid based molecules show remarkable potential against various viruses such as HIV that cause lethal disease. Therefore, such halogenated molecules are the focus of current research as they could be good candidates to be developed as potential drugs. A systematic study of the halogenated analogs of these molecules, therefore, can have similar or better function in

preventing the synthesis of various molecules that are produced by viruses inside the human body and help to cure the diseases. We have initiated a systematic study of developing computer models for novel compounds based on known drugs. These models are used to obtain the physicochemical data such as dissociation constants that help our understanding of the behavior of molecules under the human metabolic conditions. So far, very valuable data has been obtained. Hopefully, the data generated will be useful in the synthesis of potential pharmaceuticals.



Linda KordiKaKavand

Chemical Engineering
McNair Scholar

Mentor: Dr. Deran Hanesian
Chemical Engineering



Biographical Sketch

I am currently a senior in the Chemical Engineering department at New Jersey Institute of Technology. During my undergraduate studies, I have developed a strong academic background while learning how to become a resourceful engineer. I am currently an officer of the Tau Beta Pi National Engineering honor society, and a member of Omega Chi Epsilon Chemical Engineering Honor Society and Omicron Delta Kappa National Leadership Honor Society. I have received honors such as the Leadership Award, Academic Excellence Award, and National Military Engineers Award and The

Jerome J. Salamone Chemical Engineering Award. I am currently the president of the NJIT Poets Corner and a member of the American Institute of Chemical Engineers. As a McNair Scholar I have been given the opportunity to conduct research in the field of soil remediation. My short term goals are to obtain my bachelors degree form NJIT and obtain work experience while completing my masters degree in Chemical Engineering. Later I plan to complete my doctoral degree in Chemical Engineering and return to NJIT as a professor.



Research

A Study of Soil Remediation and Sound Attenuation using a Sonic Whistle

Hazardous wastes are generated in the U.S. at an estimated rate of 6lb/person/day presenting significant health and ecological concerns. The development of cost-effective clean-up strategies, such as the use of the in-situ remediation techniques with the aid of sonic energy, is consequently imperative to restoring and maintaining environmental quality. This study investigates the attenuation of sound used in the in-situ remediation of soil using a sonic whistle as the sonic generator.

Previous research at NJIT has suggested that the contaminant removal rates are increased with the aid of a sonic energy source. The objective of this research is to study the sound attenuation through an artificial fracture in order to understand the properties of sound in field conditions. Since this study included the testing of different fracture geometries, it served to the better understanding of the behavior of sonic energy in actual fractures.



Miao Li

Computer Science
McNair Scholar

Mentor: Dr. Dawn Lott
Mathematical Science



Biographical Sketch

I am a senior majoring in Computer Information Science and Applied Mathematics here at NJIT. I am originally from China and moved to the United States in 1996. I am currently involved in many extracurricular activities in college such as the NJIT tennis team, Vector—the school newspaper, and Delta Phi Epsilon Sorority. I am also a member of Albert Dorman Honors College and a member of Pi Mu Epsilon Mathematic Honors Society. I have also received honors such as the Dean's List. I also held a Teacher's Assistant position for math during the Educational Opportunity Program (EOP) summer program; that was an exciting and challenging job. In my mind, getting involved in research at the undergraduate level would prepare me for graduate school as well as give me an in

depth understanding of what my major is really about. By doing research, I will expand my skills and gain valuable experiences.

McNair program will also give me a chance to meet more people and to learn about their projects; therefore, I will acquire new interests and get a broad sense of things that people are studying in other fields. As an undergraduate student, right now I mainly concentrate on my study, because that is why I am here at NJIT. I will definitely apply for graduate school to continue my education; my ultimate goal is to get a Ph.D. in my area of concentration in one of the Ivy League schools and, maybe some day, I would be good enough to give others my knowledge.



Research

Release of Ca^{2+} from intracellular storage sites in skeletal and cardiac muscle

A numerical algorithm based on convolution of functions is utilized to determine the release of calcium ions from intracellular storage sites in skeletal and cardiac muscle. Output images of localized increases in intracellular calcium ion concentration, due to release of calcium ions from intracellular storage sites, are obtained using fluorescent calcium indicators and confocal microscopy. To obtain a calcium release function underlying these localized increases of intracellular calcium ion concentration; one-dimensional output

images are deconvolved with a point spread function that describes the optical properties of the microscope. The resulting input image is then reconstructed, assuming symmetry, into a three-dimensional image of calcium ion concentration. Temporal information about the calcium ion release function can be obtained by performing convolutions on a series of output images recorded in time and then accounting for the kinetics of calcium ion interactions with the fluorescent calcium indicator.



Erik Lorenzo

Computer Engineering
McNair Scholar

Mentor: Dr. Nirwan Ansari
Electrical & Computer Engineering



Biographical Sketch

My name is Erik Lorenzo. I am a junior at New Jersey Institute of Technology where I am pursuing a B.S. in Computer Engineering, and a minor in Mathematics. During my three years at NJIT, I have acquired many honors and have been involved in a number of extracurricular activities. As a freshman and sophomore, I received the Dean's List Award, was named in Who's Who among American College Students, and won a scholarship for an essay I entered in the Lynch/Elliot Best Essay Competition. I am also a New Jersey Bloustein Distinguished Scholar, a Mobil Scholar, a Hearst Scholar, and an active member of the Society for Hispanic Professional Engineers. Most recently, I have become a McNair Scholar and am being initiated into the Tau Beta Pi national engineering honor society. Regardless of what the future holds for me, I know what I enjoy most is helping people. Over the past two summers, I have worked with the Educational Opportunity Program (E.O.P.) tutoring underprivileged incoming freshmen in Calculus. I liked being able

to help them solve the problem that they deemed impossible a few minutes ago, and I loved the look they had a few minutes after that when they could do the problem without me. What I enjoyed most, however, was the way my students looked up to me, and would ask me, "Was it this hard for you, when you were an E.O.P. student?" I would always say, "Yes, and I hated every moment of it, but I know now that it was all worth it." I guess that is why I am giving serious thought to becoming a Math Professor. By participating in undergraduate research, I can take a glimpse of what I might be facing when I go to graduate school. From the many conferences and presentations that the McNair students take part in, I can refine my communication and writing skills. Most importantly, I can earn the respect and trust of my Faculty Mentor, Dr. Ansari, who could possibly give me a few tips on how to survive graduate school, and what might be the best graduate school program to help my career and my growth as a student.



Research

Cost and Capabilities Comparison of LAN and WLAN

The main objective of this research project is to contrast and compare Local Area Networks (LAN), a technology that has existed for some time, with the newly emerging field of Wireless Local Area Networks (WLAN). By creating generalizations of hypothetical locations and user needs then giving the pro and cons to the implementation, cost, and

capabilities of both systems, suggestions can be formed as how these needs might be met. Organizations or schools interested in creating such networks for their working environments can then consider these suggestions, and have a better understanding of what might there needs be and

what might be the best possible why of realizing | there goals.



Ulysses McCormick

Computer Engineering
McNair Scholar

Mentor: Dr. John Carpinelli
Electrical & Computer Engineering



Biographical Sketch

I am a senior at New Jersey Institute of Technology majoring in Computer Engineering, Information Technology and a minor in Management. During my freshman year I became an active member of National Society of Black Engineers, NSBE and contributed to the reactivation of the organizations newspaper. That same year I received the New Member of the Year award. As a new student I wanted to experience all that college life had to offer, so I continued to join other organizations such as the NJIT ambassadors club, the Honors College, volunteer groups and professional societies like IEEE, also I was president of the Greek Letter Council. Currently, I am the vice-president and

Greek council representative for the Phi Beta Sigma fraternity and I work with the multi-lifecycle research department on campus as a program tester on a current engineering project. All of these activities have greatly helped me to improve my speaking skills I feel that doing research will improve my computing and academic skills. My career goal is to graduate from NJIT with a degree in Computer Engineering and Information Technology. I plan to go to graduate school for my MBA. I feel that my greatest challenge and personal goal is to strengthen my public speaking skills and to advance my computer knowledge.



Research

Simulation Tools for Computer System Organization and Architecture

The purpose of this project is to aid students having difficulty visualizing how computer components work can interact with an online program that simplifies and demonstrates how a CPU functions. The simulations will focus on the following areas: Very Simple CPU design, Direct Memory Access Controller, Programmable Logic Devices, Computer Arithmetic Hardware, Cache Memory, and Virtual memory. My focus will be to program the Direct Memory Access Controller. DMA speeds up computing performance by creating a direct connection between I/O devices and the hard

drive. My focus will be to program an applet that demonstrates how this works. The programs will be written as Java applets without proprietary extensions. This will allow the simulator to be run on any computing platform (Windows PC, Mac, UNIX/Linux) using a Java-enabled web browser. This standard will also make it easier to share code among the different simulators. Each simulator will also include an online users guide. The simulators and their source code will be made available without cost under the terms of the GNU Public License.



Chukwuma Ofoma

Electrical Engineering
McNair Scholar

Mentor: Dr. Timothy Chang
Electrical & Computer Engineering



Biographical Sketch

I am presently a senior at the New Jersey Institute of Technology, majoring in Electrical Engineering; with a minor in Management. I caught onto the technological wave that swept through the nation and the whole world. I decided to be a contributor particularly as an Electrical Engineer. I have been very fortunate to meet the people at NJIT. Throughout my years at NJIT, I have been active in the National Society of Black Engineers and was also a co-founder and treasurer of the African Students Association. As a result of our hard work and efforts we received a plaque for "Best New

Club on Campus." I am honored that my name is one of the four inscribed on the plaque. I am also a member of Tau Beta Pi, Engineering Honor Society and I received some merit scholarships and maintained the dean's list every semester. Also, I am a McNair Scholar, as well as a Resident Assistant (R.A) in the residence hall on campus. My plan is to go to graduate school and pursue a Masters degree in Electrical Engineering. In addition I would like to learn to play a musical instrument such as the piano. I have a strong interest in music and I hope to achieve recognition in the musical field someday.



Research

Ultrasonic Measurement Device

The goal of my project is to design an ultrasonic measurement device that will boast a high level of accuracy and also will be relatively inexpensive. The project involves both hardware and software. The hardware is in the form of the transmitter and receiver with the basic techniques and the software is the Digital Signal Processing (DSP) programming and Labview for the measurements as well as the interface with the computer. A Signal is sent out

from a source to a receiver of unknown distance and its return is timed to allow calculation of the target's distance by use of the known propagation velocity (1100 ft/s for standard air). The DSP programmed digitizer is used to pick dimensions off of solid objects and input the digitized values to various CAD programs. The tool will be of benefit to people who cannot use a measuring tape for their tasks such as surveyors.



Robinson Salguero

Chemical Engineering
University Research Experience Scholar

Mentor: Dr. Meng Chu Zhou
Chemical Engineering



Biographical Sketch

I started at the New Jersey Institute of Technology in the Fall of 1999, through the Educational Opportunity Program. Since then, I've decided to dedicate my time and effort to finishing my BS Degree in Computer Engineering, but also to keep growing intellectually and emotionally, while focusing on developing my presentation, technical, and critical thinking skills. In the future I expect to continue my education and research experience by completing a Masters and Doctoral Program. Some time later on, I hope to start my own business that will give me complete freedom to invent and

engineer. As an engineer I know my responsibility will be to perfect existing technology, while minimizing excess pollution, costs, and side effects to the community. To do this, I believe that we must research better ways of harnessing high amounts of energy without significant waste products or harmful side effects to our planet and ourselves. By researching better ways of producing and transferring clean energy, I believe that we shall better not only the quality of life for everyone around us, but also the coming generations.



Research

Simulating a Secure Ad Hoc Network Using Berkeley's NS Software Tool

The objective of this research project is to create a more secure Ad Hoc Network, while taking into account the dynamic topologies, wireless vulnerabilities, limited physical security, and bandwidth and energy constraints of this type of wireless network. At the same time it ensures availability, confidentiality, integrity, and other authentication and access control methods for users of security sensitive networks, such as government and private companies. This research project aims

to use NS (Network Simulator, a software developed at University of California at Berkeley) to simulate ad hoc networks under four potential routing protocols. These protocols are DSDV, TORA, DSR, and AODV. The research intends to identify the best method to secure an Ad Hoc Network. The focus is on a simple and effective implementation of data encryption. The research results will also reveal how easy NS can be used in implementing the wireless network simulations.



Tiffany Sims

Electrical Engineering
McNair Scholar

Mentor: Dr. Tara Alvarez
Biomedical Engineering



Biographical Sketch

I am an undergraduate student at NJIT, majoring in Electrical Engineering and minoring in Drama/Theater Arts. I currently am a member of Student Support Services, and the Honors College. I also am an active member in Campus Advance and am currently the Laurel Hall Vice president of the Laurel-Oak Hall Council. I have received many academic honors including an academic achievement award

from Student Support Services and the Dean's list. In February 2002 I won third place at the North Jersey IEEE Presentation Contest. My goal is to become a professor at a research institution. I also would like to work in a program that will help underprivileged children learn math and science. I see it as a chance to encourage them and to help them know that they too can go to college and get an advanced degree.

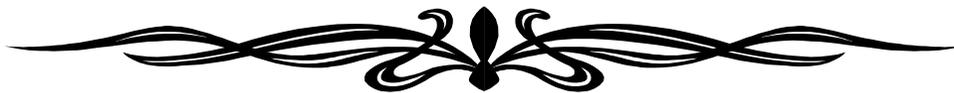


Research

Short Term Adaption of Disparity Vergence: A suppressive Stimulus Study

Everyday, adaptation occurs as our nervous systems examines and fine-tunes the correlation between sensory input and motor output. An example of a system that displays adaptation is disparity vergence, which is the inward or outward turning of the eyes. Vergence eye movements exhibit two key behaviors, high velocities and accuracy. The Dual Mode Theory depicts these behaviors by modeling the system using two control strategies. The fusion-sustaining component accounts for the

high speeds and performs coarse adjustments through open-loop control. The fusion-sustaining component accounts for the high accuracy using fine-tuning through a feedback control mechanism. This study analyzed the adaptive effects of the vergence system using an infrared limbus-tracking device to record movements of the eye. Specifically this study investigated how small steps of 1-degree influence 4, and 8 degree steps. Adaptation was observed in the two subjects studied.



Jose Sousa Jr.

Chemical Engineering
McNair Scholar

Mentor: Dr. Robert Pfeffer
Chemical Engineering



Biographical Sketch

José Sousa is a senior Chemical Engineering student interested in immediately pursuing his Ph.D. and possibly branching out into biochemical engineering. José has had a number of research projects in the past, in high school and at Lucent Technologies. Currently, he is working at the NJIT Particle Research Center where he designed and constructed an in-house fluidized bed system complete with gravity separator, gas distributor, and fines filtering and collection system. José displayed his research at the 2001 McNair Summer Research Conference (Penn State) and most recently at the 2001 AIChE Student Conference in

Reno, NV. He also plans to present at the University of Virginia, at a conference in Washington D.C., and at West Point. He is also enthusiastic about the 2002 AIChE Student Conference (Indianapolis) and about co-authoring another series of publications. José is very active as President of the AIChE student chapter and as member of Omega Chi Epsilon and Tau Beta Pi honor societies. After receiving his Ph.D., José plans to go into industry but eventually fulfill his calling of becoming a professor. Dreams of also becoming an astronaut are still on the horizon and only time and opportunity will tell.



Research

Promotion of deactivated sintering temperature and attrition resistance by dry particle coating

Dry particle coating is an environmentally friendly and cost-effective process by which sub-micron “guest” particles are attached to larger “host” particles to form custom composites without any liquids. Coating is achieved using a Magnetically Assisted Impaction Coating (MAIC) device that creates an oscillating magnetic field to excite the magnetic particles, the interactions of which promote coating. A dilatometer, which measures material expansion/contraction as a function of temperature, is used for sintering studies. Coated particles are processed in a fluidized bed to examine

their attrition resistance. The particles are examined using several characterization techniques that include Scanning Electron Microscope, Energy Dispersive X-Ray spectroscopy, and BET surface area analysis. As of now, the redesigned fluidized bed and gas distributor are nearing completion. Results indicate that dry-particle coating of alumina particles with SiC increases the deactivated sintering temperature significantly and promotes attrition resistance. Coating with smaller particles and other compounds will be the next step.



Cheryl Williams

Computer Science
McNair Scholar

Mentor: Dr. Denis Blackmore
Mathematical Science



Biographical Sketch

My name is Cheryl Williams and I am from Newton, New Jersey. I graduated with Phi Theta Kappa Honors from Sussex County Community College in May of 2000. I have an Associates Degree in Business Administration and Information Systems. Currently, I am a junior majoring in Computer Science and Applied Math at New Jersey Institute of Technology. I am a scholar of the Albert Dorman's Honors College and a mentor for the Student Support Services Program. I am receiving scholarships from the Phi Theta Kappa Committee and the Albert Dorman's Honors College. These previous honors have blessed me with an exciting opportunity, The McNair

Achievement Program. I am looking forward to participating in this program, as an undergraduate, to obtain research experience, to enhance presentation skills, but most importantly, to find the area of interest that I would like to pursue at the post-baccalaureate level. My short-term goals are to graduate in May of 2004, to study for my GREs and to apply to graduate programs. My long-term goals are to attend a graduate program at Stanford or Cal Tech. Professionally, I want to make a difference in the world and a difference in people's lives. One person can make a difference. From one man's determination, Dr. McNair, I am preparing to attend graduate school.



Research

Artificial Life Models and Their Applications

The current research is based on a version of a computer-simulated game called the Game of Life. The study involves simulations of cellular automata models and analysis of dynamical systems' properties. Actual nonlinear dynamical systems are difficult to analyze because of unpredictable behavior that can result from bifurcations and chaotic regimes. By using theory and computer simulations to study geometrical models, the fluctuations within physical and biological systems

may be predicted. The research data will be collected by analyzing the trends and patterns of finite, periodic, chaotic and bifurcation behavior within single and multiple dimensions. The base case was a single cell divided into four entities, which revealed sixteen initial states that displayed simple periodic behaviors. The hypothesis for the current case of nine entities and 512 initial states is that the cells' behaviors will become more chaotic.



Darren Williams

Electrical Engineering
McNair Scholar

Mentor: Dr. Anthony Johnson
Department of Physics



Biographical Sketch

I am currently a junior at NJIT, majoring in Electrical Engineering. I am a member of the Albert Dorman Honors College and Vice-President of the Optical Society of America, NJIT chapter. Also, I am a McNair Scholar. In the fall of 2000, I was awarded the Panasonic Amp scholarship and Texaco Corporate scholarship. The following summer, I acquired an internship at Tycom

Laboratories it was there that I did PCB design, testing and debugging of a third generation optoelectronic circuit pack.

My academic goals are to graduate from NJIT in the spring of 2003, go on to graduate school and major in the same field. In the long-term, I see myself as the owner of my own engineering consulting firm.



Research

The Optical Non-Linearities of silicon nanoclusters using the Z-scan Technique

The refractive index of a dielectric material is usually defined by $n = n_0 + n_2I$, where n_0 is the ordinary or linear refractive index, I is the intensity of the incident radiation, and n_2 is the nonlinear refractive index. The quantity n_2I represents the intensity dependent portion of the refractive index - under ordinary low intensity excitation this portion of the refractive index is negligible. However, under the conditions of intense picosecond duration excitation the intensity dependent portion of the refractive index becomes significant and can lead to novel effects as optical switching. Nanocluster composite materials formed by embedding semiconductor nanocrystals (e.g.,

silicon) in glasses, specifically SiO_2 , are good candidates for photonic applications because they exhibit a large nonlinearity when excited with picosecond optical pulses. Using a picosecond modelocked and Q-switched Nd:YAG laser that has been frequency doubled to a green wavelength of 532-nm, I will perform a technique called Z-scan to determine the nonlinear optical properties of a silicon nanocluster sample. Using picosecond 532-nm pulses, I will be able to determine if the large nonlinearity is due to fast electronic processes or slow thermal processes. A fast nonlinearity could be a candidate for all-optical switching in optical networks.