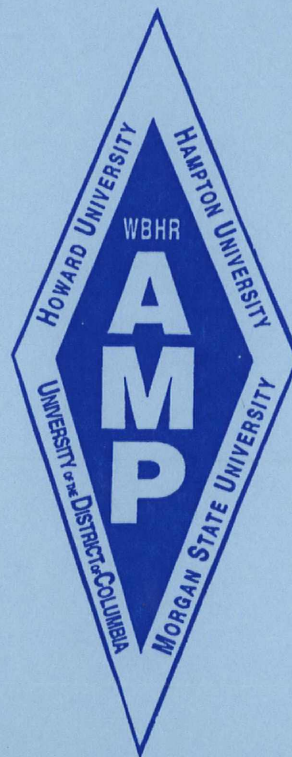


# CONFERENCE PROCEEDINGS

Undergraduate Summer Research Conference

1998

## WBHR-AMP



The Conference was jointly sponsored by the National Science Foundation WBHR-AMP program and by the NASA funded CSTE A project.

# AMP SUMMER UNDERGRADUATE RESEARCH SYMPOSIUM

Tuesday, July 28, 1998

## SESSION I LIFE SCIENCES

**MODERATOR: Dr. Raymond L. Petersen**

- 9:15                    OPENING AND WELCOME  
9:30-9:45            ROBERT PRYOR – Penicillin - Resistance  
9:45-10:00          DAR-ES RISER – Biotechnology of Polyphenol Oxidase (PPO) from  
*Coriolus versicolor*: An inducible Genetic System  
10:00-10:15          MICHAEL GORDON  
10:15-10:30          TANICA WALCOTT – Abnormal Expression of Connective Tissue  
Proteins in Various Skin Diseases  
10:30-10:45          HOSSIN MOSADDAD  
10:45-11:00          LAUREN ATKINS – Characteristics of the Electroretinogram Recorded  
from Dark-Adapted Zebrafish (*Danio rerio*) Eyes.
- 11:00-11:15          BREAK
- 11:15-11:30          REGINALD ROMAIN – A Red Leaf Spot of *Ficus lyrata*  
11:30-11:45          CHANDI THOMAS – Mosquitoes and Ants Exploiting Nectar Resources  
from the Pitcher Plant *Sarracenia purpurea*  
11:45-12:00          DAMEON GORDON – Vitamin E Succinate Suppresses G6PD Activity,  
Inhibits Proliferation, and Induces Apoptosis in THP-1 Promonocytic Leukemia  
Cells  
12:00-12:15  
12:15-1:30            LUNCH BREAK

## SESSION II PHYSICAL SCIENCES/ENGINEERING

**MODERATOR: Dr. Vernon Morris**

- 1:30-1:45            MICHELLE AUGUSTINE - Porphyrins  
1:45-2:00            WARREN BOWEN – Copper-Catalyzed Depolymerization of PPO  
2:00-2:15            PRISCA ANAMELECHI – Aerosols and Air Quality  
2:15-2:30            AYANA MCCOY – Delineating Frozen Soils Using Passive Remote  
Sensing  
2:30-2:45            RACHEL JONES – Urban Air Quality  
2:45-3:00            MONIQUE WEST- Washington DC Air Quality
- 3:00-3:15            BREAK
- 3:15-3:30            REESHIDA ROBERSON – Ab Initio calculations in Support of SOHO

3:15-3:30  
3:30-3:45  
3:45-4:00  
4:00-4:15  
4:15-4:30  
4:30-4:45

LEVAR YOUNG – Fundamentals of LabVIEW  
ANITRA HAITHCOCK – MnTAPP Protoporphyrin  
INNOCENT MONYA-TAMBI  
CORY RICHARDSON  
EBOINI CANNON – Air-Sea Turbulent Fluxes  
ROBIN MILLER – Analysis El Nino and la Nino Years

**DaNa Carlis**  
**Department of Chemistry**  
**Howard University**  
**Mentor: Charles Hosten**

### **SYNTHESIS AND ELECTROCHEMISTRY OF 1,10-PHENANTHROLINE-5,6-DIONE, AN ANALOGUE OF METHOXATIN**

Methoxatin plays the role of coenzyme in various bacterial NAD(P)-independent alcohol, glucose, aldehyde, and methylamine dehydrogenases. The molecule, which has been recently synthesized, possesses a novel structure for a coenzyme. Very little chemical data is presently available on the coenzyme. This research involves the synthesis and purification of 1,10-Phenanthroline-5,6 Dione, which is an analogue of Methoxatin. Preliminary electrochemical studies of the reduction of this compound were also conducted. The results establish that 1,10-Phenanthroline-5,6-dione undergoes a two electron reduction which occurs as a single step in aqueous solvents and as two one electron reductions in aprotic media.

**Alliyah Perkins**  
**Department of Chemistry**  
**Howard University**  
**Mentor: Dr. Charles M. Hosten**

### **SERS Spectroscopic Investigation of the Antitumor Drug 6 Mercaptopurine and DNA**

Mercaptopurine, 6 MP, is a sulfur analogue of naturally occurring purine and adenine and has found application in the treatment of childhood and adult leukemia's as well as an immunosuppressant and anti-inflammanant. The coordination chemistry of 6 MP is of interest because of the electronically and stereochemically versatile binding sites on the molecule. As a purine it offers possible binding to metals at N1, N3, N7, and N9, the presence of the sulfur atom attached to C6 of the purine ring also introduces a new range of chemical, structural and spectroscopic features to the molecule setting it apart from it's parent purine. SERS spectra of 6MP absorbed on an electrode surface are presented and the orientation of 6 MP is determined from frequency shifts between the solution Raman spectra and the SERS spectra.

**Marjorie Lazarre**  
**Department of Chemistry**  
**Howard University**  
**Mentor: Dr. Gultneh**

### **The Synthesis of Ligands**

Participating in the AMP research program has afforded me with the opportunity to gain skills and experience in a laboratory setting. My project consisted primarily of the production of ligands. The synthesis of reduced Schiff's base was my first experiment, several trials deemed a favorable amount of the desired product. My procedures and observations concerning my trials were recorded for future reference. the synthesis of Bispicyamine (BPA) also Reduction Potentials of Iron<sup>(III)</sup> and Manganese<sup>(III)</sup> Water Soluble Porphyrins proved to be successful. Unlike my previous experiment I was able, under the guidance of my mentor, to synthesize methyl xylene diBPA, by modifying the procedure provided in the literature. The production of ligands had proved to be both successful and educational.

**Willie Vann**  
**Eastern High School**  
**Dexter Price**  
**Montgomery Blair High School**  
**Mentor: Dr. Vernon Morris**

### **CHOAQE Project**

The CSTEА Howard Oxidants and Air Quality Experiment (CHOAQE) is an experiment designed to investigate a number of questions about the air in Metropolitan Washington, DC (MWDC). Headed by Dr. Vernon Morris, the CHOAQE group attempts to answer such basic questions as "What is the Air Quality in MWDC?" and "What are the Primary Influences on the Urban Smog and Ozone in MWDC?" along with several more complex ones.

In an attempt to determine the current air quality in MWDC and to understand the primary influences on the urban smog and ozone in MWDC, members of the CHOAQE have been gathering and studying atmospheric data. With a general understanding of the many reactions occurring between ozone (O<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), and volatile organic carbon species (VOCs), the CHOAQE group has composed a list of factors which they feel should be taken into consideration when analyzing the situation of the MWDC atmosphere. The group has been monitoring the factors on this list in an effort to accurately model the MWDC atmosphere. With this model and proper analysis of the data collected, the CHOAQE group attempts to answer the two previously mentioned questions.

**Tisha Y. Harper**  
**Department of Engineering**  
**Virginia State University**  
**Mentor: Dr. Sonya Smith**

### **A Model of the Flow through the Quartz Crystal Microbalance**

#### **Cascade Impactor**

The Quartz Crystal Microbalance Cascade Impactor is an instrument purchased by Howard University and CSTEА. This instrument is used to measure the amount of particles and gases in the atmosphere. Unfortunately, the flow through this instrument is incorrect. The purpose of this project is to create a model of the cascade impactor to show the correct flow through the instrument. After making the model, we have to derive numerical equations to represent the flow. Then, manipulate the equations in a program to show the flow through the model of the cascade impactor.

**Kendall S. Peace**  
**Department of Chemical Engineering**  
**Lincoln University**  
**Mentor: Dr. Sonya T. Smith**

### **Comparison of Novel Finite Difference Solution Techniques for Scalar Advection-Diffusion Equations**

The previous summer's work to study the flow over three-dimensional topography is in progress. A three-dimensional set of equations was devised in order to begin a simulation to compute wave energies and velocities. Using the comparison of novel finite difference solution techniques of the scalar advection-diffusion equation will make it possible to implement the most accurate form of the advection-diffusion equation to simplify the more complex three dimensional set of equations present in the simulation. This is necessary to aid in the process of accounting for the finite amount of energy present in the vertical direction as well as the horizontal cross-stream direction. It will also be useful in determining whether the behavior of gravity waves is the same in three-space as that in two-space.

**Sonya Johnson**  
**HU CHARC Program/Grambling State University**

**Research Mentors:**

**Dr. Sonya Smith, Howard University**

**Mr. Ronald Meyers, Army Research Laboratory**

**Mr. Keith Deacon, Army Research Laboratory**

### **Visualization for Scientific Computing**

This paper investigates the scientific visualization of the solution of partial differential equations. The first application has been to the advection-diffusion equation.

Advection-Diffusion processes are common in many physical phenomena. Advection-Diffusion equations represent these phenomena mathematically and used in such diverse applications as global climate modeling, weather forecasting, medicine, oceanography, aerodynamics, chemical mixing, air pollution and fire modeling. While the advection-diffusion equation solution is unique, its approximate solution can deviate from the analytical solution by an amount depending on the nature of the approximation. Finite difference solutions of the advection-diffusion equation were developed and programmed in Matlab. A user-interface was developed also using Matlab to display the solutions, and the effect to alter the initial and boundary conditions and parameters. Plots of the solution results were generated in Matlab and some work has been done to include animations of the time development of the solutions, comparisons of the results of various methods, and error bound graphs. Future efforts will be applied to fluid dynamics and alternate visualization concepts.

**Tehma H. Smith**

**Howard University, Materials Science Research Center of Excellence, Department of Electrical Engineering,**

### **Monte Carlo Determination of Electron Transport Properties in Boron Nitride (BN)**

Using the Monte Carlo technique, a theoretical analysis of electron transport in boron nitride (BN) will be performed for different temperatures and carrier concentrations (Borsari and Jacoboni). This method requires the prior knowledge of various physical constants for BN such as energy band gap and scattering mechanisms. To calculate the mobility, scattering, and distribution of electrons in BN, two computer operated random number generators were implemented, and will be used as part of the Monte Carlo simulation. One random number generator has a uniform distribution from zero to one and the other generator has a Gaussian distribution. It is hoped that the results from the Monte Carlo simulation will provide more unknown physical constants and determine which scattering mechanisms are dominant in the semi-conductor boron nitride.

**Albert Kwansa**  
**Martin Luther King Elementary School**  
**Mentors: Dr. Peter Hambright/David Ejeh**

### **Characterization of Colbalt Porphyrins**

The reductive electrochemistry of a dilute water-soluble iron and manganese porphyrins are investigated using electrochemical techniques involved are cyclic voltammetry (CV) and differential pulse voltammetry (DPV). Both techniques employed three-electrode system; the saturated calomel electrode (SCE) served as the reference electrode, silver, gold and glassy carbon as the working electrodes, and platinum as the counter electrode. The reduction/oxidation potentials of the iron porphyrins were found to be  $-0.12\text{V}$  and  $-0.06\text{V}$  respectively on both working electrodes. The results from DPV and UV/Vis absorption spectroscopy were in agreement with those of electrochemistry.

The UV/Visible absorption spectrometry of the porphyrins was obtained with UV/Visible Lambda II series using transparent gold minigrd with 60% transmittance as the working electrode. The reductive behaviors of the iron and manganese porphyrins were probed with CV and DPV.

**Ayana McCoy**  
**Savannah State University**  
**Mentor: Dr. Dave Toll, NASA**

### **Delineating Frozen Soils Using Passive Remote Sensing**

In this study, satellite data and simulation modeling are used to show and analyze seasonally frozen soils. Frozen soils are important to study because they have a strong effect on freshwater hydrology, terrestrial ecology and the climate. Once the soils melt, the water, can create flooding. Also the frozen soil can have a long-term effect on plant life, which can eventually affect the water and energy balances in a region. The satellite that will be used is the Scanning Multichannel Microwave Radiometer (SMMR). The SMMR depicts frozen soils from North Dakota. The data were processed from one-quarter degree grid cells during the fall and spring freeze-up and thaw cycles. To help characterize frozen soils, the Frozen Soil Temperatures (FroST) simulation model was used to predict soil water, ice content and soil temperature in north central Canada and central Maine. Preliminary results were obtained in March and April of 1997 using the SMMR data. A vegetation correction model, a conversion from brightness temperature to emissivity and selected frequency transformations were completed and tested.



**Jonah Flowers**  
**Department of Physics**  
**Grambling State University**  
**Mentor: Dr. Prabhakar Misra**

### **QUANTIFICATION OF ABSORBANCE VARIATIONS OF TRACE AMOUNTS OF SULFUR DIOXIDE WHEN PASSING THROUGH TUBINGS OF DIFFERENT MATERIALS**

The Fourier Transform Infrared (FT-IR) spectrometer is a highly sensitive instrument used for analysis of the trace of various diatomic and triatomic species. Found in trace amounts, the sulfur dioxide species enters the atmosphere through power plant emissions and volcanic eruptions. The sulfur dioxide molecule will absorb radiation, thus setting up both vibrational and rotational energies noted in their spectra. The triatomic molecule vibrates in 3 different modes. The absorbency spectrum ranges 400  $\text{cm}^{-1}$  to 4000  $\text{cm}^{-1}$ . The sulfur dioxide is fed to the spectrometer cell through tubing made of the various material being tested, namely aluminum, copper, stainless steel and Teflon. The spectrum will be taken using pressures from 50 to 250 torr. The spectrum corresponding to each pressure will be analyzed to determine which tubing could be used to minimize the alteration of absorption of sulfur dioxide due to adsorption effects that occur in the tubing.

**Rachel Branson**  
**Lincoln University**  
**Mentor: Dr. Silvano Finesche, NASA**

### **Measuring the Temporal Evolution of $\text{O}(\text{VI}) - 1032\text{\AA}$ in the Northern Coronal Hole over March 1996 through March 1998**

The Solar and Heliospheric- Observatory is a joint project between the National Aeronautics and Space Administration, and the European Space Agency. It was launched on December 2, 1995 with the intention of monitoring the sun through the use of 12 independent instruments. Each of these instruments monitors different aspects of the solar disc and solar corona. The Ultra Violet Coronagraph Spectrometer monitors the solar corona, the hot plasma formed of hydrogen and oxygen that surrounds the solar disc. Through the use of data analysis software the temporal evolution of OVI (1032A) in the sun's north solar pole, over a two-year period will be presented in this paper.

**Marvin Donaldson**  
**Material Science Research Center of Excellence**  
**Howard University**  
**Mentor: Dr. Spencer**

### **Boron Nitride**

Boron nitride (BN) is a manmade advanced ceramic whose properties make it of interest both technologically and scientifically. Cubic boron nitride is a superior super abrasive, having a similar structure to diamond sharing many of diamond's properties and characteristics. Boron nitride is the second hardest material known, after diamond, yet it is more stable at higher temperatures and does not react with ferrous metals, making it an ideal cutting tool material.

Boron nitride is an excellent insulator and resist oxidation up to 900C. It has a large band gap and a low coefficient of expansion with exceptional shock resistance. Boron nitride's high-temperature performance and lubricity make it ideal additive to metal composite friction materials used in high-performance aircraft brakes. When added to plastics, boron nitride reduces friction, increases thermal conductivity, decreases thermal expansion and increases use-temperatures. Because of its self-lubricating, wear resistant and low in friction properties, boron nitride is being evaluated for an ion-beam-assisted deposition coating on prosthetic hip, knee and wrist joints, and aerospace bearings.

It is important to note that nobody has ever grown pure cubic boron nitride. Cubic boron nitride grown is always contaminated with either rhombohedral or hexagonal boron nitride along with other substances. The growth of purer cubic boron nitride is done by chemical vapor deposition.

**Richard McLeish**  
**Department of Engineering**  
**Howard University**  
**Mentor: Dr. Vernon Morris**

### **CHOAQE Aerosol Data for 1998**

The impact of atmospheric aerosols and gaseous pollutants has any facets that affect air quality and subsequently human physiology. We are interested in discovering more about the nature of aerosols in the Washington DC area; in particular the immediate environment of Howard University. This information will elucidate the level of air quality in the area and indicate possible trends in the climatology of the region. The term aerosol alludes to a collection of liquid and or solid particles that suspended in a gaseous medium. The particles have numerous individual physical and chemical characteristics and subsequently, various equipment have to be employed to facilitate collection of relevant data. The principal method employed in the study was to measure the level of light scattering that occurred when a sample of air is illuminated. The aerosol analyzer used this method of detection. Using the information provided by the analyzer, the concentration of aerosols per unit volume of air could be determined. The second analyzer used gave a apportioning of the various aerosols present according to their diameters.

**Anitra Haithcock**  
**Department of Chemistry**  
**Howard University**  
**Mentor: Dr. Charles M. Hosten**

### **Electrochemical Reduction of Manganese Protoporphyrin IX Dimethyl Ester in Aprotic Solvent**

The reductive electrochemistry of manganese protoporphyrin dimethyl ester was investigated using cyclic voltammetry in the aprotic solvent acetonitrile. A reductive wave is observed at ca.  $-0.44$  V, relative to the saturated calomel electrode, on silver, gold and platinum working electrodes. A linear relationship was observed between the square root of the scan rate and the peak current indicating that the process is Faradaic. Both the oxidative and reductive potentials are independent of scan rate suggesting that the electrochemical reaction occurring at the electrode surface is reversible. From this data it is concluded that the process observed at ca.  $-0.44$  V represents the reduction of manganese from the (III) to (II) Oxidation State.

**Innocent Monya-Tambi**  
**Sharene Edwards**  
**Howard University**  
**Mentor: Dr. D Raghavan**

### **Study of Glucose Formation upon Alpha Amylase Digestion of Starch**

Starch is a biodegradable biopolymer present abundantly in nature. It is commonly used in the formulation of biodegradable polymer composites. Our research was geared toward the enzymatic digestion of starch in the starch-polyethylene composite. Enzymatic tests were conducted on 1% corn starch solutions. The glucose formation in these solutions was measured using photo spectrometry by performing glucose oxidase assay. The absorbance in the solutions was measured at 540 nm. In addition, the concentration of alpha amylase was varied to study the effect it would have on glucose production. It was observed that as the concentration of alpha amylase increased, there was a corresponding increase in the concentration of glucose produced. However, at very high concentrations of alpha amylase, the glucose formation reached saturation.

**Cory Richardson**  
**Department of Engineering**  
**Howard University**  
**Mentor: Dr. James Momoh**

### **A Synopsis of Distribution and Transmission Reliability**

Reliability of a bulk power system is degree of assurance in providing customers with continuous quality service within accepted standards. Hence, power system reliability is used to evaluate the ability of a system to supply the load demand, taking into account the random effects of equipment outages and load variations. Reliability is always expressed in terms of indices, which reflect the system capability, and degree of reliability is always expressed in terms of indices, which reflect the system capability and degree of reliability of the service provided to customers. In the new competitive environment these measures are extremely important in decision making when there are a significant number of players in the electric energy market. Power system reliability assessment can therefore be divided into the two basic aspects of system adequacy and system security. Adequacy relates to the existence of sufficient facilities within the system to satisfy the customer load demand or system operational constraints. Security relates to the ability of the system to respond to dynamic or transient disturbances arising within the system. The provision of adequate electric service reliability has been a consistent challenge for power distribution and transmission system engineers for many years. This abstract describes observation of the reliability of both a distribution and transmission system. Various existing studies on reliability indices are discussed. The potential advantages from probabilistic criteria and the reliability assessment techniques are adopted by U.S. utilities.

**Robert Pryor**  
**Department of Microbiology**  
**Howard University**  
**Mentor: Dr. S. Tai**

### **Penicillin Resistance**

Streptococcus pneumoniae is a gram-positive bacterium. It is a major cause of disease such as meningitis, bacteremia, pneumonia, and various ear infections. Currently, physicians are distributing antibiotics to their patients to combat this pathogen. Unfortunately, treatment with antibiotics can enhance the opportunity for bacterial pathogens to develop resistance. The main cause of bacterial resistance is either mutations of bacterial chromosome or genetic transfer extra-chromosomal DNA, plasmids. Antibiotic Penicillin is widely used in the treatment of pneumococcal patients. Penicillin stunts the growth of bacteria by inhibiting the final stage of cell wall construction; consequently, it kills bacterial cells. The goal of our research project is to identify mutations in penicillin-binding proteins isolated from penicillin-resistant strands of Streptococcus pneumoniae.

First, we obtain the amino acid sequence of penicillin-binding proteins from penicillin-sensitive and penicillin-resistant strains. Next, we use sequence analysis programs to compare these sequences so that we can identify and look for similarities amongst penicillin-resistant strains. These strains are also aligned with mutations in the primary and secondary structures of the penicillin-binding proteins.

**Dar-Es Riser**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Arthur L. Williams**

**Biotechnology of Polyphenol Oxidase (PPO) from Coriolus versicolor: An inducible Genetic System**

White rot fungi are capable of producing enzymes, which break down the three main polymers of wood: lignin, cellulose, and hemicellulose. *Coriolus versicolor*, a white rot fungus, elaborates both extracellular-ligninolytic as well as cellulolytic enzymes. At least one of these enzymes, polyphenol oxidase (PPO), appears in a culture in a very time dependent manner when grown up on defined media. Because PPO, an enzyme capable of converting diphenols to diquinones and oligomerizing the lignin derivative, syringic acid, appears to be inducible, it is conceivable that the *C. versicolor* culture system could be a model for overproduction of enzymes. This study was undertaken to investigate the that the processes and pathways involved in the secretion of extra cellular PPO, and to determine technological applications of the data gathered. The methodologies employed included cultural manipulation, UV irradiation, gel electrophoresis, and Polymerase Chain Reaction (PCR). Although no mutants showed enhanced PPO expression, there were mutants isolated, which showed reduced PPO expression. This is confirmation of the inducible nature of PPO. *C. versicolor* merits further research to determine growth conditions, which would facilitate enhanced PPO expression. Wood decaying forestis a renewable photosynthetic energy source. The primary cause of this bio-recycling are Basidiomyetous fungi, e.g., white-rot fungi. Through research of the biotechnology of PPO from *C. veriscolor*, it may be possible to utilize the data gathered to serve as a model for the over production of other enzymes which may be assistance in both an economic as well as an environmental manner.

**Michael E. Gordon**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Eribo**

### **Isolation of the poly-3-hydroxybutyrate (PHB) produced by *Alcaligenes eutrophus***

The poly-3-hydroxybutyrate (PHB) produced by *Alcaligenes eutrophus* was investigated to identify and quantify the physiological properties that determine the rate of PHB production. *A. eutrophus*, when fermented under physiological stress, utilizes excess carbons from the respective carbon source to produce PHB. PHBs are naturally occurring thermoplastic esters and are a member of the polyhydroxyalkanoate (PHA) family. Fermentation of the cells in vernonia oil yielded results that were contrary to those previously obtained.

Results reveal that *A. eutrophus* is unable to utilize the vernonia oil directly. Furthermore, cells fermented in phosphate-enriched vernonia media produced more polymer than their phosphate-deficient counterparts. Evidently, a clear deviation from our theoretical expectations. The cells grown under physiological stress, phosphate-deficient media, were expected to produce more polymer. Apparently, the cells require phosphate to utilize the carbon-enriched vernonia oil. However, previous investigations reveal that saponified carbon source was more effectively incorporated into the cells.

Chemical characterization shows that bacteria grown in saponified media generated 26% biomass. In comparison, cells grown directly in vernonia produced less than 1% biomass. These results prove that a phosphate-deficient media coupled with a saponified carbon source is the optimum physiological conditions for production of the PHAs.

**Tanica Walcott**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Agnes Day**

### **Abnormal Expression of Connective Tissue Proteins in various skin diseases**

Many skin conditions such as Psuedoxanthoma Elasticum (XPE), Ehlers-Danlos Syndrome (EDS), Malignant Melanoma and Xeroderma Pigmentosum (XP), may be directly attributed to the abnormal synthesis of connective tissue proteins. Some of these proteins include Decorin and Type 1 Collagen. The role of connective tissue proteins are to give the skin it's rigidity and elasticity, among other vital functions. Ultimately, we would like to identify which proteins demonstrate altered transcription in the above diseases. The cDNA of Decorin and Type 1 Collagen were extracted from plasmids in an E.coli bacteria. The total RNA of fibroblasts of the four pathogenic cell lines were extracted and spotted onto nitrocellulose membrane strips. The cDNA's were then labeled with  $^{32}\text{P}$  and singly hybridized with the nitrocellulose strips. Autoradiograms of slot blots were evaluated and compared to normal skin connective tissue protein expression by densitometric measurements. analyzing this data, it is indicated that these diseased cell lines have low levels of one or more connective tissue proteins, which may play a role in the development of these diseases.



**Hossin Mosaddad**  
**Department of Anatomy**  
**Howard University**  
**Mentor: Dr. M. A. Aziz**

## **THE MANDIBULAR NERVE AND ITS DISTRIBUTION IN THE HUMAN MASTICATOR SPACE.**

The MN nerve (V3) is the largest branch of the trigeminal nerve (CN V). It supplies all masticatory muscles (temporalis, masseter, and the pterygoids) their helpers (anterior digastric and mylohyoid) and specific muscles of the soft palate. It is also sensory to the jaw joint (TMJ), tongue and the mandible. Thus, MN is critical to dentistry.

To test the accuracy of the current descriptions of MN we dissected 25 human masticatory spaces and found fundamental inaccuracies in the descriptions. According to our observations the MN enters the masticator space via foramen ovale. It's main stump gives rise to the recurrent meningeal nerve posteriorly. Almost immediately the nerve divides into two divisions as follows: (I) a horizontal and (ii) and vertical division. The horizontal divisions divides into masseteric and deep temporal nerves located on the upper surface of the superior lateral pterygoid muscle (SLPT). The vertical division forms auriculotemporal and lingual nerves on the deep surface of SLPT. The long buccal nerve travels anterolaterally between the two main MN divisions; it passes between the two LPT heads. Nerves supplying the medial pterygoid, tensor palati and tensor tympani muscles normally arise from the medial surface of the vertical division. A common branch from the long buccal nerve supplies the lateral pterygoid heads; each head of the muscle also receives a separate branch from the MN divisions. In two cases we found separate branch from the MN divisions. In two cases we found separate LPT nerves to arise from a nerve loop in the LPT muscle.

**Lauren Atkins**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Abner Lall**

### **Characteristics of the Electroretinogram Recorded from Dark-adapted Zebrafish**

Electroretinograms (ERGs) elicited by photic stimuli of varying duration (20 to 300 ms) were recorded from dark-adapted eyes of the adult wild-type zebrafish. The fish was anaesthetized by Tricaine (100 mg/l fish water) and was given Gallamine Triethiodide (68.6  $\mu$ M) to immobilize the animal. during the experiment, the fish gills were perfused with fish water, which was supplemented with low concentration of anesthesia. The ERGs were recorded with a glass microelectrode (diameter = 20-50  $\mu$ m) filled with a fish ringers solution and positioned on the cornea. an Ag-agCl electrode grounded the preparation and provided a reference. The electrodes were connected to the input of a Grass P15 AC amplifier whose output was processed through the MacLab Data Acquisition and Analysis system. The MacLab system provided online oscilloscope sweep averaging and displayed on the computer screen in real time. a hard copy was obtained via an Apple laser printer. The ERG consisted of an initial small negative a-wave followed by a large positive b-wave. the peak-to-peak amplitude of the b-wave was plotted as a function of the logarithm of the intensity of photic stimulus. It was observed that these  $V/\log I$  functions were linear over 5 log units of change in the intensity of white light. The implicit time for b-wave was also measured from the onset of the photic stimulus to the peak to the response. It was observed that the implicit time varies from about 0.14 ms at threshold to about 0.06 ms at the brightest intensity of stimulus. These data clearly describe the parameters of a wild-type animal against which data obtained from mutant can then be compared. supported by National Institutes of Health Grant S06GM08016.

**Reginald Romain**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. L Frederick**

### **A Red Leaf Spot of Ficus lyrata**

Leaves of the ornamental rubber plant, *Ficus lyrata*, a plant growing in the greenhouse in the biology department at Howard University, were noted to have distinct red leaf spots dispersed over the leaf surface. Another leaf was noted to have a different kind of leaf spot. Both leaves were removed and attempts were made to isolate and culture the probable causal agents. These leaves were surface sterilized to eliminate any contaminants present on the leaf surfaces. Infected spots were excised and placed on a potato dextrose agar (PDA) medium to isolate the potential pathogens. They were allowed to grow for several days and were found to be in fact dissimilar in appearance. Microscopic observation with the aid of a compound and dissecting microscope enabled us to identify these potential pathogens as a species of Chaetomium and Alternaria.

Further investigations of the two fungi responsible were made. This was done by observing their germination habits on PDA and on leaf disks from uninfected leaves. The microscopic observations previously done, on PDA u depression slides enable us to determine how long I would take for spore germination to occur on the leaf disks. The leaf disks were examined with the aid of a scanning electron microscope to view how the fungi grew on healthy leaf tissue of Ficus lyrata. After that was done we proceeded to inoculate heavy leaves of *Ficus*. Upper and lower surfaces were inoculated. Chaetomium produced symptoms similar to those found at the onset of the study.

Currently, reisolating from the leaf where *Chaetomium* produced the characteristic infection is testing Koch's postulates.

Literature has cited Alternaria as being a probable causal agent of infection for Ficus lyrata, but not Chaetomium.

**Chandi Thomas**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Duffield**

**Mosquitoes and Ants Exploiting Nectar Resources from the Pitcher Plant**  
***Sarracenia purpurea***

*Sarracenia purpurea L.* is an insectivorous plant, which lures insects into its water-filled trap by producing extraflora nectar. Nectar is produced by glands scattered around the entire epidermis of the pitcher, particularly on the mouth and vein of the hood. Insects feeding on the nectar appear to prefer certain locations on the pitchers. We studied which zones of the pitchers were more preferable to ants and mosquitoes. Using one meter transects on the pitcher plant sites, we observed how many ants and mosquitoes were feeding on the plant and on which zone they were located on. Mosquitoes and ants appear to prefer certain zones to others. We compared zones of the pitcher plants from one transect with the zones of other transects.

**Dameon Gordon**  
**Department of Biology**  
**Howard University**  
**Mentor: Dr. Theodore a. Bremner**

**Vitamin E succinate suppresses G6PD activity, inhibits proliferation, and induces apoptosis in THP-1 promonocytic leukemia cells**

Redox modification of regulatory proteins implicates the glutathione redox system (GRS) in the modulation of signal transduction pathways leading to gene expression and apoptosis. Because glucose 6-phosphate dehydrogenase (G6PD) provides reducing equivalents to the GRS, it has been suggested that high levels of G6PD in preneoplastic lesions be directly related to neoplastic growth. Indeed G6PD is an early proliferation-related gene whose activity is required for nucleotide biosynthesis. Consistent with this view, we have shown previously (Life Sciences 58, 1015-1022, 1996) that the induction of differentiation of THP-1 promonocytic leukemia cells is associated with a dramatic decrease in G6PD mRNA and specific activity.

Vitamin E succinate (VES) has been shown to have an anti-proliferative effect on prostate and mammary carcinomas, but its mechanism of action has not been fully elucidated. We have tested the effect of VES on proliferation, viability, and induction of apoptosis in THP-1 cells. VES (37.5  $\mu$ M) inhibited proliferation and reduced viability of THP-1 from 86% to 46% over a period of 2 days. In addition, cells grown in 37.5  $\mu$ M VES for 2 days contained lower levels of G6PD (25.5 mU/mg protein) than control cells (36.5 mU/mg protein). VES-treated cells underwent apoptotic cell death as determined by DNA fragmentation analysis. The signaling pathway utilized in VES-induced apoptosis of THP-1 cells is not known. However, THP-1 cells express Fas ligand constitutively and may, therefore, undergo apoptosis upon expression of the Fas death receptor. Current efforts are directed toward the identification of the pathway activated by VES.

**Michele Augustine**  
**Department of Biology**  
**Lincoln University**  
**Mentor: Dr. Peter Hambright**

### **Reduction Potentials of Iron and Manganese Water Soluble Porphyrins**

We plan to use metalloporphyrins as sensing agents on the quartz crystal microbalance to measure trace atmospheric gases. First, we needed to understand the electrochemistry of the metalloporphyrins themselves. To this end, we did cyclic voltammetric measurements on millimolar aqueous solutions of various manganese and iron porphyrins on gold, glassy carbon, and silver electrodes at various pH values. The silver electrode did not have a wide enough window at low pHs for measurements to be made.

The Fe(III)/Fe(II) reduction potentials of iron tetra(N-4-pyridyl)porphyrin were found to be independent of pH from 2.0 to 6.0. In this range, the porphyrin is a monomer. No reversible behavior was found at pH 7 and above, where the porphyrin changes into a u-oxo bridged dimer,  $\text{PeF-O-Fe-P}$ . Several other iron compounds were measured at pH 2, and we found the higher the electron density on the porphyrin ring, the harder it was to reduce the Fe(III) porphyrin to Fe(II) form.

For some reason, we could not get good data for the manganese porphyrins at  $\text{pH}=2$ , and are in the process of trying these reactions at higher pH values.

The UV-Vis absorption spectra of these compounds were measured.

**Roderick Brown**  
**Jackson State University**  
**Department of Physics**  
**Mentor: Dr. Arthur Thorpe**

### **Improvements in Instruments Used to Collect and Measure Aerosols**

This abstract is structured to provide a general overview on improvements in instruments, used by CSTEa and Howard University, to collect and measure aerosols. The Climet, quartz Crystal Microbalance and the Laser Particle Counter are instruments being studied for improvement at Howard. A study of one way direction valves and better calibrations are two areas being given consideration to improve such instruments. It is reasonable to conclude that better calibrations and extended features to these instruments will result in a better collection of data. Consistent retrieval of in-flight data is an important aspect of researching aerosols for the collection and determining the ambient size of the particles.

**Prisca Anamelechi**  
**Department of Chemistry**  
**Howard University**  
**Mentor: Dr. Vernon Morris**

### **The CSTEА Howard Oxidants and Air Quality Experiment (CHOAQE)**

Unlike the weather, hardly anyone talks about air quality. But the quality of the air has a profound affect on individual health, especially on individuals with respiratory problems, the visibility and agriculture. Major factors that affect the quality of the air include the size, lifetime, distribution and composition of atmospheric particulate and pollutants.

The CSTEА Howard Oxidants and Air Quality Experiment was designed to study the air quality in the Metropolitan Washington DC (MWDC). The MWDC area was chosen as an area of interest because the air quality in the MWDC area tend to fall to hazardous levels and also because we live right here in DC. The three main aspects of this project include: field measurements, laboratory analysis, and mathematical modeling. An air pollution/meteorological station set up on the Howard University campus will measure ozone, Nox, and volatile organic carbon species (VOCs), and airborne particulate that affect air quality. Laboratory analysis of grab samples of ambient air will be made and particulate will be characterized using gas chromatography, EDX, and spectroscopic analysis. The EPA Urban Airshed model (UAM3) will be used for analysis and interpretation of measurements.

**Rachel Jones**  
**Department of Chemistry**  
**Savannah State University**  
**Mentor: Dr. Vernon Morris**

### **Urban Air Quality**

Air pollution caused by a combination of meteorology, natural emissions, and anthropogenic factors triggers the formation of ozone ( $O_3$ ), nitrogen oxide ( $NO_x$ ), and volatile organic compounds (VOCs). These atmospheric aerosols have adverse effects on the health, agriculture, climate, and visibility.

The project that I am working on involves a study of field measurements, and laboratory analysis of the air quality in Washington, DC. In a weather station on Howard University campus we will measure ozone ( $O_3$ ), nitrogen oxides ( $NO_x$ ), volatile organic compounds (VOCs), and airborne particulate. Grab samples of ambient air and particulate will be analyzed in the laboratory. We will also use EPA Urban Airshed Model (UAM3) series to analyze and interpret measurements.

The results gathered from the project will be used to determine the characteristics of airborne particulate, the extent of urban plume, and the primary influences on the urban smog and ozone. The effects of pollution on Howard University campus and other areas nearby will be considered. We will investigate how regional meteorology, anthropogenic factors, and natural emissions affect the air quality in Washington, DC. In addition to this the EPA Urban Airshed series of models will be used to determine how well they predict or explain the pollution in the area of study.



**Monique West**

**The CSTEA Howard Oxidants and Air Quality Experiment (CHOAQE)**

The nature of air quality affects all aspects of our lives. It revolves around the size, distribution, and composition of the atmospheric particulate. Currently, I am working on a comprehensive study on the air quality in the Metropolitan Washington D.C. area, on the Howard University campus. For this particular project, we have set up an air pollution/meteorological station on Howard University campus. We are conducting the station on top of Locke Hall, one of the highest buildings on the campus. Taking measurements at a poor position often means poor data. Therefore, we will be taking accurate measurements of  $\text{NO}_x$ , ozone, aerosols, and ammonia in the ambient air of the Metropolitan Washington D.C. area. We will also be taking into account the size of aerosols, distribution, number of density and composition. However, my main focus in this project is the measurements of  $\text{NO}_x$  and how it affects the air quality within the urban area of Washington D.C. By conducting this project, we will be able to gain an understanding about the nature of the urban air quality and be able to answer fundamental question concerning the air quality in this area.

**Reeshida Roberson**  
**Department of Chemistry**  
**Virginia State University**  
**Mentor: Dr. Vernon Morris**

**Ab Initio Calculations in Support of SOHO**

Collisions in the solar corona, within coronal mass ejecta (CMEs), and coronal streamers are only beginning to be understood. Recent successes in observational data from the Solar Heliospheric and Coronagraphic Observatory (SOHO) have led to insights into the structure, intensity, frequency, and spectral distribution of CMEs and coronal streamers. The purpose of this project is to perform some fundamental studies on scattering collisions, which excite atoms and ions in the regions of interest to the SOHO science team. These efforts will assist in the interpretation of the spectra obtained by the Ultraviolet Coronagraphic Spectrometer (UVCS). The model system for study was chosen to be the  $\text{H}_2 + \text{O}(\text{VI})$ . Ab initio calculations have been performed on the separated reactants and the collisions complex. The results of the ab initio work will be used in a scattering calculation to predict the nature of the excitation in the collisions between these species in the outer regions of the sun.

**Monesa Watts**  
**Department of Chemistry**  
**Jackson State University**  
**Mentor: Dr. Vernon Morris**

#### **The CSTEAs Howard Oxidants and Air Quality Experiment (CHOAQE)**

Urban air quality has been a local issue for more than 20 years. The CSTEAs Howard Oxidants and Air Quality Experiment (CHOAQE) was created to study the air quality on Howard University's campus as well as around the Metropolitan Washington DC area using Eulerian and Lagrangian Experiments. A set of measurements of all relevant meteorological parameters (wind speed and direction, temperature, relative humidity, pressure, visibility) and selected chemical measurements (Nox, O<sub>3</sub>, VOCs, and aerosols, CN) will be collected and compared with data from EPA measurements of O<sub>3</sub> to corroborate datasets. A study of 2 high ozone days in July for the Metropolitan Washington, DC area (MWDC) will be analyzed for air mass classification and transport. The Urban Airshed Model (UAM) will be used for analysis and interpretation of datasets. The results of this experiment hopefully will give insight to the many questions regarding the air quality and climatology around Metropolitan Washington, DC and the primary influences on the Urban Smog and Ozone in MWDC.

**Bobby Wilson II**  
**Department of Chemical Engineering**  
**Savannah State University**  
**Mentor: Dr. William Collins**

#### **Structure-Function Relationships of Impact-Modified Cyanate Ester Resins**

The purpose of this research is to develop space-ready materials that have great strength and are capable of resisting heat at high temperatures. Cyanate ester resins (CERS) are capable of such a task. They are highly rigid and can withstand high temperatures. The only downside of using these resins is the fact that they tend to be brittle. Thus, we are incorporating CERS with siloxanes to increase toughness, microcrack resistance, hydrophobicity, and oxidation resistance. The siloxane-modified cyanate ester resins after synthesis will be tested to determine their mechanical properties and impact strength. Thermal analysis and Differential Scanning Calorimetry will assist in characterization and evaluation of the impact modified cyanate ester resins.

**Paul Nkansah**  
**Department of Pharmacy and Pharmacal Sciences**  
**Howard University**  
**Mentor: Dr. Vernon Morris**

### **Investigating the reactivity of nitron as a Potential Chemical Sensor for Atmospheric Trace Gases**

A chief concern to atmospheric scientists for the last two decades has been the depletion of stratospheric ozone caused by free radicals belonging to the Nox, ClOx, SO<sub>2</sub>, and Hox, families. Recent studies in our laboratory have focused on the development of chemical sensors, which can be deployed on the Howard QCM Cascade Impactor or on CCO mass loading modules to detect key reservoirs of active ozone-destroying species. One of the compounds currently being investigated by CSTEAs is nitron [3,5,6 triphenyl-2,3,5,6-tetra-azobicyclo] (fig 1.1). Studies have shown that HCl and HNO<sub>3</sub> detection limits on nitron coated QCM crystals are on the order of pptv and ppbv, respectively. The Hyperchem molecular modeling and computational chemistry software package was used for the theoretical study of nitron reactivity toward HCl, HNO<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>3</sub>. Some of the results of the semi-empirical calculations on nitron reactivity are:

- ◆ nitron undergoes simple acid-base reactions and this accounts for its reactivity towards electrophiles [ HCl, HNO<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>3</sub> ].
- ◆ reactivity sequence of nitron : HCl > O<sub>3</sub> ~ NO<sub>2</sub> > SO<sub>2</sub> > HNO<sub>3</sub>.  
acidity strength: HCl > HNO<sub>3</sub> > O<sub>3</sub> > NO<sub>2</sub> > SO<sub>2</sub> (Steric hindrance may account for the deviation shown by HNO<sub>3</sub>).
- ◆ reactions involving protonated nitron are energetically favored than reactions that involve the unprotonated zwitterionic form.

**Ramon Foreman**  
**Department of Laser Chemistry**  
**Savannah State University**  
**Mentor: Dr. Joshua Halpern**

### **Development of Diode Laser System**

My research is based on a problem within a laser system. The problem is that there is a noise entering the system, which causes the readings to be inaccurate. In order to resolve the problem I will build an Optical Coupler. An Optical Coupler is an isolator, which allows a system to send digital and sometimes analog between circuits with two separate grounds. The Optical Coupler I plan to build, will, at one point, change electrical signals to light signals, and at the other point the light signals will return back to electrical signals.

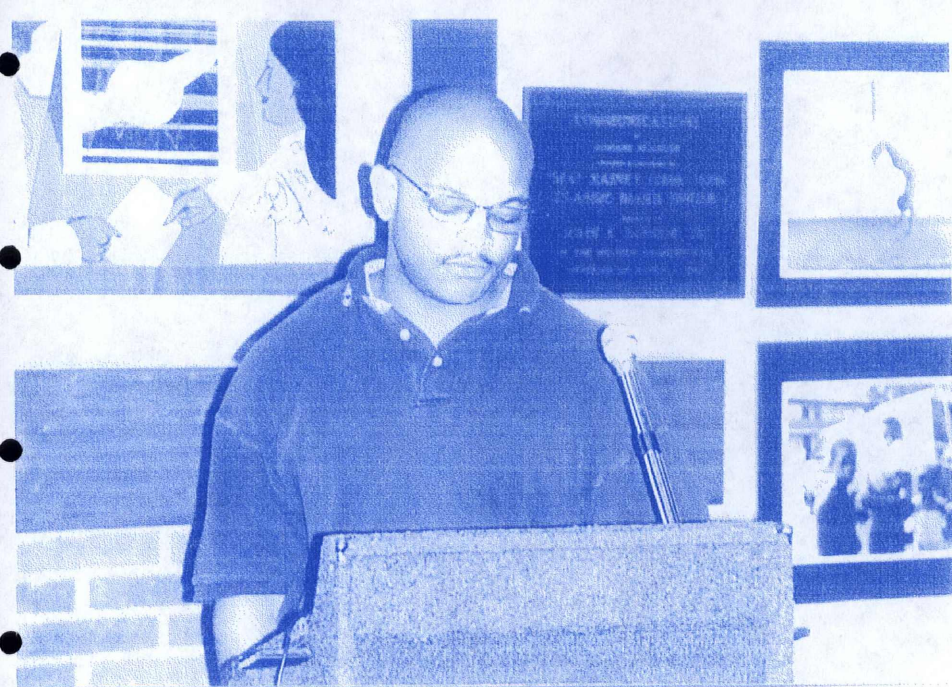
# Moderators



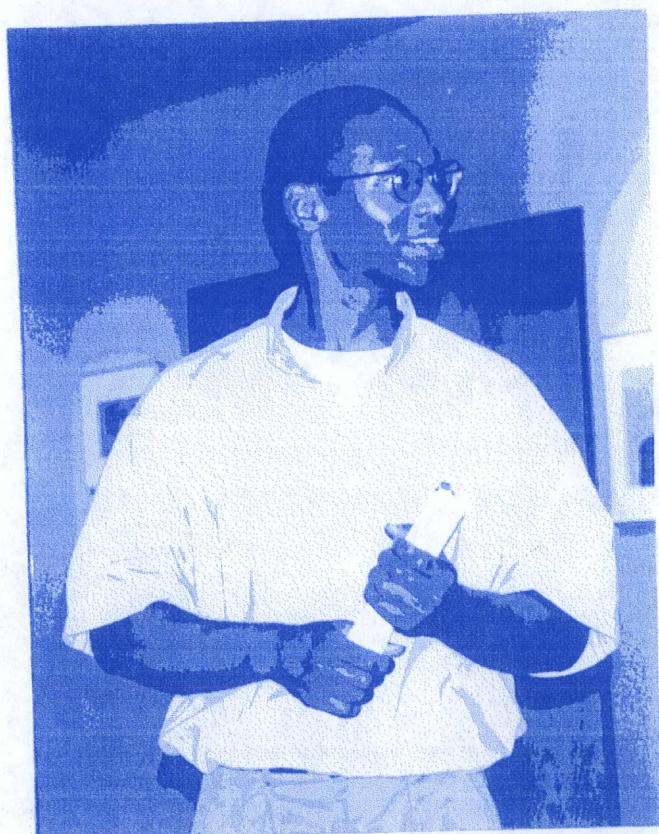
**Dr. Robert Catchings**



**Dr. Raymond Peterson**



**Dr. Donnell Walton**



**Dr. Vernon Morris**

# Student Presenters



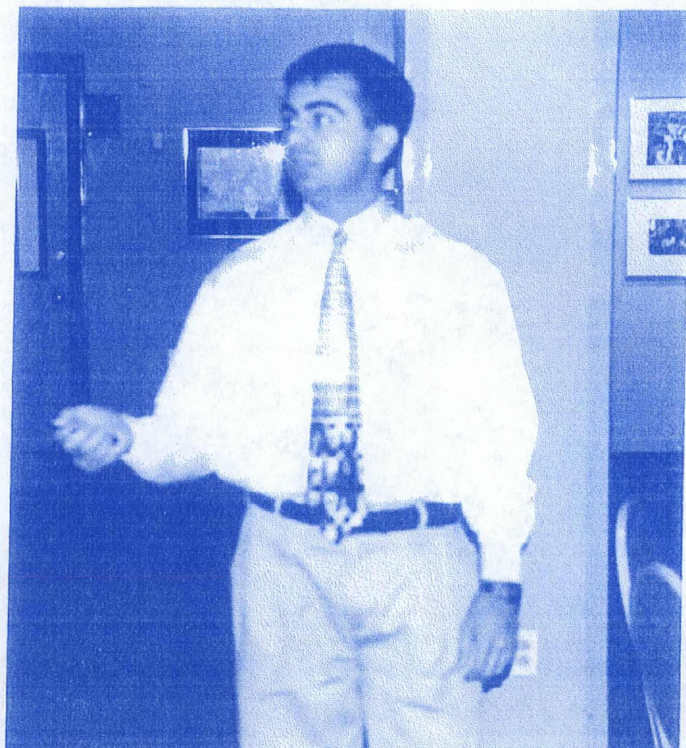
**Tanica Walcott**



**Reginald Romain**



**Dameon Gordon**



**Hossin Mosaddad**

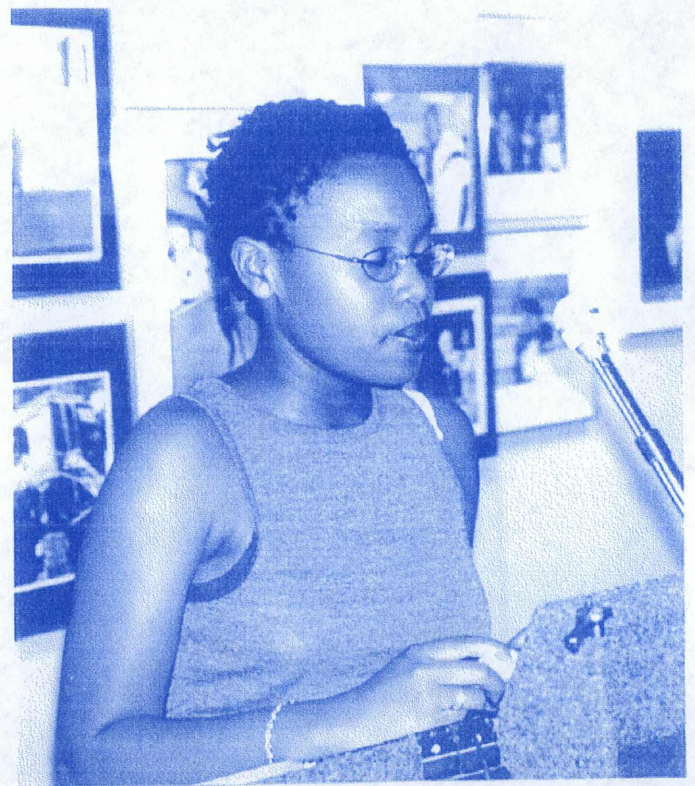




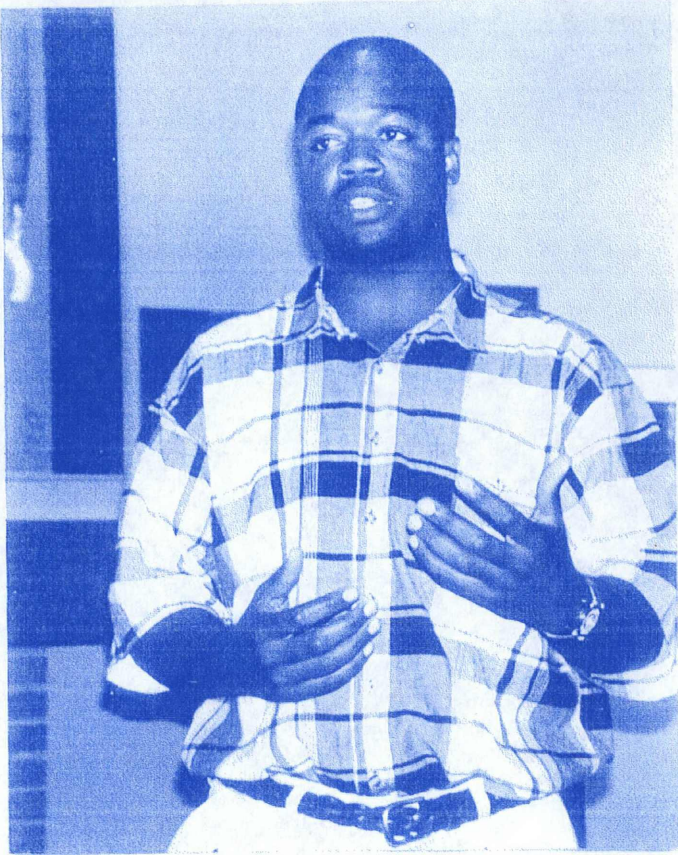
Aaliyah Perkins



Tisha Harper



Marjone Lazzar



**Richard Mcleish**



**Rachel Branson**



**Jonah Flowers**



**Anitra Harthcock**



**Bobby Wilson III**



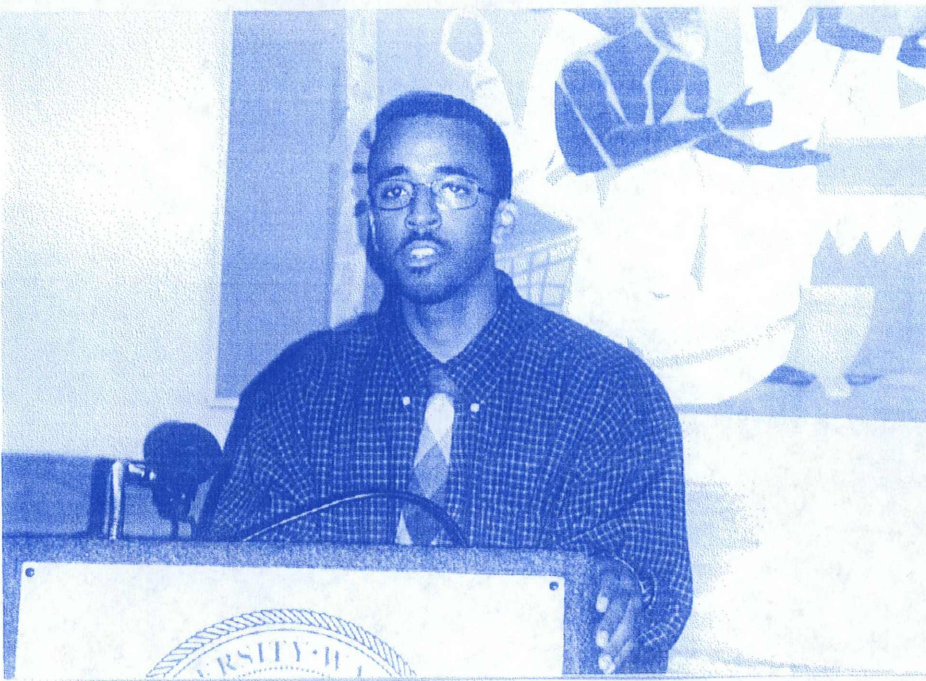
**Michele Augustine**



**Rachel Jones**



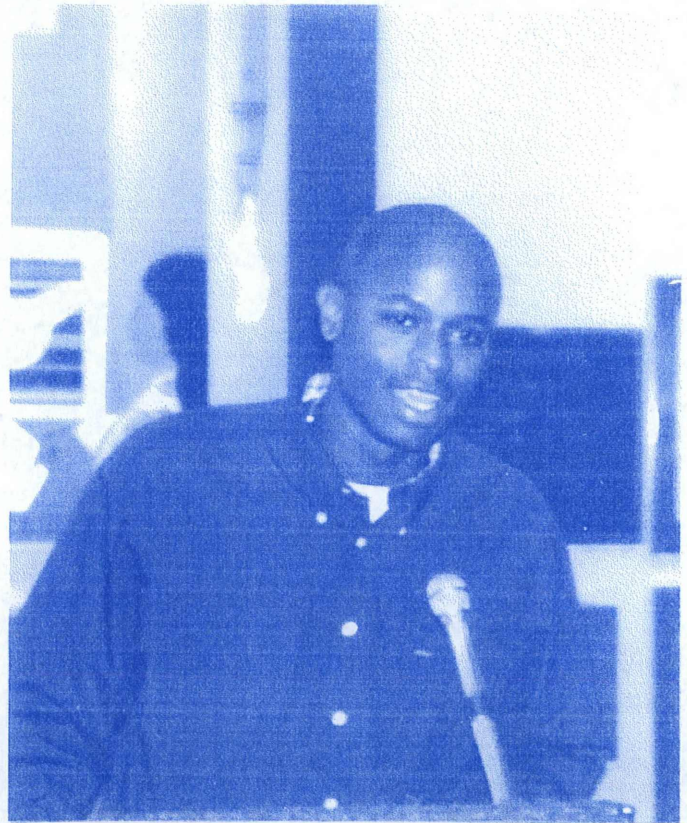
**Monesa Watts**



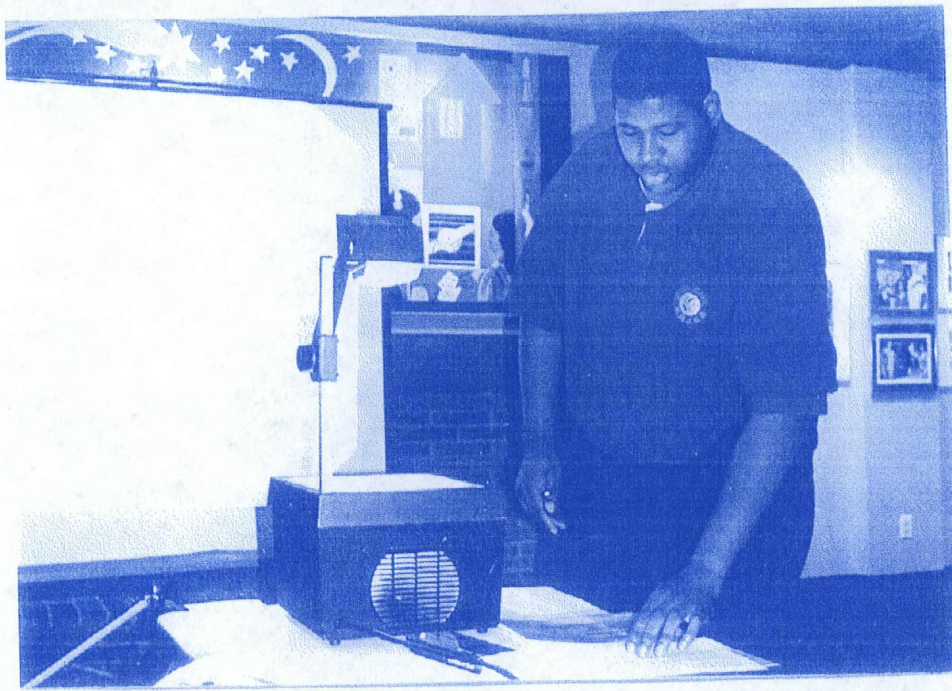
**Chandi Thomas**



**Prisca Anamelechi**



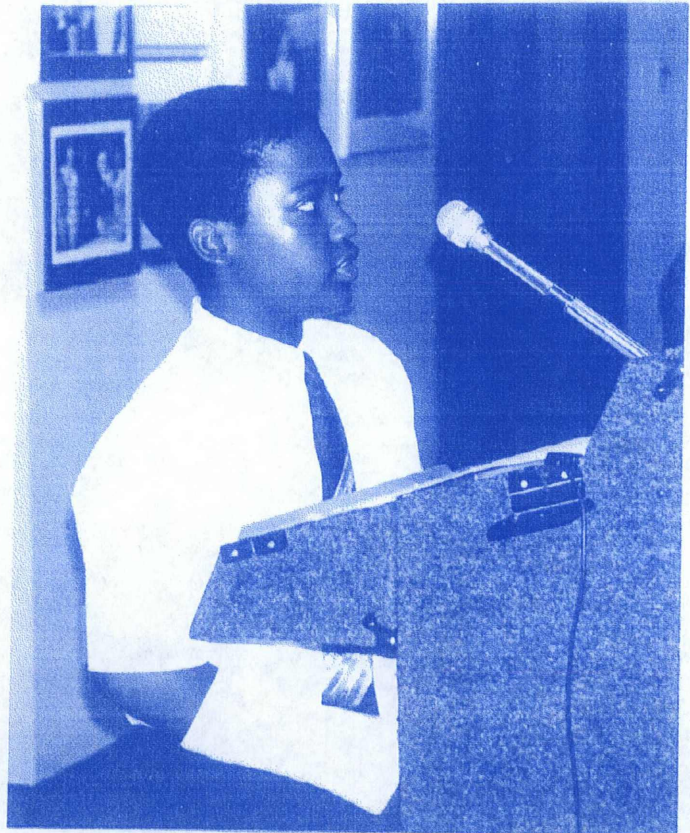
**DaNa Carlis**



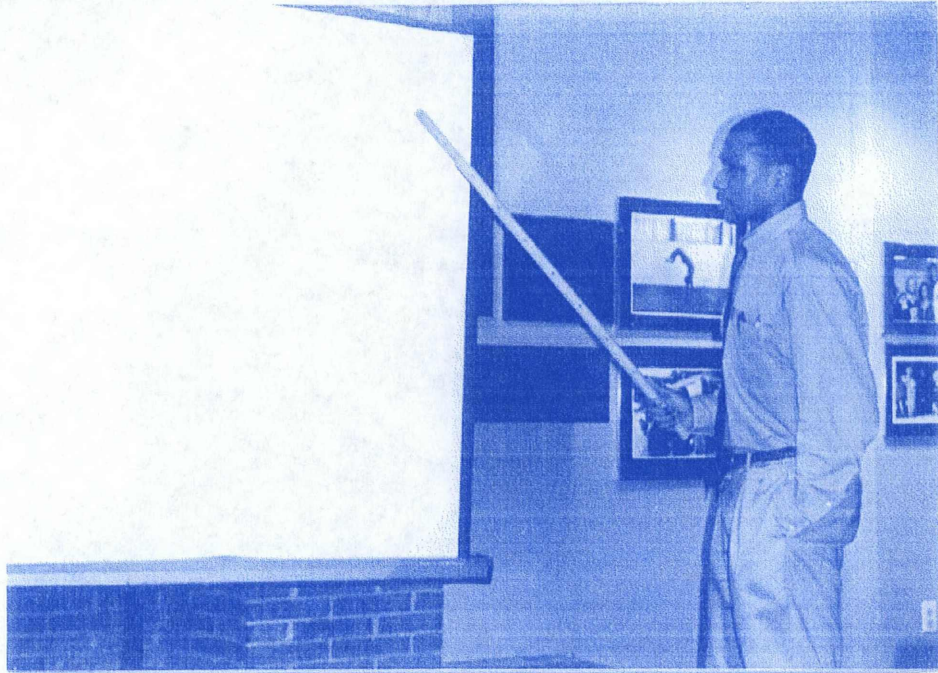
**Marvin Donaldson**



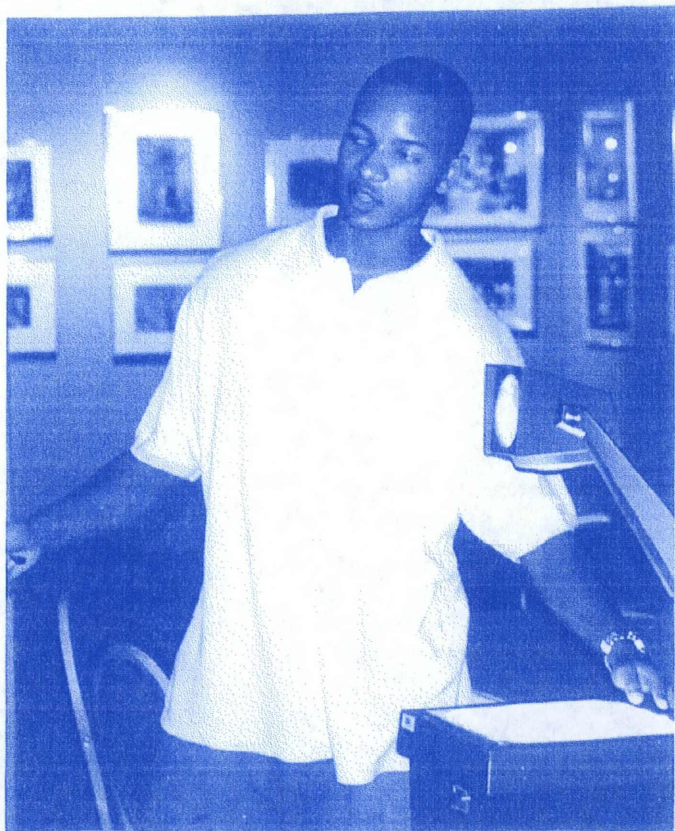
**Ayana McCoy**



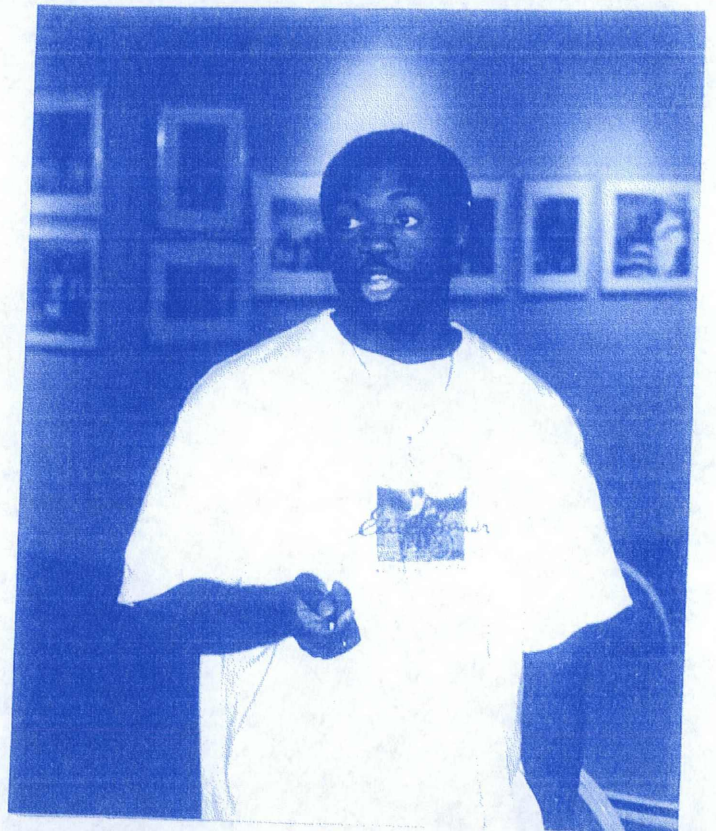
**Albert Kwansa**



**Robert Pryor**



**Dar-Es Riser**



**Michael Gordon**