

CONFERENCE PROCEEDINGS

First Annual Undergraduate Research Conference North Carolina Alliance for Minority Participation

“Achieving Academic Excellence Through Research”

NCAMP

**NORTH CAROLINA ALLIANCE
FOR MINORITY PARTICIPATION**

**April 11, 1997
Greensboro Hilton Hotel
Greensboro, North Carolina**

NCAMP is sponsored by the National Science Foundation and participating institutions.

CONFERENCE PROCEEDINGS

First Annual Undergraduate Research Conference North Carolina Alliance for Minority Participation


“Achieving Academic Excellence Through Research”



**April 11, 1997
Greensboro Hilton Hotel
Greensboro, North Carolina**

National Science Foundation • NCAMP Partner Institutions
North Carolina Agricultural and Technical State University • Fayetteville State University
North Carolina Central University • North Carolina State University
University of North Carolina-Chapel Hill • University of North Carolina-Charlotte
University of North Carolina-Greensboro • University of North Carolina-Pembroke

Table of Contents

	Page
Acknowledgements	i
Foreword	ii
Messages	
NCAMP Advisory Board Chairman	iii - iv
NCAMP Executive Director	v - vi
Conference Agenda	1 - 9
Conference Speakers	10 - 12
<u>Poster Abstracts</u>	13 - 19
Engineering	
Life Sciences	
Physical Sciences	
Geography	
	
<u>Oral Abstracts</u>	20 - 31
Computer Science/Mathematics	
Engineering	
Life Sciences	
Physical Sciences	
Abstract Index	32
Roster of Conference Participants	33 - 35
Student Certificate Award	36

Acknowledgements

A special note of appreciation is extended to all NCAMP administrators and staff, faculty, mentors, and parents for the time, energy, and encouragement provided to support the student research projects presented in this publication.

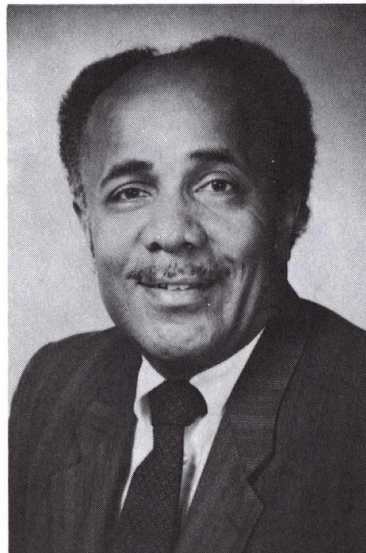
The views expressed in this document are those of the author(s) and do not necessarily reflect policy of the National Science Foundation. This publication was developed under Grant HRD-9255239.

Foreword

The North Carolina Alliance for Minority Participation (NCAMP) is strongly committed to the enhancement of research opportunities and experiences for undergraduate students in science, mathematics, engineering, and technology (SMET.) On April 11, 1997, NCAMP sponsored the First Annual Undergraduate Research Conference at the Hilton Hotel in Greensboro, North Carolina. This conference marked an important milestone in the concerted efforts of the Alliance to promote and celebrate research achievements by undergraduate SMET students at participating institutions. A summary of activities related to this major event and abstracts for research presented by students are reported in the Conference Proceedings.

NCAMP Advisory Board Chairman

MESSAGE



The National Science Foundation (NSF) recently set a formidable goal to be achieved by the year 2000. This goal is to increase the number of minorities underrepresented in NSF-supported fields receiving B.S. degrees to more than 50,000 annually, and to increase minority Ph.D. attainment to more than 2,000 annually by the same year. To facilitate the realization of this ambitious goal, NSF implemented the Alliances for Minority Participation (AMP) Program in 1991 with the establishment of six projects. This national, comprehensive, longitudinal effort is designed to substantially increase the quantity and quality of underrepresented minority students who earn baccalaureate degrees in science, mathematics, engineering, and technology (SMET) disciplines, and subsequently attain doctorate degrees in these fields. The current expansion of AMP programs to a total of 27 with a 1997 budget of \$27 million is evidence of the continued success of this flagship initiative. NSF is well on the way to meeting its goal. Since the inception of the AMP Program, the number of minority students annually earning B.S. degrees in SMET fields from AMP institutions has increased from less than 4,000 in 1991 to more than 15,000 in 1996.

The North Carolina Alliance for Minority Participation (NCAMP), formed in the fall of 1991, is totally committed to NSF's long-term goal. Collectively, NCAMP institutions are making a significant contribution to NSF's chief effort through a variety of programs and activities, including bridge programs, supplemental instruction, undergraduate research, and summer internships. These initiatives are aimed at systematically enhancing recruitment, retention, access, and opportunities to SMET education, internships, and research in these fields. The Advisory Board of NCAMP, composed of chancellors for partner institutions, reviews all aspects of Alliance operations and activities, and ensures that project goals and objectives are accomplished. One of the key components of the Alliance is the Undergraduate Research Program. This initiative specifically addresses the retention, education, and graduation of SMET students through a focused research experience that exposes participants to a graduate/postgraduate environment.

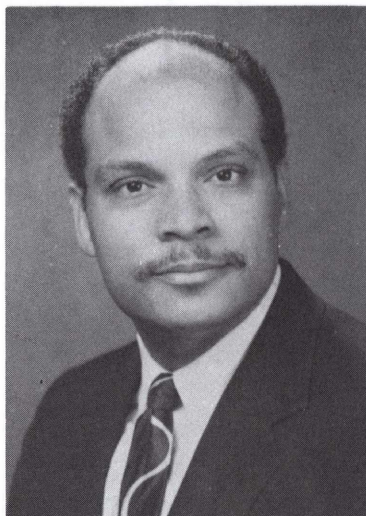
On behalf on the Advisory Board of the North Carolina Alliance for Minority Participation, I commend and applaud every student who participated in the First Annual Undergraduate Research Conference sponsored by NCAMP on April 11, 1997, at the Hilton Hotel in Greensboro, North Carolina. It was strongly encouraging to observe the enthusiasm and confidence displayed by undergraduate students who made poster and oral presentations. For the majority of students, this was their first time ever making a research presentation at a conference. Moreover, numerous students who did not make presentations benefitted tremendously from attending the conference. In addition to hearing a variety of interesting and informative reports addressing topics in life and physical sciences, computer science, mathematics, geographical science, and engineering, these students also had an excellent opportunity to meet and interface with NCAMP leaders, teaching and research faculty from all NCAMP institutions, and representatives from NSF, the NASA Lewis Research Center, the North Carolina Community College System, Los Alamos National Laboratory, and the Delphi Chassis Division of General Motors. Additionally, faculty mentors are acknowledged for their sincere dedication and ongoing commitment to serve as role models for students during their research investigations. Judging from the impressive quality of students' presentations, it is apparent that faculty performed superbly in directing each student.

Finally, the Advisory Board extends a special note of congratulations to everyone affiliated with NCAMP. To be sure, the Alliance is making a noteworthy contribution today in the preparation of tomorrow's technological workforce.

Sincerely,
Edward B. Fort
Chancellor
NCAMP Advisory Board Chairman
North Carolina A&T State University

NCAMP Executive Director

MESSAGE



It is a special pleasure to present the proceedings of the First Annual Undergraduate Research Conference sponsored by the North Carolina Alliance for Minority Participation (NCAMP) on April 11, 1997, at the Hilton Hotel in Greensboro, North Carolina. The primary objective of the conference was to provide a forum to showcase faculty-mentored research accomplishments by undergraduate students in science, mathematics, engineering, and technology (SMET) at all NCAMP institutions. Indeed, this conference marked an achievement of paramount importance to the overall aim of the North Carolina AMP. Specifically, that aim is to significantly increase the number of underrepresented minority students earning baccalaureate degrees in SMET disciplines, and subsequently pursuing graduate degrees. We strongly believe that research opportunities at the undergraduate level are not only desirable, but requisite to adequately prepare students for a rigorous graduate experience in a research field. Consequently, a chief goal of the Alliance is to boost research involvement for undergraduate students in SMET programs through faculty mentoring. In turn, we anticipate that these early, guided research experiences will serve as a major catalyst in motivating more minority students to attain Ph.D. degrees in SMET fields.

As the conference theme suggests, NCAMP is truly committed to the achievement of academic excellence through research. Across the Alliance, faculty in SMET disciplines are steadfastly focusing on this goal and assuming key roles as mentors to ensure success for students undertaking research ventures. Special efforts are channeled towards providing faculty-directed research experiences for students early in their studies rather than delaying participation until the junior and senior years. Opportunities are available for students to engage in summer internships and research experiences at different universities and national laboratories. Students at all partner institutions have shared numerous positive comments attesting to the benefits they have derived through firsthand involvement with research. In several instances, students have also reported marked improvement in performance in "gatekeeper courses" and increases in grade point average as a result of intensive participation in research projects. Additionally, students who have presented their research at local, state, and national SMET conferences provided further positive feedback concerning their gains from such experiences.

NCAMP partners are highly pleased with the overall outcome of the initial research conference. Clearly, we are now in a better position to more comprehensively assess the full impact of our efforts thus far to improve the participation of undergraduates in research. Although the conference was planned as a one-day event, every student who submitted an abstract for a poster or oral presentation was accommodated. A total of thirty-five (35) students presented research, and more than 200 students, faculty, and staff attended the conference. A conference invitation was extended to local community colleges and high schools. We were delighted that several high school and community college students and faculty participated in the conference. It was extremely encouraging that one community college student also presented research. All presenters received a special certificate and NCAMP tee-shirt during the Awards Banquet. Partners agree that the First Annual Research Conference was a tremendous success, and preliminary plans are in progress for the 1998 Spring Conference. We sincerely hope that SMET students and faculty at all NCAMP institutions will join us in April for the Second Annual Conference hosted by the University of North Carolina in Charlotte, North Carolina.

The impact of the NCAMP project at partner institutions is quite dramatic. There is a cultural change occurring on all campuses that is reflecting a more strategic and systemic focus on the institutional issues that impede minority student success in SMET programs. Indeed, outcomes of NCAMP up to this point are encouraging, and we fully anticipate reaching even higher levels of success during implementation of PHASE II operation over the next five years. We will continue to place emphasis on retention, which has proven to be our greatest challenge. It is apparent that attainment of our chief goal will be largely determined by our success in not only recruiting minority students into SMET programs at partner universities, but in nurturing these students through the SMET pipeline from undergraduate to the graduate level. In short, NCAMP is totally committed to making a substantial contribution to the preparation of skilled and talented underrepresented minorities to ensure that the United States will continue to have a globally, competitive workforce in science, mathematics, engineering, and technology.

The Executive Committee of the North Carolina Alliance for Minority Participation recognizes and congratulates all SMET students who presented research at the 1997 Spring Conference. Additionally, faculty mentors who facilitated these exemplary research projects are commended for their outstanding guidance and leadership. We warmly invite SMET students across the Alliance to participate in the 1998 Spring Conference. Further, we challenge students to become actively involved in a research project and submit an abstract for either a poster or oral presentation. We are confident that students will benefit significantly from these exciting and meaningful experiences.

Sincerely,
Harold L. Martin, Sr.
Vice Chancellor for Academic Affairs
NCAMP Executive Director
North Carolina A&T State University

Conference Agenda

First Annual Undergraduate Research Conference North Carolina Alliance for Minority Participation (NCAMP)

Hilton Hotel
304 North Elm Street
Greensboro, North Carolina
Friday, April 11, 1997

8:00 AM - 12 Noon

CONFERENCE REGISTRATION

Location: Southern Crescent Foyer, 2nd Floor

STUDENTS SET UP POSTER PRESENTATIONS

(Posters will remain on display throughout the Conference.)

CONTINENTAL BREAKFAST

Location: Southern Crescent Foyer, 2nd Floor

10:00 AM - 11:00 AM

OPENING SESSION

All Conference Participants

Location: Virginia Room

Moderator

Dr. Harold L. Martin, Sr.
Vice Chancellor for Academic Affairs
North Carolina A&T State University
NCAMP Principal Investigator/Executive Director

Introduction of Keynote Speaker

Dr. Juliette B. Bell, Associate Professor
Natural Sciences Department
Fayetteville State University

Keynote Speaker

Dr. William A. Sibley, Program Director
Centers for Research Excellence in Science and
Technology (CREST)
Directorate of Education and Human Resources
National Science Foundation

Special Presentation

Dr. Harold L. Martin, Sr.

11:00 AM - 12 Noon

POSTER PRESENTATIONS

Location: Cape Fear / Kitty Hawk Rooms

(students accompanied by faculty mentors)

Engineering

Saunya Amos, Senior - Mechanical Engineering

Acid Digestion: Fiber Volume Fraction Determination

Dr. Derome O. Dunn

North Carolina A&T State University

Ronnie Isaac, Senior - Architectural Engineering

The Study of PMV and Thermostat Controlled Building Energy Performance

Dr. Harmohindar Singh

North Carolina A&T State University

Yolanda D. Watson, Junior - Industrial Engineering

Relationship Between Sample Size and Normality of Inspection Samples

Dr. Sanjiv Sarin

North Carolina A&T State University

Keisha C. Williamson, Sophomore - Electrical and Computer Engineering

Gate-electrode Doping for the Fabrication of Deep-submicron Devices: Thermal Budget

Dr. Richard T. Kuehn

North Carolina State University

Biology

Tammy T. Burroughs, Senior

Analysis of Ni²⁺ Mutagenicity During IN VITRO DNA Synthesis by E. Coli DNA Polymerase I

Dr. Juliette B. Bell

Fayetteville State University

Kenneth Edwards, Senior

Particle Size Analysis to Determine the Prevalence of Airborne Fungal Spores

Dr. John Mayfield

North Carolina Central University

Angela Michelle Gales, Senior

The Localization of Actin and Neurofilament in Developing Japanese

Medaka Embryos Using Epifluorescent Microscopy

Dr. Michele Barker-Bridgers

University of North Carolina - Pembroke

Shanta E. MacKinnon, Senior

Seed Germination on Acid Rain

Dr. Sumana Banerjee

Durham Technical Community College

Biology (continued)

Rochelle Y. Taylor, Senior

The Effect of Mutagens on Sea Urchin Fertilization and Development

Dr. Michele Barker-Bridgers

University of North Carolina - Pembroke

Chemistry

Tavia S. Boston, Senior

Synthesis of the Acceptor Portion of a Molecular Triad for Artificial Photosynthesis

Dr. John Myers

North Carolina Central University

Aquilla L. Highsmith, Senior

Novel Applications of Michael Addition Reactions in the Synthesis of Selected Products From Furan Derivatives

Dr. Booker Juma

Fayetteville State University

Julian D. Phifer, Senior

Synthesis and Reactivity of $NMoCl_3$ (bpy)

Dr. Shawn Sendlinger

North Carolina Central University

Meredith Wilcox, Senior

Kinetic Study of Bovine Heart Lactate Dehydrogenase

Dr. Leonard Holmes

University of North Carolina - Pembroke

Geography

Ansel E. Brown, Junior

Identification of Mortality Patterns in the United States: A Geographic Information Systems (GIS) Application

Dr. Dennis Enberg

North Carolina Central University

12 Noon - 1:30 PM LUNCHEON

Location: Georgia / Carolina Rooms

Moderator

Dr. Harold L. Martin, Sr.

Invocation

Mr. Marcus Collins

Recruiter/Educational Counselor

University of North Carolina-Pembroke

12 Noon - 1:30 PM LUNCHEON (continued)

Introduction of Speaker

Dr. Terrel L. Rhodes
Associate Vice Chancellor for Academic Affairs
Office of Undergraduate Programs
University of North Carolina-Charlotte
NCAMP Associate Executive Director

Keynote Speaker

Dr. Julian M. Earls
Deputy Director For Operations
NASA Lewis Research Center

Special Presentation

Dr. Terrel L. Rhodes

1:45 - 4:15 PM

ORAL PRESENTATIONS

Locations: Triad West, Triad Central, and Triad East
Concurrent Sessions

Session I: Triad West

Engineering / Computer Science

Moderators

Dr. Dennis Maher, Professor
Materials Science and Engineering/Materials Physics
North Carolina State University

Ms. Karmon Miller, Graduate Student
Mechanical Engineering
North Carolina A&T State University

SESSION I

Jeffrey Everette, Senior - Industrial Engineering
Design of an Automated Material Handling System

Dr. Bala Ram
North Carolina A&T State University

Elizabeth A. Farr, Junior - Civil Engineering
Wastewater Recycling

Dr. S. Y. Chang
North Carolina A&T State University

Aquaris Moore, Senior - Industrial Engineering
*The Feasibility of Utilizing Ergonomic Task Analysis to Reduce
the Physical Demands of Military Occupational Specialists*

Dr. Celestine Ntuen
North Carolina A&T State University

SESSION I (continued)

Marques A. Holmes, Freshman - Electrical Engineering
A Mature Software Process
Dr. Steffan Parrott (Sandia National Laboratories)
North Carolina A&T State University

Lena Horsley, Senior - Chemistry
Surface Modification of Stainless Steel Chips with Agron and Acrylonitrile Plasmas to Prevent the Growth of Salmonella Typhimurium
Dr. Alvin Kennedy
North Carolina A&T State University

Session II: Triad Central
Sciences (Biology, Chemistry, Physics, other)

Moderators

Dr. Booker Juma, Assistant Professor
Natural Sciences and Chemistry Departments
Fayetteville State Faculty

Ms. Valerie McLaughlin, Graduate Student
Chemical Engineering
North Carolina A&T State University

SESSION II

Ayanna Cooper, Senior - Chemistry
Differentiation of HIB-1B Brown Adipocytes by PPAR γ and RXR α Potently Stimulates the Expression of the Uncoupling Protein Gene and β ARs.
Dr. Lynda M. Jordan
North Carolina A&T State University

Jason Gilchrist, Senior - Physics
A New Model Potential for Excited State Metal Atom-Rare Gas Interaction
Dr. Solomon Bililign
North Carolina A&T State University

Jerretta Lashelle Gilchrist, Senior - Food Science
Consumption Trends of Meat and Soybean Products in Greensboro, North Carolina
Dr. Margaret J. Hinds
North Carolina A&T State University

Gerald J. Gracia, Senior - Biology
In Vivo and in Vitro Studies Support Selenium as a Potential Chemo-Preventive Agent for Colon Cancer
Dr. Mark Nelson
North Carolina A&T State University

SESSION II (continued)

Christopher A. Graves, Senior - Biology

*Isolation and Identification of Hydrocarbons in the Nantucket Pine Tip Moth:
Potential New Tools in Taxonomy*

Dr. James A. Richmond

North Carolina Central University

Vanessa Marie Martinez, Senior - Biology

*Setting Success of the Intertidal American Oyster *Crassostrea virginica*
Using Two Methods: Epinephrine and Microcultch*

Dr. Parke Rublee

University of North Carolina - Greensboro

Bennie A. Rice, Senior - Biology

Down Regulation of Cyclin B Expression Due to DNA Damage in S Phase

Dr. Karen Katula

University of North Carolina - Greensboro

J. Cristobal Salazar, Senior - Biology/Psychology

*Facilitation of the VBNC Condition in *R. meliloti*
by Exposure to a Heavy Metal*

Dr. Todd Steck

University of North Carolina - Charlotte

Bradley J. Wright, Senior - Chemistry

*Oxidative Ring Fissions of Aliphatic and Cyclic Substituted
in Furan Toxicity Pathways*

Dr. Booker Juma

Fayetteville State University

Session III: Triad East
Mathematics / Technology

Moderators

Dr. David L. Hunter, Faculty
PRODUCE Program Coordinator
University of North Carolina - Charlotte

Mr. Perry Gillespie, Graduate Student
Mathematics
North Carolina A&T State University

SESSION III

Cedric D. Cheek, Senior - Electronic Technology
Ethernet. . . the Standardization, Elements, and Its Operation
Dr. John Spurlin
North Carolina A&T State University

Trena Covington, Senior - Engineering Mathematics
*Statistical Description of North Carolina A&T State University Calculus
Students Who Took the Fall 1991 Placement Test*
Dr. Janis Oldham
North Carolina A&T State University

Tyrone Eugene Davis, Senior - Manufacturing Systems
Radio Frequency Identification
Dr. Paul Liu
North Carolina A&T State University

Lisa A. Dempson, Senior - Electronics and Computer Technology
The What, When, Why, and How of the Internet
Dr. John Spurlin
North Carolina A&T State University

Lamont Green, Senior - Chemistry
*The Engineering of A Streptavidin Mutation Consisting
of a 6x Histidine Tag at the N-Terminw Site*
Dr. Lynda M. Jordan
North Carolina A&T State University

Kevin Grove, Freshman - Manufacturing Systems
Superabrasive Grinding Wheel in Machining Processes
Dr. Paul Liu
North Carolina A&T State University

Christopher Ogu, Senior - Manufacturing Systems
Productivity, Quality, and Improvement Concept in Electronics Assembly
Dr. Paul Liu
North Carolina A&T State University

4:30 - 5:30 PM

RECEPTION

Location: 2nd Floor Foyer

(During this time, students should dismantle poster presentations.)

5:30 - 7:30 PM

AWARDS BANQUET

Location: Georgia / Carolina Rooms

Moderator

Dr. Harold L. Martin, Sr.

Invocation

Miss Shawonda Brockington, Senior
Chemical Engineering
North Carolina A&T State University

Introduction of Speaker

Dr. Lonnie Sharpe, Jr.
Associate Dean for Undergraduate Programs
College of Engineering
North Carolina A&T State University
NCAMP Co-Principal Investigator

Speaker

Mr. Barry Lamont Ray
Industrial Relations Specialist
Delphi Chassis Division of General Motors

Special Presentation

Dr. Mattie Moss, Associate Dean
College of Arts & Sciences
North Carolina Central University

Presentation of Awards

• **Student Certificates**

Dr. Harold L. Martin, Sr.

Dr. John Kelly, Associate Dean for Graduate Programs
College of Engineering
North Carolina A&T State University

Dr. Carolyn Girardeau, Associate Vice Chancellor
& Director of Grants and Assessment
North Carolina Community College System

Ms. Pamela A. Bivens, Program Administrator
Los Alamos National Laboratory
Los Alamos, New Mexico

Mr. Benjamin R. Kraft, Senior
Electrical Engineering
North Carolina A&T State University

5:30 - 7:30 PM

AWARDS BANQUET (continued)

- **Outstanding SMET Faculty Mentors**
Dr. Edward B. Fort, Chancellor
North Carolina A&T State University
NCAMP Advisory Board, Chairman

Closing Remarks / Special Award

Dr. Harold L. Martin, Sr.
Dr. Edward B. Fort

Conference Speakers

Dr. William A. Sibley

After serving in combat as an artillery Lieutenant, W. A. Sibley received his B.S., M.S., and Ph.D. degrees in physics at the University of Oklahoma. When he completed the Ph.D. degree, Dr. Sibley pursued research at the Technical University in Aachen, Germany. Subsequently, he joined the Solid State Division of Oak Ridge National Laboratory, where he became Head of the Non-metals Section of the Division. After nine years at Oak Ridge National Laboratory, he relocated to become Head of the Physics Department at Oklahoma State University. Dr. Sibley was later given responsibility for the School of Physical Sciences, the Education and Research Foundation, and then directed the University research efforts as vice president for research. In 1988, he joined the National Science Foundation (NSF) as Program Director for the Experimental Program to Stimulate Competitive Research (EPSCoR), and in 1990 was named director of the Division of Materials Research at NSF. On August 1, 1990, Dr. Sibley was appointed vice chancellor for academic affairs at the University of Alabama at Birmingham. He again joined the National Science Foundation in 1996 as Program Director of the Centers for Research Excellence in Science and Technology (CREST).

Dr. Sibley has published over 200 papers in refereed journals in the area of condensed matter physics in radiation damage and laser materials. His latest research focused on new laser systems and the upconversion efficiency of light in crystals and heavy metal fluoride glasses. He has received funding in the past from the Department of Energy, The National Science Foundation, the Department of Defense and other agencies. To date, Dr. Sibley has been responsible for over \$10 million in grant funds. As an educator, he has assumed responsibility for education programs, research, and construction projects. During this period, he always made time to teach both undergraduate and graduate physics courses. Dr. Sibley received the Outstanding Teaching Award and the Sigma Xi Research Award at Oklahoma State University, and the President's Medal for service at the University of Alabama at Birmingham. He is a Fellow of the American Physical Society, and has served on numerous national and state Boards of Directors and Advisory Committees. Additionally, Dr. Sibley has provided extensive consultation services pertaining to management and distance learning.

Dr. Julian Earls

Dr. Julian M. Earls, Deputy Director for Operations, NASA Lewis Research Center, is a native of Portsmouth, Virginia. He earned a B. S. degree in physics with distinction from Norfolk State University; M.S. degree in radiation physics from the University of Rochester School of Medicine; and Ph.D. degree in radiation physics from the University of Michigan. In addition, Dr. Earls earned the equivalence of a second M.S. degree in environmental health from the University of Michigan, and is a graduate of the Harvard Business School's prestigious Program for Management Development. He also received the NASA Medal for Exceptional Achievement on two separate occasions.

Dr. Earls has 21 publications, both technical and educational. He has been Distinguished Honors Visiting Professor at numerous universities throughout the nation, and is an adjunct faculty member at Capital University, Columbus, Ohio. Previously, Dr. Earls was an adjunct faculty member at Cuyahoga Community College in Cleveland, Ohio. Moreover, he served on the Visiting Committee and the Board of Overseers at Case Western Reserve University, and the Board of Trustees at Cuyahoga Community College. Recently, he was appointed by the Governor of Ohio to serve on the newly restructured Board of Trustees for Central State University.

Throughout his professional career, Dr. Earls has received numerous honors for community services. He was designated the Black College Graduate of Distinction by the National Urban League, and honored by Norfolk State University and the National Association for Equal Opportunity in Higher Education. Dr. Earls was inducted into the inaugural class of the National Black College Alumni Hall of Fame with such distinguished individuals as Dr. Martin Luther King, Jr. and Justice Thurgood Marshall. More recently, he was honored as one of nine individuals included in the Strong Men and Women: Excellence in Leadership Series by Virginia Power and North Carolina Power Companies. Others who have been included in the Series were: Dr. Johnnetta Cole, President of Spelman College; Henry Aaron, member, Baseball Hall of Fame; Dr. John Hope Franklin, noted historian; retired General Colin Powell; Michael Jordan, Chicago Bulls basketball star; and noted poet, Maya Angelou. Dr. Earls is co-founder of the Development Fund for Black Students in Science and Technology, which awards scholarships to black students who major in technical disciplines at Historically Black Colleges and Universities.

Dr. Earls is an avid runner and has run over 10,000 miles in the past five years. He entered and successfully completed 15 marathons, including the Boston Marathon. He is married to the former Zenobia Gregory of Norfolk, Virginia, a Reading Curriculum Specialist in the Cleveland School System. They have two sons. Julian, Jr., a neurologist, is a graduate of Howard University and Case Western Reserve University School of Medicine. Gregory, a cinematographer, is a graduate of Norfolk State University and the American Film Institute in Hollywood, California.

Barry Lamont Ray, Esq.

Barry L. Ray is a native of Wilson, North Carolina. He is married to the former Petal-Lee Grant of St. Thomas, U.S. Virgin Islands. Mr. Ray earned a B.S. degree in Industrial Engineering from North Carolina Agricultural and Technical State University. Subsequently, he received an M.S. degree in Business Administration, and a doctorate of Jurisprudence from Ohio State University.

Currently, Mr. Ray is employed as an Industrial Relations Specialist with the Delphi Chassis Division of General Motors in Dayton, Ohio. Previously, he worked with Ford, Cincinnati Bell Telephone, and General Electric Corporation, as well as Thomson, Hine, and Flory, Attorneys at Law. Mr. Ray is also a partner with Bishop, Ray and Associates, a motivational speaking firm which challenges and inspires individuals from all walks of life to view themselves and their circumstances constructively.

Mr. Ray has received numerous awards for his oratorical and leadership skills. He is a member of several civic and social organizations, including the National Black MBA Association, Alpha Phi Alpha Fraternity, Tau Beta Pi Engineering Society, Phi Alpha Delta Legal Fraternity, and the Zion Baptist Church of Dayton, Ohio.

Poster Abstracts

SAUNYA AMOS

Major: Mechanical Engineering

“Acid Digestion: Fiber Volume Fraction Determination”

Faculty Mentor: Dr. DeRome Dunn
North Carolina A&T State University

There is a growing importance of composite use in structural applications. Test and laboratory operations must be performed on composites to evaluate their quality and strength. In this case, a carbon-epoxy composite was evaluated. The fiber volume content of braided and woven carbon-epoxy composites must be determined to calculate apparent strength through use of ASTM methods. The D792 ASTM method of finding the density of the sample by liquid displacement was used. The D3171 ASTM method was used in digesting the resin portion of the composite sample with nitric acid. The digested fiber was filtered, washed, dried and weighed. The digestion process requires three hours with varying times for preparation, filtration and wash. These data will be used to predict the characteristics of given composite materials.



RONNIE ISSAC

Major: Architectural Engineering

“The Study of PMV and Thermostat Controlled Building Energy Performance”

Faculty Mentor: Dr. Harmohindar Singh
North Carolina A&T State University

Thermal comfort is based on dry bulb temperature, mean radiant temperature (MRT), air velocity, humidity, clothing insulation value (Clo Value), and metabolic rate. We control our clo value and metabolic rate while the other four factors can be mechanically controlled. However, a conventional thermostat controls only dry bulb temperature, limiting its ability to provide optimum thermal comfort. In order to optimize thermal comfort with minimum energy consumption, a Predicted Mean Vote (PMV) control strategy can be used. PMV is an index that predicts the mean value of the votes of a large group of persons on a seven point thermal sensation scale: from -3 (cold), to +3 (hot). PMV controlled sensors could prove to be worthwhile by providing an energy efficient environment while maximizing worker productivity. A comparative study of the energy consumption of a variable air volume system controlled by a conventional thermostat and PMV temperature sensor was investigated.

YOLANDA D. WATSON

Major: Industrial Engineering

“Relationship Between Sample Size and Normality of Inspection Samples”

Faculty Mentor: Dr. Sanjiv Sarin
North Carolina A&T State University

Inspection of products in a manufacturing plant generally involves the selection of a sample and a determination of one or more quality characteristics, such as a dimension or surface finish. The sample average is assumed to follow a Normal Distribution, provided the sample size is “large enough.” This study investigated the relationship between the size of the sample and the degree of normality of the sample average. In particular, for a very widely dispersed distribution, the threshold sample size was empirically determined.



KEISHA C. WILLIAMSON

Major: Electrical/Computer Engineering

“Gate-electrode Doping for the Fabrication of Deep-submicron Devices: Thermal Budget”

Faculty Mentor: Dr. Richard Kuehn
North Carolina State University

This project is concerned with both in-situ gate-stack processing as well as across-stage processing for the fabrication of metal-on-semiconductor capacitors at design rules which require 30 Å gate oxides and n⁺ doped gate electrodes (circa 2007). An important research concern is the process step used to dope the gate electrode because this step impacts on the thermal budget and has a problematic impact on device performance. In order to address this concern, four doping schemes were studied. Temperature and time were varied to achieve different doping conditions. The optimum processing step was obtained through a methodology which is based on current versus voltage measurements. Figures-of-merit were established from the area dependency of the current at a given bias voltage. Data sets addressed uniformity and optimization through a graphical approach that includes linear regression, confidence intervals, and extrapolation.

Contributing student: Bobby Barnes • North Carolina A&T State University.

TAMMY T. BURROUGHS

Major: Biology

“Analysis of Ni²⁺ Mutagenicity During *In Vitro* DNA Synthesis by *E. Coli* DNA Polymerase I”

Faculty Mentor: Dr. Juliette B. Bell
Fayetteville State University

Nickel, a naturally occurring metal, has been demonstrated as a genotoxic carcinogen. In this research project, an analysis of the mutagenic effects of nickel cations on the fidelity of *in vitro* DNA synthesis by exonuclease-deficient *E. coli* DNA polymerase I (Klenow fragment) was undertaken. Using the M13mp2 Lac Z- α complementation assay, errors caused by the presence of NiCl₂ during template-directed DNA synthesis were quantitated. Results indicate an increase of up to 5-fold in the mutation frequency as the NiCl₂ concentration is varied from 0 to 0.4 mM. DNA sequence analysis of 50 mutants from assays containing 0.3 mM NiCl₂ indicate that 50% of the mutants were base mutation errors and 50% were frameshifts. The mutational spectrum shows a high level of sequence specificity with nearly two-thirds of the frameshifts occurring at two sites and nearly two-thirds of the base substitution errors, resulting from C--T transitions occurring at two other sites. These results offer intriguing possibilities for mechanistic modeling of Ni-induced mutagenesis. (Supported by NIH Grant #S06 GM08206.)



KENNETH EDWARDS

Major: Biology

“Particle Size Analysis to Determine the Prevalence of Airborne Fungal Spores”

Faculty Mentor: Dr. John Mayfield
North Carolina Central University

Recent clinical data show an increased incidence of fungal infections. Besides pathogenic fungi, we also face the problems of allergenic fungi within the atmosphere. To monitor the occurrence of both pathogenic and allergenic fungi in the atmosphere, it is necessary to sample, identify, and quantify fungal spores with a high degree of reliability. The strategy of this laboratory involves using the Andersen Atmospheric Sampler to collect spores from known volumes of outdoor air. Phase contrast microscopy, particle size analysis (PSA) and image analysis techniques were used to characterize spores by their microscopic morphology, particle size distribution and shape factors, respectively. The combination approach has increased our ability to make frequent collections and reduced both the time and effort for identification. Collections during a 12-month period revealed a fungal spore prevalence that ranges from 3.5 - 148 colony forming units (CFU)/100 liters of air. The most frequently occurring CFUs are Alternaria, Cladosporium, Epicoccum, Fusarium, Penicillin, and Yeast. To simplify identification, PSA profiles and micrographs were arranged into an identification guide. Using PSA parameters, the mode of area density and volume density were used to distinguish species within some genera. The identified airborne fungal spores have been assigned modal values along a scale that ranges from 3 to 30 p.m.

ANGELA MICHELE GALES

Major: Biology

“The Localization of Actin and Neurofilament in Developing Japanese Medaka Embryos Using Epifluorescent Microscopy”

Faculty Mentor: Dr. Michele Barker-Bridgers
University of North Carolina at Pembroke

Fluorescent dyes were used in an effort to evaluate the progressive development of actin protein and neurofilaments in embryos of Japanese medaka. The dyes were applied at various stages of development and compared to an untreated control. Localization was subsequently determined using an epifluorescent microscope. A numerical scale was developed to quantify the amount of each cellular component present at each development stage.



SHANTA E. MACKINNON

Major: Biology

“Seed Germination on Acid Rain”

Faculty Mentor: Dr. Sumana Banerjee
Durham Technical Community College

During the growth and development of a seed, the formerly dormant embryo resumes growth and emerges from the seed. A non-polluted embryo would absorb water which would then swell and burst open from its coat. From this process emerges the root from the seed coat to begin the rapid growth phase. The majority of the time, pollution slows or stunts the growth phase of the seed(s). Everyday pollutants such as fumes released from automobiles and hair spray, plague the atmosphere causing more severe long term problems such as diminishing plant growth later leading to the break down of the food chain.

In recent years, there has been much discussion about the effects of acid rain on vegetation. During the past few months, this investigation explored the different levels in pH at which a seed could actually mature and flourish. The experiment included the two classes of seeds: (1) Monocot, which consisted of corn seeds; (2) dicots, which consisted of sunflower seeds. In order to show a variation of effect, sulfuric acid and nitric acid were used to maintain the three pH levels. The first pH level showed no sign of seed maturation. There were signs of seed growth in the second pH level. The third pH level showed 100% seed germination.

Although this investigation was on a smaller level than most studies, it enhanced the researcher's knowledge pertaining to seed production. Specifically, the study indicated that the more acidic a solution is the greater negative effect it will have on vegetation. This finding is a plus in itself because it will assist agriculturists in determining ways that best suit their overall crop.

ROCHELLE Y. TAYLOR

Major: Biology

“The Effect of Mutagens on Sea Urchin Fertilization and Development”

Faculty Mentor: Dr. Michele Barker-Bridgers
University of North Carolina at Pembroke

This research evaluated the effect of various mutagenic agents on sea urchins at different developmental stages. The suspected mutagens utilized in the study included tobacco smoke, caffeine, theophylline, and ultraviolet light at various intensities and durations. Sperm, eggs, as well as fertilized zygotes, were exposed to each treatment. The effect of each mutagen on fertilization was quantified in terms of percent fertilization as compared to an untreated control. Development deficiencies and abnormalities were examined and documented using light and epifluorescence microscopy.



TAVIA S. BOSTON

Major: Chemistry

“Synthesis of the Acceptor Portion of a Molecular Triad for Artificial Photosynthesis”

Faculty Mentor: Dr. John Myers
North Carolina Central University

Incorporation of an isoindolequinone into a molecular triad as the acceptor end of an electron transfer system is envisioned as a model system to observe artificial photosynthesis. In this project, three new isoindolequinones were synthesized and characterized by $^1\text{H-NMR}$ spectroscopy. The two cyclopentadiene protected isoindolequinones appear to differ by a carbon-carbon double bond. Each compound has an ester functionality for covalently linking to an organo-ruthenium complex in formulating the desired molecular triad.

AQUILLA L. HIGHSMITH

Major: Chemistry

“Novel Applications of Michael Addition Reactions in the Synthesis of Selected Products From Furan Derivatives”

Faculty Mentor: Dr. Booker Juma
Fayetteville State University

Furan and its derivatives, present in a variety of sources such as foods, tobacco smoke and therapeutic agents, are known to be toxic. In the biological system, such compounds are bioactivated by the cytochrome P₄₅₀ mixed function oxidase system resulting in α , β -unsaturated dicarbonyl compounds. These oxidative metabolites (electrophiles) undergo covalent bonding with nucleophilic macromolecules in tissues. The bonding of the metabolite and the macromolecule is simulated in the laboratory by the Michael addition of the oxidative product and benzylmercaptan. The condensed product is characterized by the ¹H NMR and IR. (Supported by NIH Grant #S06 GM08206.)



JULIAN DEPRIEST PHIFER

Major: Chemistry

“Synthesis and Reactivity of NMoCl₃(bpy)”

Faculty Mentor: Dr. Shawn Sendlinger
North Carolina Central University

Synthetic organic polymers reportedly have many important uses. Recent interest in these polymers has focused on their interesting physical properties such as being electrically conductive and having nonlinear optical behavior. There are some known inorganic polymers that have these same characteristics, but there is no general synthetic route to make them. The goal of this project was to develop a general synthetic route to make inorganic oligomers and polymers containing a transition metal and nitrogen in the backbone starting with known monomeric transition metal nitrido complexes.

The monomer [NMoCl₃(bpy)] has been synthesized and its possible use as a precursor for oligomers and polymers is under investigation. Using ⁿBuLi, the one electron reduction of [NMoCl₃(bpy)] leads to an as yet uncharacterized product. Based on spectroscopic data, the possible structures of this product will be presented.

MEREDITH WILCOX

Major: Chemistry

“Kinetic Study of Bovine Heart Lactate Dehydrogenase”

Faculty Mentor: Dr. Leonard Holmes
University of North Carolina at Pembroke

An initial rate study was conducted to determine the kinetic parameters of bovine heart lactate dehydrogenase. The enzyme assay involved the two natural substrates, pyruvate and NADH. Pyruvate concentration was maintained at the saturation level and the concentration of NADH was varied to determine K_m , V_{max} and the turnover number (K_{cat}). In addition, the influence of pH on the specific activity was studied.



ANSEL E. BROWN

Major: Geography

“Identification of Mortality Patterns in the United States: A Geographic Information Systems (GIS) Application”

Faculty Mentor: Dr. Dennis Enberg
North Carolina Central University

The objective of this research was to identify mortality patterns throughout the United States using a newly acquired GIS software package. Geographic Information Systems (GIS) are powerful computer-based tools for integrating and analyzing spatial data from multiple sources. GIS permits geographically referenced information be stored, manipulated, edited, and analyzed to generate interpretive thematic maps and related statistics relevant for decision making.

Mortality, the occurrence of death, contrasts with fertility by being more stable and predictable, and thus, less prone to mysterious fluctuations. Using data that will express itself spatially in an accurate manner certainly aids the researcher. In this research, three different time periods were analyzed spatially in order to illustrate any important changes over a 20 year period. The census years examined were 1970, 1980, and 1990.

Five procedures were used to identify mortality patterns throughout the United States:

1. data were collected using United States Census reports.
2. data were formatted for specific time periods.
3. data were entered into a database spreadsheet and linked to a GIS package.
4. data were manipulated in order to generate a series of quantitative thematic maps.
5. spatial patterns of mortality were interpreted and analyzed.

Oral Abstracts

JEFFREY EVERETTE

Major: Industrial Engineering

“Design of an Automated Material Handling System”

Faculty Mentor: Dr. Bala Ralm
North Carolina A & T State University

This project was completed by a team of students for a course on Material Handling Systems Design. The objective of this project was to re-design the Final Test & Packing department for HE, Inc. HE, Inc. is a manufacturer of automotive sound systems. The main features of our design were: smooth flow of material to all stations, minimum floor space requirement, ergonomic issues, minimizing accidental delivery of the untested units to the packing area, return of empty pallets, and designing a pallet. The re-design effort has resulted in the development of a flow chart, a final layout drawing, workstation design, pallet design, and the addressing of ergonomic issues. We have divided the department into six different locations to perform various tasks on the sound system. The locations are test station, bar-code reader #1, cosmetic and trouble shooting stations, quality audit and burn-in test stations, bar-code reader #2, and the packing area. Additionally, we have calculated the pallet and floor space requirements, and cost for the system we designed. A simulation model is included to provide an animation of the proposed design.

Contributing graduate students: Kolo Emmanuel and Gunvant Patel • North Carolina A&T State University.



ELIZABETH A. FARR

Major: Civil Engineering

“Wastewater Recycling”

Faculty Mentor: Dr. S. Y. Chang
North Carolina A & T University

Water is a precious resource. How will we meet the needs of the future when populations increase and industrial growth expands? The answer is water recycling. Observations about wastewater recycling are considered, dating from the 1970's up to the 1990's showing that wastewater recycling is a viable process for meeting the needs of expanding communities. Examples of Tampa, Florida and Irvine, California are studied to examine their experience and the resulting efficiency from using recycled wastewater. Information concerning retrofitting of existing systems versus cost of new installation is considered for cost effectiveness and practicality. Furthermore, information about current plans in the community of Chapel Hill, North Carolina is presented to substantiate interest in this process on a local level. The benefit to businesses, industry and residential users is also examined to support wastewater recycling for the future needs of growing communities.

AQUARIS MOORE

Major: Industrial Engineering

“The Feasibility of Utilizing Ergonomic Task Analysis to Reduce the Physical Demands of Military Occupational Specialists”

Faculty Mentor: Dr. Celestine Ntuen
North Carolina A&T State University

Military vehicle operators are Military Occupational Specialists (MOS) of 88M tasks. Certain tasks require extensive strength and have been labeled as physically demanding by the United States Department of Labor. To determine whether a MOS job is laborious, soldiers must exemplify one or more of the following criteria: possess red/green color discrimination, occasionally lift and/or pull 130 pounds or more, constantly lift and pivot 342 pounds as part of a 2 soldier team, frequently read maps, signs and signals, and constantly listen to engines for unusual sounds.

Physically demanding tasks are identified and redesigned using ergonomic principles. Ergonomics is the discovery of information relative to human behavior, abilities, and limitations. These principles are applicable to the design of systems, tasks, jobs, and environments for productive, safe, comfortable, and effective human use.

Contributing students: Nichole Setzer, La'Tawanna Tallie, and Kimberly Willis • North Carolina A&T State University.



MARQUES A. HOLMES

Major: Electrical Engineering

“A Mature Software Process”

Faculty Mentor: Dr. Steffan Parrott (Sandia National Laboratories)
North Carolina A&T State University

The purpose of this project was to develop a software integrity, software quality assessment, and software quality assurance model for a software application called *Prevail*. *Prevail* is a new application used to automatically embed engineering bill of material information in Pro/ENGINEER product solid models. Through references to the Pro/ENGINEER database, users can quickly place a bill of material table onto a drawing or transmit bill of material information to engineering and manufacturing applications. This project will make *Prevail*, a software product, error free and will also provide essential room for added improvement to design techniques. After completely devising the methodology for *Prevail*, the entire process of software integrity, assessment, and assurance will be implemented into every software product that is produced for Sandia National Laboratories. During the development process, it has been noted that the way the software is being engineered is acceptable, but, a mature process needs to be developed.

AYANNA COOPER

Major: Chemistry

“Differentiation of HIB-1B Brown Adipocytes by PPAR γ and RXR α Potently Stimulates the Expression of the Uncoupling Protein Gene and β ARs.”

Faculty Mentor: Dr. Lynda M. Jordan
North Carolina A&T State University

Approximately one-third of the American population is obese. The understanding of adipose tissue metabolism is important for the treatment and prevention of this disease. Three β -Adrenergic Receptor (β AR) subtypes, including the adipocyte-specific β_3 AR, are expressed in white and brown adipocytes. Each is coupled to the stimulation of adenylyl cyclase (AC) activity. Because brown adipose tissue (BAT) can actually fight obesity by dissipating excess caloric energy, it is important to understand the regulation of BAT functions by these β ARs. Therefore, these experiments were designed to address two issues: (1) the expression of β AR, especially β_3 AR, during BAT differentiation and (2) the induction of the brown adipocyte-specific uncoupling protein (Ucp) gene by β ARs in differentiated cells. The mouse HIB-1B cell line is a model of BAT *in vitro* which was differentiated to mature brown adipocytes by one of two protocols: (1) a standard adipogenic cocktail or (2) the synthetic agonists for nuclear receptors PPAR γ and RXR α , BRL-49653 (BRL) and LGD-1069 (LGD), respectively. β AR function was analyzed by adenylyl cyclase activity and the formation of cAMP by Radioimmunoassay. The Ucp gene expression was measured by Northern Blot RNA analysis. The results show that differentiation of HIB-1B preadipocytes by BRL + LGD led to a greater degree of lipid accumulation. Using β -agonist stimulated AC activity, differentiation by BRL + LGD led to a much greater expression of the fat cell β -Adrenergic Receptor, β_3 AR. BRL + LGD-mediated differentiation was associated with a 10-fold greater induction of Ucp mRNA by β ARs than the standard adipogenic cocktail. Therefore, these results support the hypothesis that a key step in differentiation of brown adipose tissue by the PPAR γ /RXR α nucleoreceptors includes activation of the β_3 AR gene and the induction of Ucp by the cAMP pathway. (Supported by MARC Grant 5 T34 GM07649-18, North Carolina A&T State University.)

Contributing students: Kiefer Daniel and Sheila Collins • North Carolina A&T State University.



LENA C. HORSLEY

Major: Chemistry

“Surface Modification of Stainless Steel Chips with Argon and Acrylonitrile Plasmas to Prevent the Growth of Salmonella Typhimurium”

Faculty Mentor: Dr. Alvin Kennedy
North Carolina A&T State University

The purpose of this study was to modify the surface of stainless steel chips with different plasmas to prevent the growth of *S. typhimurium*. Electron Spectroscopy for Chemical Analysis (ESCA) revealed that argon treatment removed two-thirds of the carbon from the surface. ESCA analysis of acrylonitrile-treated chips showed an increase in the carbon and nitrogen content. Biofilm experiments revealed that plasma treatment did not have an effect on biofilm growth and there was no significant difference in 24 and 48 hours of growth. Scanning Electron Microscopy (SEM) showed healthy bacteria on argon-treated chips whereas bacteria were misshapen and small in size on acrylonitrile-treated chips. Contact angle measurements of the acrylonitrile-treated chips revealed that the surface was hydrophobic. This study supports the theory that plasma treatment does not prevent the growth of *S. typhimurium* on stainless steel chips. (Supported by MARC Grant 5T34 GM07649-18, North Carolina A&T State University.)



JASON GILCHRIST

Major: Physics

“A New Model Potential for Excited State Metal Atom-Rare Gas Interaction”

Faculty Mentor: Dr. Solomon Bililign
North Carolina A&T State University

Determination of potential curves of the interaction of ground and excited states of metal atoms with rare gases is not only important in understanding van der Waals bonding, but also useful in interpreting dynamical processes such as electronic energy transfer, resonance radiation collision distribution, elastic and inelastic scattering, van der Waals complex excitation and transport properties. We developed a simple analytical model potential function to describe the Metal Rare gas (M.RG) van der Waals bonding in different electronic states. In addition, we attempted to model this bonding as a contribution of several interactions: (1) long range dispersion ($\sim R^{-6}$), (2) RG dipole induced by the point charge quadrupole of the $M^*(n\pi\pi)$ state at close range ($\sim R^{-4}$), and (3) Back polarization of $M^+(ns)$ core (for group I) metals by the induced RG dipole ($\sim R^{-10}$). The model potential is compared to the potential derived from spectroscopic data for $MgAr(^1\Pi)$ and $ZnAr(^1\Pi)$. The fit is reasonable.

JERRETTA LASHELLE GILCHRIST

Major: Food Science

“Consumption Trends of Meat and Soybean Products in Greensboro, North Carolina”

Faculty Mentor: Dr. Margaret J. Hinds
North Carolina A&T State University

Soybean is the third most important agricultural crop in North Carolina. Seeds contain 21% fat, of which 73% is unsaturated and 56% is polyunsaturated fat. Clinical researchers recommend increased consumption of soybeans to assist in lowering cholesterol levels. This study investigated consumption of meat and soy products by 200 Greensboro residents, and their willingness to eat meat analogs containing soy protein. Of the population surveyed, 74%, 51%, 82%, and 14%, respectively, consume deli meats, franks, burgers, and vegetarian foods \geq once per week. The frequency with which deli meats and burgers are eaten significantly ($p < 0.01$) influenced willingness to eat similar products containing some vegetable protein; 64% and 60%, respectively, would be willing to eat these products. However, only 31% and 26%, respectively, would be willing to eat deli- and burger-analogs made from 100% vegetable protein. Demographical variables did not influence willingness to purchase meat analogs containing \leq 100% soy protein.



GERALD L. GRACIA

Major: Biology

“In Vivo and In Vitro Studies Support Selenium as a Potential Chemo-Preventive Agent for Colon Cancer”

Faculty Mentor: Dr. Mark Nelson
North Carolina A&T State University

Epidemiological studies in humans suggest selenium deficiency is associated with increased risk of colon cancer (CC). Selenium supplementation has recently been reported to cause significantly reduced incidence of colon, lung, and prostate cancer (L. Clark et al. JAMA, Dec., 1996). The mechanisms responsible for anticancer effects of selenium are unknown. To begin evaluation for a protective mechanism, we determined the effects of selenium *in vitro* on growth and apoptosis of HT 29 cells and *in vivo* in rats on formation of carcinogen-induced aberrant crypt foci (ACF), an accepted surrogate end point biomarker for CC. To evaluate the effects of selenium *in vivo* on the formation of colonic ACF, male F344 rats were dosed with azoxymethane (15 mg/kg/wk x 2) and 2 weeks later fed an AIN-76 diet containing either 0, 1, or 2 ppm of LSM. After 3 weeks of treatment, the colons were removed, formalin fixed, stained with methylene blue, and ACF quantitated by light microscopy. Dietary supplementation with LSM significantly decreased development of colonic ACF. The mean number of colonic ACF was 45.5 ± 3.3 , 22.7 ± 5.1 , and 15.7 ± 6.4 in the control, 1 ppm, and 2 ppm doses of LSM, respectively. *These results demonstrate that LSM suppresses growth and progression of early stages of colon cancer in the AOM rat model. *In vitro* observations with HT 29 cells suggest the anticarcinogenic activity of LSM operates through a mechanism causing enhanced apoptosis and inhibition of tumor cell growth. (Supported in part by NCI grant P01 CA41108 and CA 41108-MIS.)

CHRISTOPHER A. GRAVES

Major: Biology

“Isolation and Identification of Cuticular Hydrocarbons in the Nantucket Pine Tip Moth: A Potential New Tool in Taxonomy”

Faculty Mentor(s): Dr. James A. Richmond and Dr. Coby Schal
North Carolina Central University

The Nantucket Pine Tip Moth (NPTM), *Rhyacionia frustrana*, is a serious pest of loblolly pine, *Pinus taeda*, in the South. The literature is extensive on studies dealing with control, genetics, damage, hosts, growth and development under various conditions. The insect attacks young pine seedlings until they reach 5-8 feet in height or before they are 5 years old. Damage to hosts can be reduced with insecticides. Control is difficult because the NPTM has from 3 to 5 generations and is cryptic, feeding inside the shoots of its host. Hydrocarbons (HC) provide a new tool for studying the taxonomy of insects. Adults of the NPTM were extracted with hexane to remove cuticular lipids. The lipids were fractionated by silica gel column chromatography and the HC were eluted through the column with hexane. The HC fraction was injected into a gas liquid chromatograph which separated and quantified the HC. We extracted males and females in order to examine sexual dimorphism and correlated the amount of HC in internal and external extracts. The species-specific HC profile of this moth will facilitate future taxonomic and population studies of this forest pest.



VANESSA MARIE MARTINEZ

Major: Biology

“Setting Success of the Intertidal American Oyster *Crassostrea virginica* Using Two Methods: Epinephrine and Microcultch”

Faculty Mentor(s): Dr. Parke Rublee
University of North Carolina at Greensboro
Nancy Hadley
South Carolina Marine Resources Research Institute

Since the 1950's, there has been a gradual decline in oyster populations due to overharvesting and introduced diseases. Therefore, more seafood companies are turning to oyster hatcheries to provide them with reliable, healthy oyster seed. Laboratories have been studying various methods of producing cultchless oyster spat in order to reduce costs of shucking, shipping, and handling of cultch materials. The purpose of this study was to compare the setting success of South Carolina intertidal oysters (*Crassostrea virginica*) utilizing two setting methods: epinephrine and microcultch. Four experiments were conducted that involved treating a set of approximately 75-125 pediveligers with a 10⁻⁴M epinephrine stock solution, a second set with a control solution, and a third set using microcultch. After 24-48 hours, larvae were scored as set or not set. Mortality was also noted. There was little difference in percent mortality between each method. Although the epinephrine method demonstrated a higher setting success than the microcultch method (8% versus 0-1%), the overall setting success was poor in both methods.

BENNIE A. RICE

Major: Biology

“Down Regulation of Cyclin B Expression Due to DNA Damage in S Phase”

Faculty Mentor: Dr. Karen Katula
University of North Carolina at Greensboro

In S phase of the eukaryotic cell cycle, DNA damage results in a G2 arrest, allowing the cell to repair its DNA before entering mitosis and cell division. The molecular mechanisms responsible for the G2 arrest are still being investigated. One possibility is that the expression of cyclin B, which regulates entry into mitosis, is downregulated as a consequence of DNA damage. In this study, we tested the hypothesis that cells treated in S phase with the DNA damaging agent, bleomycin, will display a decrease in cyclin B expression. A line of NIH3T3 cells containing a stably transfected cyclin B-luciferase reporter vector was grown in multiwell dishes and synchronized by serum starvation. At 18 hours, following re-addition of serum, 5 µg/ml bleomycin was added. Lysates were prepared from bleomycin-treated and non-treated (control) cells at 22 and 26 hours and assayed for luciferase activity. No difference in the level of luciferase activity was detected at 22 hours between control and treated cells. At 26 hours, luciferase activity in bleomycin treated cells was reduced approximately 50% relative to the control cells. Cells were then treated with 0.1, 0.5, 1.0, 2.0, 5.0, and 10.0 µg/ml bleomycin. Results show that the effects of bleomycin on luciferase activity is dose dependent. These data indicate that cyclin B gene expression is responsive to DNA damage and may be one mechanism by which the cell ensures a G2 arrest.



J. CRISTOBAL SALAZAR

Major: Biology

“Facilitation of the VBNC Condition in *R. meliloti* by Exposure to a Heavy Metal”

Faculty Mentor: Dr. Todd Steck
University of North Carolina at Charlotte

The Viable but NonCulturable response (VBNC) is exhibited in many bacteria when they are presented with adverse environmental conditions. VBNC bacteria are still metabolically active, but are unable to give rise to a viable colony on a non-selective growth plate. This makes detection of VBNC cells difficult, since they cannot be assayed through standard microbiological methods. *Rhizobium meliloti* is a soil dwelling bacteria responsible for nitrogen fixation in some legumes. When exposed to varying concentrations of CuSO₄, it was observed that colonies did not form on rich agar media after removal of the heavy metal, yet the cells were still viable. This finding suggests that CuSO₄ is an inducer for the VBNC response in *R. meliloti*.

BRADLEY J. WRIGHT

Major: Chemistry

“Oxidative Ring Fissions of Aliphatic and Cyclic Substituted Furans: Studies in Furan Toxicity Pathways”

Faculty Mentor: Dr. Booker Juma
Fayetteville State University

Furans substituted with aliphatic and cyclic side chains have been shown to be toxic in the biological system. This process is facilitated in biological systems by the mixed oxidase system of cytochrome P-450. This oxidative process involves ring fission at the site of the heteroatom in the furan ring. The P-450 oxidized furans (electrophiles) are then covalently bonded to the macromolecules (nucleophiles) found in the tissues. In this study, two oxidants were used to produce α , β -unsaturated- γ -dicarbonyl compounds. These diketones and ketals were purified and characterized by physical methods. Subsequently, the diketones and ketals were condensed in a Michael Addition reaction. Benzylmercaptan was used as a substitution for the macromolecule. The resulting products were characterized by physical methods. (Supported by NIH Grant #S06 GM08206.)



CEDRIC DEAN CHEEK

Major: Electronics and Computer Technology

“Ethernet . . . the Standardization, Elements, and Its Operation”

Faculty Mentor: Dr. John Spurlin
North Carolina A&T State University

Ethernet was developed in the early 1970's by Dr. Robert Metcalfe. This effort was undertaken to support research being done on the “office of the future.” The Local Area network technology initially allowed data flow between computers to operate a 3 Mbps but later move to 10 Mbps and 100 Mbps with Gigabit Ethernet now stepping onto the scene. The standardization of Ethernet arrived initially in 1980 as the (DIX) standard, but would later be adopted and standardized by IEEE as “IEEE 802.3 CSMA/CD.” There are three fundamental elements of Ethernet: the Physical Medium or the actual cable used to carry data; the Medium Access Control (MAC), which allows a number of users on the net at once; and the Ethernet Frame or Packet, which is simply the organization of bits into data fields.

Ethernet operation allows for no controller anywhere in its “BUS” topology. The Medium Access Control utilizes CSMA/CD or Carriers Sense (CS) Multiple Access (MA); and Collision Detection (CD) to ensure data integrity on the net.

Because Ethernet is spid to Vender Neutral, it has easily become the most preferred LAN technology in use worldwide with over 40 million nodes installed as of 1994.

TRENA COVINGTON

Major: Engineering Mathematics

**“Statistical Description of North Carolina Agricultural and Technical State University
Calculus Students Who Took the Fall 1991 Placement Test”**

Faculty Mentor: Dr. Janis Oldham
North Carolina A&T State University

The purpose of this project was to statistically describe a sample of students (N=260) who took the fall 1991 Placement Test and enrolled in Calculus I that next fall. The progress of students in the sample was followed through the Calculus sequence (Calculus I, II, III). To examine the progress of the Calculus students who took the Placement Test, a statistical description was most effective. This project examined the students' scores on the Placement Test, and students' grades in the Calculus classes, and also analyzed the following questions: (1) Is there a correlation between the performance on the Placement Test (scores) and the performance in the Calculus classes (grades)? (2) Is there a correlation between the section in which the student was enrolled and the students' grades in Calculus I? First, a statistical description was completed, including computation of the mean score, standard deviation, variance and other measures of central tendency. Subsequently, analyses were performed to statistically compare samples. In particular, a regression analysis was done.



LISA ANGELETTE DEMPSON

Major: Electronics and Computer Technology

“The What, When, Why, and How of the Internet”

Faculty Mentor: Dr. John Spurlin
North Carolina A&T State University

The internet is a term that we hear often everywhere we go. As one asks around, it is clear that to many people the internet means different things. It was originally formed in the 1970s as a military network called ARPANet (Advanced Research Projects Agency network) as part of the Department of Defense. By the early 1990s, the internet had encompassed all research universities, four-year colleges, federal agencies, and laboratories, and computer vendors. In 1993, the commercial providers were first permitted to sell internet connections to individuals. Consequently, the internet has now spreaded overseas connecting networks in over 40 countries.

There are hundreds of ISPs (Internet Service Provider) all over the world. The most common ones we have heard of are America On-line, CompuServe, and Prodigy. There is a difference in the ISPs because of the features they provide. The prices of the services are in the same range.

The internet activities can be divided into six main categories: Electronic Mail (e-mail), File Transfer, Run programs on other Computers, Search for Files and Databases, Discussion Groups, and Play Games and Talk. The internet is growing by the minute and there will be more features added in the near future.

LAMONT GREEN

Major: Chemistry

“The Engineering of a Streptavidin Mutation Consisting of a 6X Histidine Tag at the N-Terminw Site”

Faculty Mentor: Dr. Linda Jordan
North Carolina A&T State University

The general goal of this project was to genetically engineer a 6X Histidine Tag sequence onto a streptavidin (STAV) protein. With this tag we used the Ni-NTA column to purify the protein/polymer conjugate. The 6X His/Ni-NTA (Ni- nitrilo-tri-acetic acid) system is a fast and versatile tool for affinity purification of recombinant proteins and antigenetic peptides. This procedure is based on the higher affinity of histidine to the immobilized Ni which allows for the purification of tagged proteins. The interaction between the histidine tag and the Ni column is independent of each other. The proteins carrying the his-tag can be purified under strong denaturing conditions required to solubilize inclusion bodies. Genetically modifying the streptavidine protein with the histidine tag allowed for the immobilization of the protein/polymer conjugate onto the Ni column. This modification allowed us to place it in any position we wanted, (e.g., away from the protein active site). The histidine tags can be used to immobilize and orient proteins at any surface containing the Ni complex. Thus, there are some interesting applications in biomaterials and diagnostics in addition to the affinity chromatography.



KEVIN GROVE

Major: Manufacturing Systems

“Superabrasive Grinding Wheel in Machining Processes”

Faculty Mentor: Dr. Paul Liu
North Carolina A&T State University

Automotive and aerospace manufacturers today are faced with the challenges of meeting tighter deadlines, increased production schedules, and rapid delivery to the market place. At the same time, these manufacturers are forced to produce more and more out of the same existing equipment. Therefore, manufacturing engineers are constantly looking for alternatives to improve the production process. Keep in mind that the product has to be manufactured faster, with a better finish, to meet the higher quality standards of today's customer.

One advancement that has been around for about eighteen years, but not readily put to use until the last five years is Cubic Boron Nitride (CBN), a type of coating that is applied to the grinding wheel, also known as the superabrasive grinding wheel. Recently, the automotive and aerospace industries have put more faith in CBN because of the advantages they have found in the machining of their high precision parts. This investigation explained the advantages and disadvantages of CBN, why its usage has not been extensive due to high expense, and methods used to justify that expense. Other subject areas covered include how to obtain the maximum benefits out of CBN grinding wheels, proper grinding fluids, care, and maintenance.

“Productivity, Quality, and Improvement Concept in Electronics Assembly”

Faculty Mentor: Dr. Paul Liu
North Carolina A&T State University

In the past forty years, employment, working life, industrial productivity, international trade, and global communications have been influentially impacted by electronics technologies. Microelectronics technology revolutionalized our way of living and had tremendous impact on almost everything that we do.

Prediction by industry analysts stated that the electronics industry would grow by ten percent or more annually. The United States electronics industry had grown from a two hundred million dollar enterprise (\$200 million) in 1927 to two hundred and twenty-nine billion dollars (\$229 billion) in 1989. Anticipation was that it would reach eight hundred billion dollars (\$800 billion) by the year 2000.

This investigation introduced the background on electronics industry products, processes, and growth rate in a competitive world economy; definition of electronics and important statistics on the electronics industry; productivity; and quality.



“Radio Frequency Identification”

Faculty Mentor: Dr. Paul Liu
North Carolina A&T State University

Automatic Data Collection and Identification (ADCI) technologies are forms of keyless data entry which can automatically identify objects and input the data collected directly into computer system. The ADCI technologies include bar coding, optical character recognition (OCR), voice data entry, radio frequency identification (RF/ID), magnetic stripes, machine vision, and other systems. Currently, the ADCI market is dominated by bar coding and OCR technologies. Two basic limitations of these technologies are short read ranges and poor readability under harsh conditions. Radio Frequency Identification (RF/ID) is rapidly becoming the system of choice to overcome these limitations.

Automatic identification systems using RF/ID can read data from tags that are not even optically visible to the system. A radio signal is transmitted toward the tag, and it responds with a radio signal that is modulated with information stored in the tag. One of the initial applications involved the tracking of livestock, but many applications in transportation and manufacturing have subsequently developed. This investigation introduced the history of RF/ID, the technology, the advantages and limitations of the system, and various applications in the market today.

The investigation was funded in part by a National Science Foundation Instrumentation and Laboratory Improvement Grant (NSF Grant No.9550859) from the Division of Undergraduate Education.

Contributing student: George Eric Hinton • North Carolina A&T State University.



Abstract Index

North Carolina A&T State University

<u>STUDENT NAME</u>	<u>PAGE</u>
Saunya Amos	13
Ronnie Isaac	13
Yolanda D. Watson	14
Elizabeth A. Farr	20
Aquaris Moore	21
Marques A. Holmes	21
Lena Horsley	23
Ayanna Cooper	22
Jason Gilchrist	23
Jerretta L. Gilchrist	24
Gerald J. Gracia	24
Cedrick D. Cheek	27
Trena Covington	28
Tyrone E. Davis	31
Lisa A. Dempson	28
Lamont Green	29
Kevin Grove	29
Christopher Ogu	30
Jeffrey Everette	20

Fayetteville State University

<u>STUDENT NAME</u>	<u>PAGE</u>
Tammy T. Burroughs	15
Aquilla L. Highsmith	18
Bradley J. Wright	27

North Carolina Central University

<u>STUDENT NAME</u>	<u>PAGE</u>
Kenneth Edwards	15
Tavia S. Boston	17
Julian D. Phifer	18
Ansel E. Brown	19
Christopher A. Graves	25

North Carolina State University

<u>STUDENT NAME</u>	<u>PAGE</u>
Keisha C. Williamson	14

University of North Carolina-Charlotte

<u>STUDENT NAME</u>	<u>PAGE</u>
J. Cristobal Salazar	26

University of North Carolina-Pembroke

<u>STUDENT NAME</u>	<u>PAGE</u>
Angela M. Gales	16
Rochelle Y. Taylor	17
Meredith Wilcox	19

Durham Technical Community College

<u>STUDENT NAME</u>	<u>PAGE</u>
Shanta E. MacKinnon	16

University of North Carolina-Greensboro

<u>STUDENT NAME</u>	<u>PAGE</u>
Vanessa Marie Martinez	25
Bennie A. Rice	26

***Conference Participants**

Fayetteville State State University

Sharron Baines
Beverly Ann Carino
Kim Douglass
Amy Dziemian
Tracy L. Funk
Vickie Hardy
Doris Harker
DeLise Hopson
Tiffany Mapp
Gregory Massey
Laila Lorolyn Price
Marie Sullivan
Tana Tyler
Timeka S. Moore
Sherri S. Morrissey
James H. Singletary
Demetria White
Dr. Juliette B. Bell
Dr. Morris A. Blount
Prof. O. C. Holloway
Dr. Booker Juma

North Carolina Cenral University

LaTasha Austin
Nathan C. Davis
Madenyika Denford
Sabirah Hargette
Danielle S. Hoyles
Alexander P. Major
Antwoinne D. McLendon
Marcus M. Moye
Renee Payne
Otis G. Petifer
Paul Polo
Dr. Sandra F. DeLauder
Dr. J. M. Dutta
Dr. Dennis P. Enberg
Dr. Charles R. Jones
Dr. Mattie E. Moss
Dr. James A. Richmond
Dr. Shawn C. Sendlinger
Dr. Laura B. Smith

**Student presenters are listed on page 32.*

North Carolina State University

Bobby L. Barnes
Chadwin D. Young
Dr. Richard T. Kuehn
Dr. Dennis M. Maher
Dr. Tony L. Mitchell

University of North Carolina-Charlotte

Mrs. Patricia Gray
Dr. David L. Hunter
Dr. Terrel L. Rhodes
Dr. John Thornton

University of North Carolina-Greensboro

Tonique Crawford
Audry Faucette
David Gifondorwa
Rhonda Kearney
Sommer Knight
Erica Robinson
Lequanda Stewart
Gloria Thompson
Tiffany Vinson
Monica E. Webb
Dr. Timothy D. Johnston
Dr. Karen Katula
Ms. Debora Pelli
Dr. Parke A. Rublee

University of North Carolina-Pembroke

Angie Joyce
Schmele Kerns
Jennifer Rowe
Okema Richardson
Dr. Michele Barker-Bridgers
Mr. Marcus Collins
Mrs. Janice Jackson-Freeman
Dr. Leonard Holmes

North Carolina A&T State University

Kenneth C. Bain
Michelle R. Baker
Shawonda Brockington

NC A&T State University (continued)

Sirena C. Hargrove
Jerry Allen Heath, Jr.
Benjamin R. Kraft
Kyle Lockley
Alesia Lyon
Kurtis F. Martin
Valeria N. McLaughlin
Franchesca Meachem
Karmon L. Miller
Felicia Morgan
Toni Pettiford
Myron S. Powell
Vonzella Pritchard
Nichole Setzer
Ashley Simon
Winston Small
Paula M. Spencer
La'Tawanna Tallie
Darren R. Walls
Donald R. West
Angela Whitehead
Kimberly Willis
Mr. Ronnie Bailey
Ms. Bertha Barrow
Dr. David Bellin
Ms. Sylvia Broidy
Mr. Cary Burnette
Ms. Dorothy Burnette
Dr. Shoou-Yuh Change
Dr. Jeff Clouse
Dr. Ray J. Davis
Dr. Raj Desai
Dr. DeRome O. Dunn
Dr. Fereshteh Fatehi
Dr. Edward B. Fort
Dr. Doretha B. Foushee
Ms. Jocelyn Foy
Mr. Perry Gillespie
Dr. Vallie Guthrie
Mr. Otis L. Hairston, Jr.
Dr. Vivian Harding Hampton
Mrs. Delores Handon
Mrs. Elaine M. Harrigan
Mr. Rodney E. Harrigan
Mrs. Cheryl Henderson
Dr. Margaret J. Hinds
Ms. Sunnie Howard

Ms. Valeria Howard
Dr. John Kelly
Dr. William J. Craft
Ms. Caroline Jones
Mrs. Audrey H. Ling
Dr. Paul Liu
Dr. Harold L. Martin, Sr.
Dr. Perry V. Mack
Dr. Bette McKnight
Dr. Abdul K. Mohammed
Dr. Joseph Monroe
Dr. Sekazi Mtingwa
Mrs. Joyce Neal
Ms. Minnie Norman
Dr. Celestine A. Ntuen
Dr. Janis M. Oldham
Dr. Larry Powers
Dr. Kenneth L. Roberts
Ms. Camille Ross
Dr. Sanjiv Sarin
Dr. Lonnie Sharpe, Jr.
Ms. Patricia G. Shelton
Dr. Musibau Shofoluwe
Dr. Mary O. Smith
Dr. Wilbur Smith
Dr. Gary Spring
Dr. John Spurlin
Ms. Wilsonia Candy Staton
Dr. Ethel F. Taylor
Ms. Wanda Troxler
Dr. Yabo Wang
Mr. Reginald Whitsett
Mr. Shakur Williams
Dr. Alex Williamson
Mrs. Brenda Woodland
Dr. Huiming Yu

Special Guests

Dr. William A. Sibley
National Science Foundation
Dr. Julian Earls
NASA Lewis Research Center
Mr. Barry L. Ray
General Motors, Dayton, OH
Dr. Carolyn Girardeau
N.C. Community College System
Ms. Pamela A. Bivens
Los Alamos, New Mexico

Special Guests (continued)

Ms. Venita Payton

N.C. Community College System

Dr. Sumana Banerjee

Durham Technical Community College

Ms. Laverne Hooks

Durham Technical Community College

Ms. Charlene Pittman

Guilford Technical Community College

Mr. Jasper Tyson

Guilford Technical Community College

Visiting High Schools

Romeo Brown

A.L. Brown, Kannapolis, NC

Jazmine Caldwell

West Charlotte, Charlotte, NC

Jessica Chandler

Harding University, Charlotte, NC

Jamila Crawford

Victory Christian Ctr, Charlotte, NC

Aurieece McCain

Victory Christian Ctr, Charlotte, NC

Osi Ogirri

Independence, Charlotte, NC

Caleb Barge

Concord, Concord, NC

Heather Kerner

Concord, Concord, NC

Mrs. Shelia C. Hinson

MSEN Pre-College Program, Charlotte, NC

Mr. Victor B. Mack

MSEN Pre-College Program, Charlotte, NC

North Carolina Alliance for Minority Participation (NCAMP)

Sponsored by the National Science Foundation

Recognizes

North Carolina A&T State University

for participation in the First Annual NCAMP Undergraduate Research Conference

Hosted by Fayetteville State University, North Carolina Central University, North Carolina State University, University of North Carolina-Chapel Hill, University of North Carolina-Charlotte, University of North Carolina-Greensboro, University of North Carolina-Pembroke, and North Carolina Agricultural & Technical State University (lead campus)

Awarded this eleventh day of April nineteen hundred and ninety-seven

*Dr. Vivian Harding-Hampton
Alliance Coordinator
North Carolina A&T State University*

*Dr. Harold L. Martin, Sr.
Principal Investigator
North Carolina A&T State University*

North Carolina Agricultural and Technical State University is committed to equality of educational opportunity and does not discriminate against applicants, students, or employees based on race, color, national origin, religion, gender, age, or disability. Moreover, the University is open to people of all races and actively seeks to promote racial integration by recruiting and enrolling a larger number of white students.

1,000 copies of this public document were printed at a cost of \$2,212.00 or \$2.21 per copy.