

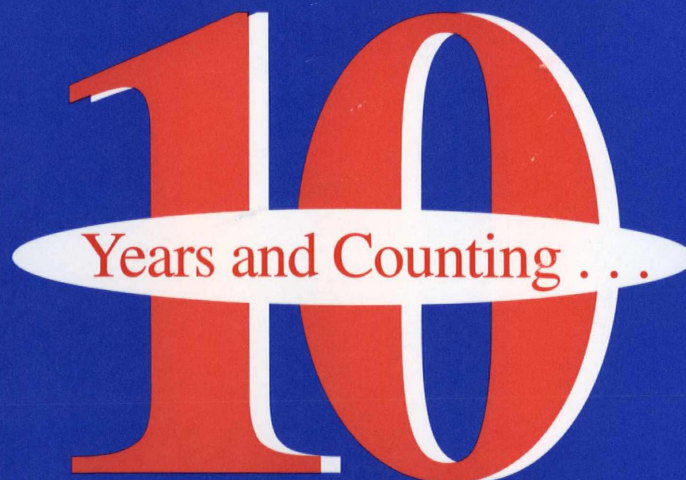
SIXTH ANNUAL UNDERGRADUATE RESEARCH CONFERENCE

**NORTH CAROLINA LOUIS STOKES
ALLIANCE FOR MINORITY PARTICIPATION**



**PATHWAYS TO RESEARCH AND HIGHER EDUCATION:
EXPANDING OPPORTUNITIES THROUGH ALLIANCES**

**APRIL 26, 2002
McKIMMON CENTER
NC STATE UNIVERSITY
RALEIGH, NC**



Host: North Carolina Alliance To Create Opportunity Through Education

**NORTH CAROLINA LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION (NC-LSAMP)
PROGRAM SYNOPSIS**

The North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) is a comprehensive, interdisciplinary, regional coalition comprised of eight institutions within the University of North Carolina system. A primary aim of the Alliance is to significantly increase the quantity and quality of underrepresented minority students earning B.S. degrees in science, technology, engineering, and mathematics (STEM) disciplines, and subsequently pursuing Ph.D. degrees in these fields. Partner institutions include Fayetteville State University, North Carolina Central University, North Carolina State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, University of North Carolina at Pembroke, Winston-Salem State University, and North Carolina A&T State University (lead campus).

Program priorities focus on four central approaches. These entail a systemic, collaborative learning approach emphasizing group study and support; positive and sustained interaction with faculty; intensive interaction with other support persons at the university and the wider community (alumni, parents, mentors from industry and community organizations); and hands-on experience in STEM including undergraduate research opportunities, internships with industry, and interaction with class projects. All partners share a strong commitment to the goal of increasing retention, access, and opportunities for minority students in STEM fields. Accordingly, NC-LSAMP is systemically assisting students in developing a supportive community, and presenting opportunities for students to grow academically, professionally, and personally. Another major function of NC-LSAMP is to provide student financial aid to support tuition and related university fees.

The impact of the NC-LSAMP project at partner institutions is quite dramatic. There is a cultural change occurring on all campuses reflecting a more strategic and systemic focus on the institutional issues that impede minority student success in STEM programs. Indeed, outcomes of NC-LSAMP up to this point are encouraging, and we fully anticipate reaching higher levels of success as we complete implementation of Phase II operation through 2002, marking a ten-year period of performance. We will continue to place emphasis on retention, which has proven to be our greatest challenge. Attainment of our chief goal will be largely determined by success not only in recruiting minority students into STEM programs at partner universities, but also in nurturing these students through the STEM pathways from undergraduate to the graduate level.

Since the inception of the Alliance in 1992, combined efforts of partner institutions have resulted in a variety of programs and activities geared toward enhancing student success. Major initiatives include STEM curriculum reform, supplemental instruction, bridge programs, undergraduate research, and summer internships. The Alliance also sponsors an annual research conference, which serves as a forum to showcase faculty-mentored research projects. During the 2000-2001 academic year, 6,230 underrepresented minority students enrolled in STEM disciplines were supported by NC-LSAMP institutions. Moreover, 1,034 B.S. degrees were awarded to underrepresented minority students in STEM fields.

NC-LSAMP operations are supported primarily through funding provided by the National Science Foundation (NSF) and participating institutions. The North Carolina University system is indebted to NSF for its generous support of programs and activities to increase minority participation in the STEM enterprise.

NC-LSAMP Linkages with NSF Diversity-Focused Programs Addressing the STEM Continuum Centers of Research Excellence in Science and Technology (CREST); Alliances for Graduate Education and the Professoriate (AGEP); Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP)

Institutions within the North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) are collaborating with HBCU-UP, AGEP, and CREST Programs to maximize resources and opportunities for students pursuing B.S., M.S., and Ph.D. degrees in science, technology, engineering, and mathematics (STEM) disciplines. When the Alliance was formed in 1992, several programs and activities were developed to facilitate a significant increase in the number of B.S. degrees earned by underrepresented minority students in STEM fields. Major initiatives implemented include: supplemental instruction in gatekeeper courses, calculus reform using graphing calculators, general engineering freshman core program, bridge programs, STEM study groups, organized tutorial sessions, undergraduate research through faculty mentoring, and internships in industry and at national research laboratories.

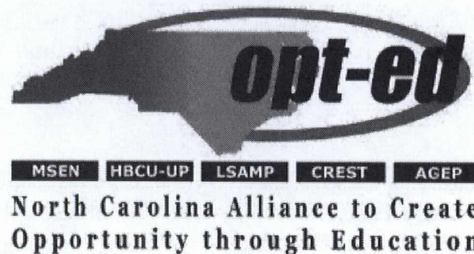
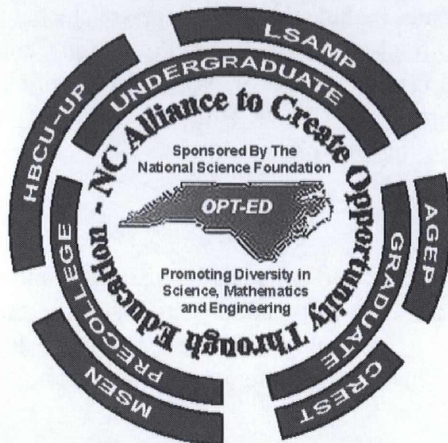
The CREST Center was subsequently established in 1997 at North Carolina A&T State University (NCA&TSU), in a ten-year partnership with North Carolina State University (NCSU). Outreach activities supported by the CREST Program at NCA&TSU, “Center for Advanced Materials and Smart Structures” (CAMSS), are geared to build upon and enhance ongoing NC-LSAMP programs and services, particularly in research. CREST is coordinating efforts with NC-LSAMP to expand undergraduate summer research experiences, and to provide research opportunities at collaborating industry and government facilities. An Undergraduate-Graduate Transition Program exposes rising seniors to current research issues being addressed by CREST. Moreover, collaboration between NC-LSAMP and CREST reinforces the relevancy of research and assists students in gaining valuable insights between engineering theory and practice. Additionally, CREST promotes interactions among undergraduate and graduate students, other researchers, and local technical professionals for continuous upgrading of skills. These experiences are inspiring many students to make early decisions to pursue graduate study.

More recently, NCA&TSU acquired funding for the HBCU-UP Program in Spring 2000, which targets undergraduate students in physics, chemistry, biology, and mathematics at participating schools. This program is titled “TALENT-21: Gateway for Advancing Science and Mathematics Talent.” Also, the AGEP Program focusing on STEM Ph.D. production for the professoriate, was funded simultaneously at two partner institutions: the University of North Carolina-Chapel Hill and North Carolina State University. NCA&TSU sponsors the “Student Transition and Retention (STAR) Program” as a partner with the NCSU AGEP Program. The HBCU-UP and AGEP Programs are building on established NC-LSAMP/CREST programs, activities, and services to implement a systemic, seamless approach. This strategy addresses undergraduate and graduate recruitment; best practices in teaching and learning strategies; and mentoring, retention, and graduation of students with B.S., M.S., and Ph.D. degrees in STEM disciplines, including students who will enter the professoriate.

Through pre-college programs offered across the Alliance, students receive early “hands-on” introductions to STEM opportunities and careers. To be sure, many of these students are entering the STEM programs in North Carolina, and collaborative efforts between LSAMP, HBCU-UP, AGEP, and CREST are facilitating a persistent and effective progression from the undergraduate to the graduate level for increasing numbers of underrepresented minority students.

NC OPT-ED

North Carolina Alliance to Create Opportunity through Education



The North Carolina Alliance to Create Opportunity through Education (OPT-ED) is a partnership among NSF-sponsored diversity programs at Bennett College, North Carolina Agricultural and Technical State University, North Carolina State University, Saint Augustine's College, the University of North Carolina at Chapel Hill, and the University of North Carolina Mathematics and Science Education Network.

Programs that constitute OPT-ED (MSEN, HBCU-UP, LSAMP, CREST, AGEP) operate both individually and cooperatively to diversify the science, technology, engineering and, mathematics (STEM) workforce and academe by encouraging underrepresented minority students, from middle school through graduate school, to obtain the Ph.D. in one of the STEM disciplines. Serving as a catalyst for greater synergy among these NSF-sponsored partners, OPT-ED strengthens their collaboration and cooperation for excellence in STEM education and research, promoting activities that magnify their efforts to achieve common goals. Additionally, OPT-ED provides a central office for communicating and disseminating information about partner activities and for exploring alliances and connections with neighboring NSF-sponsored, diversity-focused programs with similar goals.

<http://opt-ed.ncsu.edu>

NC OPT-ED

North Carolina Alliance to Create Opportunity through Education

MSEN

Since 1986, the Mathematics and Science Education Network (MSEN) Pre-College Program has been preparing middle and high school students to achieve high standards in mathematics and science. NSF funds PREP (Pre-College Research Experience in Science, Mathematics, and Technology Program) within the MSEN. PREP is a research experience program for high-ability/high-potential secondary teachers and students. OPT-ED includes the UNC-system MSEN serving as the coordinating office of ten center sites located on public university campuses statewide. Each campus strives to fulfill the mission of MSEN: to improve both the teaching and learning of science in North Carolina. MSEN center sites include the following: Appalachian State University, East Carolina University, Fayetteville State University, the Greensboro Area Math and Science Education Center (sponsored by North Carolina A&T State University and the University of North Carolina at Greensboro), North Carolina School of Science & Mathematics, North Carolina State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, University of North Carolina at Wilmington, and Western Carolina University.

HBCU-UP

The NSF Historically Black Colleges & Universities Program (HBCU-UP) seeks to enhance the quality of undergraduate STEM education at Historically Black Colleges and Universities (HBCUs) as a means to broaden participation in the nation's STEM workforce. OPT-ED includes HBCU-UPs at Bennett College (Integrating Technology in Science & Math Instruction), North Carolina A&T State University (Talent-21: Gateway for Advancing Science and Mathematics Talent), and Saint Augustine's College (The Living and Learning Science Retention Program).

LSAMP

The North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) Program is a regional Alliance comprised of eight institutions within the University of North Carolina System. A primary goal of NC-LSAMP is to significantly increase the quantity and quality of underrepresented minority students earning B.S. degrees in the STEM disciplines, and subsequently pursuing Ph.D. degrees in these fields. Since the inception of the Alliance in 1992, combined efforts of partner institutions have resulted in a variety of programs and activities geared toward enhancing student success. Major initiatives include supplemental instruction, bridge programs, undergraduate research, and summer internships. The Alliance also sponsors an annual research conference, which serves as a forum to showcase faculty-mentored research accomplishments by students. OPT-ED includes the following NC-LSAMP institutions: North Carolina A&T State University (lead campus), North Carolina Central University, the University of North Carolina at Chapel Hill, the University of North Carolina at Pembroke, Fayetteville State University, North Carolina State University, the University of North Carolina at Charlotte, and Winston-Salem State University.

CREST

NSF Centers of Research Excellence in Science and Technology (CREST) make available substantial resources to upgrade the capabilities of the most research-productive, minority-serving institutions to promote the production of new knowledge, increase the research productivity of individual faculty, and expand the diverse presence in the SMET disciplines. OPT-ED includes a CREST program (Center for Advanced Materials and Smart Structures) at North Carolina A&T State University, which collaborates closely with North Carolina State University.

The Center for Advanced Materials and Smart Structures (CAMSS) seeks to create cross-disciplinary infrastructure that transcends departmental, institutional, industrial, and governmental barriers and lends itself to the integration of research and education in the vital field of smart and advanced materials.

AGEP

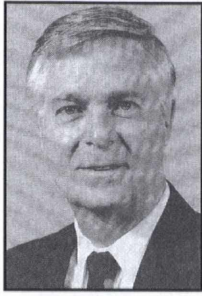
The NSF Alliances for Graduate Education and the Professoriate (AGEP) Program seeks to increase significantly the number of African American, Hispanic, and Native American students receiving doctoral degrees in the sciences, technology, engineering, and mathematics. OPT-ED includes AGEP programs at the University of North Carolina at Chapel Hill (Research Education Support Program) and jointly at North Carolina State University (Minority Graduate Education Program) and North Carolina A&T State University (Student Transition and Retention Program).

Acknowledgements

A special note of appreciation is extended to all NC-LSAMP 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-9702237.

Notes:



MICHAEL F. EASLEY
GOVERNOR



STATE OF NORTH CAROLINA
OFFICE OF THE GOVERNOR
20301 MAIL SERVICE CENTER • RALEIGH, NC 27699-0301

WELCOME

I am delighted to extend greetings and welcome you to the Sixth Annual North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) Undergraduate Research Conference. The North Carolina Alliance to Create Opportunity Through Education is pleased to host this important gathering at the McKimmon Center on the campus of NCSU, April 26, 2002.

This year marks the 10th anniversary of the NC-LSAMP. Since 1992, partner institutions have awarded almost 10,000 baccalaureate STEM degrees to underrepresented minority students. Many of those students have gone on to pursue higher degrees in the fields of science, technology, engineering and mathematics. This is a mission of the highest order, and I congratulate you on a job well done!

Mrs. Easley joins me in welcoming you to the Undergraduate Research Conference. We congratulate each student who will present a research project, and send our best wishes for continued success in your studies.

With kindest regards, I remain

Very truly yours,

Michael F. Easley

MFE:pbt





NATIONAL SCIENCE FOUNDATION
Director

Greetings to the North Carolina Louis Stokes Alliance:

The National Science Foundation (NSF) is proud to support the NC-LSAMP, and extends congratulations on this, your 10th Anniversary.

We, at NSF, have watched your steady progress in increasing the number of underrepresented minority students who pursue and graduate with baccalaureate degrees in science, technology, engineering, and mathematics (STEM).

Since NC-LSAMP began in 1992, you can boast awarding nearly 10,000 baccalaureate degrees. Indeed, this is a very special achievement.

The nation's growing emphasis on a science and engineering-driven economy requires the aggressive enlistment of underrepresented minority students to careers in these disciplines.

NSF and the nation are grateful for the consistently effective work of NC-LSAMP in recruiting students to STEM disciplines. The mentoring and nurturing support provided by NC-LSAMP for many students has made the difference in earning a degree.

We also want to express our special appreciation to the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED) for hosting the Sixth Annual NC-LSAMP Undergraduate Research Conference.

We, at NSF, wish you decades more of continuing success. Your accomplishments have made a major contribution to North Carolina and to the nation. Congratulations!

Dr. Rita Colwell, Director
National Science Foundation



NATIONAL SCIENCE FOUNDATION
Directorate for Education and Human Resources

Greetings to the North Carolina Louis Stokes Alliance:

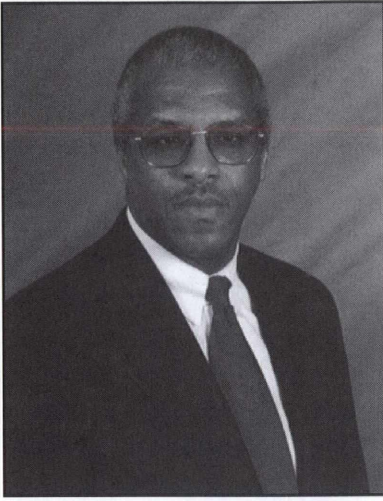
The Directorate for Education and Human Resources (EHR) congratulates the North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) for 10 years of significant contributions to the National Science Foundation's (NSF) goal of broadening student and faculty participation in science, technology, engineering, and mathematics (STEM) disciplines.

Your success in producing large numbers of minority students receiving baccalaureate degrees in the STEM disciplines continues to provide concrete evidence of the value of NSF's investment in programs such as LSAMP.

The role of the North Carolina Alliance to Create Opportunity Through Education (NC OPT-ED) as host for the Sixth Annual NC-LSAMP Undergraduate Research Conference is commendable. This collaboration exemplifies the cooperative spirit that is so critical to our efforts aimed at ensuring both diversity and high quality within the nation's scientific and engineering research and education enterprise.

I speak for the EHR in applauding your accomplishments, and I wish you continued success.

Dr. Judith A. Ramaley, Assistant Director
Directorate for Education and Human Resources
National Science Foundation



NATIONAL SCIENCE FOUNDATION

Directorate for Education and Human Resources

Division of Human Resource Development

A Message from the Acting Division Director and Program Director of the Alliances for Graduate Education and the Professoriate (AGEP) Program

Dear NC-LSAMP Research Conference Participants:

The opportunities for success in science, technology, engineering, and mathematics (STEM) careers are unlimited. Scientific discoveries are only limited by imagination... and access to the opportunity to obtain advanced education in STEM disciplines. Currently, there is tremendous excitement at the boundaries between traditional disciplines, creating a demand for a new breed of scientists, engineers, and mathematicians. It is essential for all professionals in these fields to be skilled in multiple disciplines, and capable of working in diverse teams to solve complex, real-world problems.

America has taken an international leadership role in STEM by producing a steady source of newly trained scientists, mathematicians, and engineers to meet the challenges of the 21st Century. In order to sustain that leadership position, however, America must more effectively engage segments of the population that have traditionally been underrepresented in STEM careers. The National Science Foundation (NSF) is strongly committed to significantly contributing to that effort through sponsorship of programs such as the North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) program.

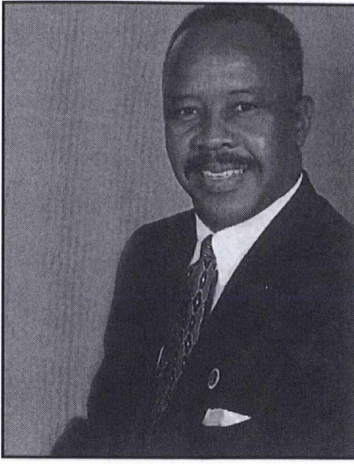
This year's conference theme is "Pathways to Research and Higher Education: Expanding Opportunities through Alliances." The participants of this conference provide dramatic testimony to the success of alliances such as NC-LSAMP. Previous NC-LSAMP Undergraduate Research Conferences have been absolutely outstanding. I have every expectation that this year's conference hosted by the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED) will be the best ever.

I encourage conference participants to take full advantage of the extraordinary opportunity to network with each other and with STEM professionals. You are a vital part of America's STEM community - the future of our STEM enterprise, in fact.

Your journeys are just beginning. This conference is one small step on the pathway to your becoming productive STEM professionals. The ability that is within you will be nurtured and developed through continued interactions with the people you meet at this conference (and other people like them). I encourage you to rigorously prepare yourselves for the next step in your journey... the attainment of graduate excellence. It is a challenging step, but one that can yield satisfaction and success beyond your wildest dreams.

On behalf of all my colleagues at NSF, I welcome you to the 2002 NC-LSAMP Undergraduate Research Conference, and wish you unlimited success in your graduate and career pursuits.

Roosevelt Y. Johnson, Ph.D.
Acting Division Director, HRD
Program Director, AGEP



NATIONAL SCIENCE FOUNDATION
Directorate for Education and Human Resources
Division of Human Resource Development

**A Message from the National Program Director of the Louis Stokes
Alliances for Minority Participation (LSAMP) Program**

Dear NC-LSAMP Research Conference Participants:

Welcome to the Sixth Annual NC-LSAMP Undergraduate Research Conference hosted by the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED). The conference theme is "Pathways to Research and Higher Education: Expanding Opportunities through Alliances." In this 10th Anniversary year for the NC-LSAMP Program, I highly commend North Carolina A&T State University (*the lead university partner in the NC-LSAMP Project*) and other partner institutions for the outstanding achievements attained.

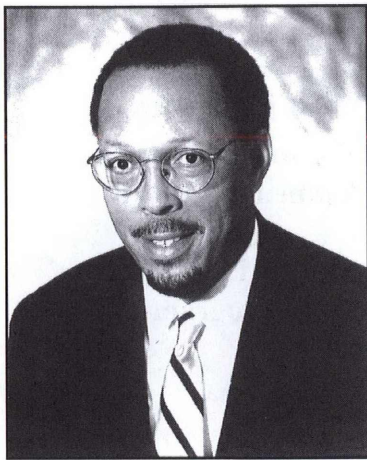
Cumulative student participation in the LSAMP Program has reached an all-time national high of 201,615 enrollees. Moreover, 21,704 students have graduated with baccalaureate degrees during the same period. Obviously, NSF's investment in the LSAMP program has paid remarkable dividends. On behalf of the NSF, I applaud and congratulate all NC-LSAMP universities for helping to accomplish this laudable outcome.

Alliance leaders have designed a truly unforgettable conference this year. Heading the conference agenda are student research presentations as well as the keynote address by Dr. Roosevelt Y. Johnson, Acting Director, Division of Human Resource Development at the National Science Foundation. Other notable events are a STEM Graduate Student/Professoriate Roundtable moderated by Dr. Johnson and several concurrent professional development workshops. I invite you to participate fully in all conference activities and to establish new professional relationships with fellow students and faculty from Alliance schools.

Clearly, the United States needs a more diverse workforce of scientists, technical workers, engineers, and mathematicians prepared to participate in international, technological enterprise activities. Your entrance into the STEM disciplines is more critical to our country's future than ever, in the wake of the terrorist attacks of September 11, 2001. Although we are offering congratulations for your current achievements, we are also anticipating that you will enter and complete graduate school and become an integral part of our country's intellectual capital.

Again, it is my special honor and great privilege to welcome you to the 2002 NC-LSAMP Undergraduate Research Conference. I extend best wishes to student participants for an intellectually challenging and productive career in the STEM disciplines!

A. James Hicks, Ph.D.
LSAMP National Program Director



Greetings from Dr. James C. Renick
Chancellor, North Carolina A&T State University
Greensboro, North Carolina

Greetings to all Conference Participants:

It is a heartfelt pleasure to welcome you to the Sixth Annual Undergraduate Research Conference sponsored by the North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) Program. Indeed, this event marks a truly significant benchmark for the NC-LSAMP Project. As we convene today to recognize and applaud the faculty-mentored research accomplishments of undergraduate students in science, technology, engineering, and mathematics (STEM) disciplines, we simultaneously celebrate the 10th Anniversary of the NC-LSAMP Program.

I express highest regard to Dr. Marye Anne Fox, chancellor of North Carolina State University, as well as administrators, faculty, staff, and most of all students, for hosting this event under the auspices of the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED). This partnership among NSF-sponsored, diversity-focused programs is facilitating optimal outcomes for students pursuing careers in STEM fields from middle school to the Ph.D. degree level. The specific programs comprising OPT-ED (MSEN, HBCU-UP, LSAMP, CREST, and AGEP) are dramatically increasing the number of underrepresented minority students aspiring to earn undergraduate and graduate STEM degrees. In short, OPT-ED is playing a central role in North Carolina's effort to provide leadership for the nation in promoting excellence in STEM education and research.

I am certain that everyone in attendance today joins me in commending the National Science Foundation (NSF) for its generous sponsorship of the LSAMP Program, now in its 11th year of operation. It is evident that the LSAMP program is significantly benefiting underrepresented minority students in STEM disciplines throughout the United States. The Louis Stokes Alliances for Minority Participation Program began in 1991 with an annual STEM minority B.S. degree production of 3,914. In 2002, LSAMP Programs collectively enrolled 201,615 student participants nationwide, and graduated 21,704 at the baccalaureate level. By any measure, this is an unqualified success.

It is an honor to welcome our special guest speaker for the Conference: Dr. Roosevelt Y. Johnson, Acting Director, Division of Human Resource Development, NSF. In addition, we extend a hearty welcome to other guests, students, faculty mentors, and administrators. Thank you for joining us today as we celebrate a decade of Louis Stokes AMP achievement in North Carolina.

Sincerely,

A handwritten signature in black ink that reads "James C. Renick". The signature is written in a cursive style with a large, looping initial "J".

James C. Renick
Chancellor and NC-LSAMP Advisory Board Chair



Greetings from Dr. Carolyn W. Meyers
Project Director, North Carolina Louis Stokes Alliance for Minority
Participation Program

Greetings Conference Participants:

I am pleased to welcome students, faculty, special guests, and all NC-LSAMP and NC OPT-ED affiliates to the Sixth Annual North Carolina Louis Stokes Alliance for Minority Participation (NC-LSAMP) Undergraduate Research Conference. As we gather today, I invite you to look back with me to the inception of the Louis Stokes Alliances for Minority Participation Program. The National Science Foundation launched this ambitious initiative in 1991 with six Alliances. Just one year earlier, in 1990, the annual STEM minority baccalaureate degree production for the nation was 3,914. It is commendable that NSF currently supports 29 LSAMP Programs nationwide. And, these programs jointly awarded 21,704 B.S. STEM degrees to underrepresented minorities in 2002. We appreciate the vital role of the National Science Foundation in making its LSAMP Program a key resource for STEM students throughout the United States.

The North Carolina Louis Stokes AMP Program began in 1992. Thus, we have reached an important milestone: our 10th Anniversary. During the ten years in which we have operated the Alliance, partner institutions have awarded almost 10,000 baccalaureate STEM degrees to underrepresented minority students. Moreover, a number of these students have earned or are pursuing M.S. and Ph.D. degrees in these fields. As the NC-LSAMP prepares to transition into Phase III implementation, we remain fully committed to the broad goal of creating a more diversified workforce of scientists, technological workers, engineers, and mathematicians to sustain America's international competitiveness in technological enterprises.

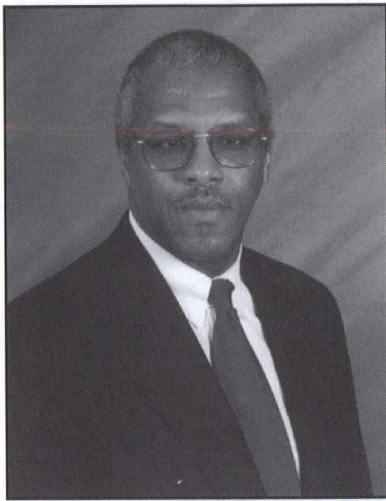
I personally congratulate and applaud every student presenting a research project at today's Conference. Furthermore, I challenge students not sharing a research project today to make a commitment to be a presenter next year. I urge you to take full advantage of every opportunity to become involved in research at your respective university, at other institutions, at national laboratories, and in industry settings. You will pleasantly discover that active engagement in research enhances your overall undergraduate academic experience and boosts your preparedness for graduate study.

Finally, on behalf of the NC-LSAMP Executive Committee, I acknowledge our appreciation to North Carolina State University for hosting this year's Conference in conjunction with the North Carolina Alliance to Create Opportunity through Education (NC OPT-ED). And, once again, I heartily welcome you and hope that all facets of your Conference experience will be most enjoyable.

Sincerely,

A handwritten signature in black ink that reads "Carolyn W. Meyers". The signature is fluid and cursive, with a long, sweeping underline.

Carolyn W. Meyers, Ph.D.
Provost/Vice Chancellor for Academic Affairs
and NC-LSAMP Project Director
North Carolina A&T State University



DR. ROOSEVELT Y. JOHNSON

**Acting Director, Division of Human Resource Development
and Program Director of the Alliances for Graduate Education
and the Professoriate (AGEP) Program / National Science Foundation**

Dr. Johnson received a baccalaureate degree in zoology in 1968 from Howard University (Washington, D.C.). Subsequently, he earned a doctorate in microbiology from Indiana University (Bloomington, IN) in 1972. As a National Institute of Health (NIH) Fellow, he engaged in postdoctoral research in the area of plant molecular biology at the University of Washington (Seattle, WA; 1972-74).

Dr. Johnson has held full and adjunct faculty positions at Pacific Lutheran University (Tacoma, WA), Howard University College of Medicine, Howard Community College (Columbia, MD), Towson State University (Towson, MD), and Howard University College of Liberal Arts. He also served as an official collaborator at the Los Alamos National Laboratories (Los Alamos, NM; 1986-89), conducting research directed toward elucidating the molecular basis of salt tolerance in plants.

From 1989 to 1995, Dr. Johnson served as a program director with the National Science Foundation (NSF). During his tenure at NSF, Dr. Johnson managed the Minority Research Initiation (MRI) Planning Grant Program, the Research Improvement in Minority Institutions (RIMI) Program, the Research Careers for Minority Scholars (RCMS) Program, the Graduate Research Traineeship (GRT) Program and, the NSF-NATO Postdoctoral Fellowship Program in the Directorate for Education and Human Resources. From 1995 to November 1997, Dr. Johnson served as Deputy Director and Acting Executive Director of the National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM Consortium), where he was responsible for management of the GEM Fellowship Program and operations at the GEM Center (South Bend, IN). From November, 1997 to February, 2000, he managed administrative operations in the Division of Undergraduate Education at the National Science Foundation.

In November of 2001, Dr. Johnson became Acting Director of the Division of Human Resource Development. Additionally, he continues to serve as National Program Director of the Alliances for Graduate Education and the Professoriate (AGEP) Program. Specific objectives of the AGEP Program are to increase the number of underrepresented minorities receiving doctoral degrees in science, technology and engineering and to augment the number of underrepresented minorities entering academia at the faculty level.

Sixth Annual NC-LSAMP Undergraduate Research Conference

April 26, 2002

McKimmon Center

North Carolina State University, Raleigh, North Carolina

***“Pathways to Research and Higher Education:
Expanding Opportunities through Alliances”***

Sessions

8:00 AM -12:00 Noon

CONFERENCE REGISTRATION

Location: McKimmon Center Lobby

8:00 - 9:00 AM

STUDENT POSTER SET-UP

Location: Room 1 McKimmon Center

(Posters will remain on display until 3:30 PM.)

8:00 –10:00 AM

CONTINENTAL BREAKFAST

Location: Room 1 McKimmon Center

9:00 – 9:30 AM

WELCOME SESSION

Location: Room 1 McKimmon Center

Moderator:

Dr. Carolyn W. Meyers, Provost and

Vice Chancellor for Academic Affairs

North Carolina A&T State University

NC-LSAMP Principal Investigator/Executive Director

Greetings:

Ms. Sonia Barnes, Special Assistant

Community Affairs, Office of Governor Michael F. Easley

Dr. Janice G. Brewington, Interim Associate Vice Chancellor

Institutional Planning, Assessment, and Research/Salary

Administration, North Carolina A&T State University

Dr. Duane Larick, Assistant Dean

Graduate School, North Carolina State University

Dr. Walter E. Jordan-Davis, Director

Fairness, Accessibility, Multiculturalism, and Equity (FAME)

Educational Testing Service (ETS)

9:30 – 11:00 AM

STEM GRADUATE STUDENT/

PROFESSORIAL ROUNDTABLE

“Perspectives on Preparation for Faculty Careers”

Location: Room 1 McKimmon Center

Roundtable Moderator:

Dr. Roosevelt Y. Johnson, Acting Director

Division of Human Resource Development and Program Director

of the Alliances for Graduate Education and the Professoriate (AGEP)

Program, National Science Foundation

Introduction of Roundtable Moderator: **Dr. Tony L. Mitchell**, *Assistant Dean/Director for Minority Engineering Programs/NC-LSAMP Campus PI North Carolina State University*

Introduction of Panelists: **Dr. Roosevelt Y. Johnson**
Panelists
Mrs. Renee Payne Baggot-Hampton University
Dr. Juliette B. Bell –Fayetteville State University
Dr. Anne E. Donnelly-University of Florida
Ms. Ondulla Foye-North Carolina State University
Dr. Walter E. Jordan-Davis-Educational Testing Service
Dr. John C. Kelly-North Carolina A&T State University
Dr. Mark Kithcart-North Carolina A&T State University

Special Presentation: **Dr. Janice G. Brewington / Dr. Tony L. Mitchell**

11:00 AM – 12:30 PM **CONCURRENT WORKSHOPS**
(Refer to Program Insert for Workshop Descriptions, Times, and Locations.)

Maximizing the Benefits of a Research Internship

Dr. Anne E. Donnelly
University of Florida

Facilitator: Dr. Clinton Lee, Associate Professor, College of Engineering, North Carolina A&T State University

Being Successful After the Bachelor's Degree: Applying to and Making Yourself Competitive for Graduate School

Dr. Duane Larick

North Carolina State University

Facilitator: Ms. Valarie Deese, NC-LSAMP Campus Counselor/Recruiter, University of North Carolina - Pembroke

Gaining Access to Graduate School: Preparing for the GRE

Dr. Walter E. Jordan-Davis

Educational Testing Service (ETS)

Facilitator: Mrs. A. Ayanna Boyd-Williams, Assistant Dean of Graduate Studies, North Carolina A&T State University

Financial Support for Graduate Education

Mr. David Shafer

North Carolina State University

Facilitator: Mrs. Jodi Turner, PRODUCE Coordinator, University of North Carolina-Charlotte

Transitioning into STEM Disciplines: Tips on Selecting a College Major

Dr. Stephen McCary-Henderson

North Carolina A&T State University

Facilitator: Mrs. Charlene Carr, Recruiter/Retention Coordinator, College of Engineering North Carolina A&T State University
(One session only for high school students)

12:30 – 1:45 PM

LUNCHEON SESSION

Location: Room 2 McKimmon Center

Luncheon Moderator:

Dr. Janice G. Brewington

Invocation:

Mr. Leotis Parrish, Assistant Dean
Student Affairs, College of Engineering
North Carolina A&T State University

**Introduction of
Keynote Speaker:**

Dr. Bertha H. Miller, Dean
College of Arts and Sciences
Fayetteville State University

Keynote Speaker:

Dr. Roosevelt Y. Johnson, Acting Director
Division of Human Resource Development
National Science Foundation

Special Presentation:

Dr. Janice G. Brewington

***IMMEDIATELY FOLLOWING LUNCHEON GROUP PHOTOGRAPH WITH
DR. ROOSEVELT Y. JOHNSON AND ROUNDTABLE PANELISTS
(ALL CONFERENCE PARTICIPANTS)***

2:00 p.m.

POSTER PRESENTATIONS

Location: Room 1 McKimmon Center

3:00 p.m.

ORAL PRESENTATIONS

Refer to Oral Session Schedule for Presenters in Sessions 1-6, and Room Locations.

SESSION I: Biology/Life Sciences/Animal Science/Environmental Science

Moderator: Dr. Errol Thompson, Professor, Department of Life Sciences
Winston-Salem State University

SESSION II: Chemistry

Moderator: Dr. Etta Gravely, Co-Chair and Professor, Department of Chemistry
North Carolina A&T State University

SESSION III: Computer Science

Moderator: Dr. Alade Tokuta, Chair and Professor, Department of Mathematics and
Computer Science, North Carolina Central University

SESSION IV: Computer Science/Engineering

Moderator: Mr. Harold Woodard, Associate Dean, Office of Student Counseling
University of North Carolina-Chapel Hill

SESSION V: Engineering

Moderator: Dr. Tony L. Mitchell, Assistant Dean/Director for Minority Engineering
Programs, College of Engineering, North Carolina State University

SESSION VI: Physics/Mathematics/Technology

**Moderator: Dr. Nalin R. Parikh, Professor, Department of Physics and Anatomy
University of North Carolina-Chapel Hill**

Awards Dinner

(Location: Room 2 McKimmon Center)

5:15 – 7:00 PM

In Recognition of Student Presenters and Outstanding Faculty Mentors

“Celebrating 10 years of LSAMP Excellence”

Location: Room 2 McKimmon Center

Moderator: Dr. Joseph Monroe, Dean

***College of Engineering, North Carolina A&T State University
NC-LSAMP Co-Principal Investigator***



RENEE PAYNE BAGGOTT

*Ph.D. Candidate in Physics, Hampton University
Former NC-LSAMP Scholar, North Carolina Central University*

Renee graduated with an Associate degree in applied science in electronics engineering technology from Durham Technical College. She earned a Bachelor of Science degree in physics from North Carolina Central University. In 2001, Renee received a Master of Science degree in physics from Hampton University. Currently, she is a doctoral candidate in physics at Hampton University with an emphasis in optics. Renee's doctoral research focuses on holographic data storage in cylindrical photorefractive crystals.

Renee's research experiences began early in her undergraduate studies. She worked at Duke University's Free Electron Laser Laboratory as an electronics technician. She was also a summer undergraduate research assistant in the Molecular Beam Epitaxy Laboratory in the Department of Electrical Engineering at Duke University. While at Hampton University, Renee participated in an internship at ITT Industries System and Science Division working on receiver development for Hampton University's ozone and aerosol LIDAR systems. Additionally, she has several international and national conference presentations and publications to her credit.

Outside of her research, Renee has volunteered at the Food Bank. She also personally provided transportation for rural North Carolina high school students to visit local area colleges and universities to expose them to post-secondary educational opportunities in their area of interest. In addition, she has acted as a mentor for rural eastern Virginia high school students interested in science and mathematics. Specifically, she designed a summer research project to give students hands-on research experience in optical physics. In addition, Renee has taught undergraduate physics laboratory classes.

Renee is a recipient of a Non-Traditional Careers for Women Scholarship and North Carolina Louis Stokes Alliance for Minority Participation scholarship. Currently, she is an Office of Naval Research Fellow and a Virginia Space Grant Fellow. Renee's professional memberships include: Sigma Pi Sigma National Physics Honor Society, Alpha Kappa Mu National Honor Society, Virginia Academy of Science, Optical Society of America, National Society of Black Physicists, and the American Physical Society.



DR. JULIETTE BELL

*Professor of Chemistry and Director of the Biomedical Research Program
Fayetteville State University*

Dr. Juliette B. Bell is professor of chemistry and director of the Biomedical Research Program at Fayetteville State University (FSU). She earned a B.A. degree in chemistry from Talladega College, and subsequently received the Ph.D. degree in chemistry from Atlanta University in 1987. Following postdoctoral training in the Department of Biochemistry at the University of North Carolina- Chapel Hill, Dr. Bell joined the Laboratory of Molecular Genetics at the National Institute of Environmental Health Sciences as a Senior Staff Fellow. In 1992, she joined the faculty of FSU.

Dr. Bell provides excellence in scholarship, teaching, and service to Fayetteville State University and the research community. An outstanding mentor and teacher, she has worked tirelessly to enhance student performance and engage students in biomedical research activities. Dr. Bell has helped to garner funded grants totaling over \$6 million. Moreover, she has actively presented and published her research results, and served as a consultant to funding agencies and several professional organizations. For her efforts, Dr. Bell has received numerous local and national honors including The National "Role Model Award" from Minority Access, Inc. in 2001, The White House Initiative on HBCUs' "Millennium Award for Excellence in Teaching" and The UNC Board of Governors' "Award for Excellence in Teaching" in 2000, Fayetteville State University "Teacher of the Year" in 1999, the QEM/MSE Network "Giant in Science Award" and the NAFEO "Research Achievement Award" in 1997. In addition, Dr. Bell was a recipient of the prestigious National Science Foundation Young Investigator Award in 1993.

Dr. Bell is married and has one son.



DR. ANNE E. DONNELLY (right)
Associate Director for Education and Outreach
National Science Foundation Engineering Research Center
for Particle Science and Technology
University of Florida

Dr. Anne E. Donnelly received a B.A. degree in zoology from Ohio Wesleyan University. She earned the MBA degree from Georgia State University, and a Ph.D. degree in science education at the University of Florida. In 1996, Dr. Donnelly joined the Engineering Research Center at the University of Florida. She has worked in education for over 20 years, across the continuum from adult lifelong learning down through the precollegiate level. Additionally, Dr. Donnelly has experience in both formal and informal settings, and has worked with local school systems to bring the excitement of engineering and science to middle and high school level students.

Dr. Donnelly is the Associate Director of Education and Outreach at the National Science Foundation Engineering Research Center for Particle Science and Technology at the University of Florida. In this multidisciplinary program, she works with STEM students at both the graduate and undergraduate levels. Dr. Donnelly has placed over 500 undergraduate students in research projects in engineering, chemistry, microbiology, and pharmacy. Moreover, she has worked with over 125 graduate level students. Dr. Donnelly serves as the College of Engineering Co-PI for the University of Florida NSF Alliance for Graduate Education and the Professoriate Program (AGEP) that has brought 25 minority Ph.D. students into STEM departments across campus. In addition, the Program has provided summer research experiences for 30 visiting minority students in the past two years.

Dr. Donnelly has studied the role of metacognition in learning from science objects. Currently, she is investigating the factors that encourage women and minority participation in undergraduate research. She is also interested in factors that improve the retention of students in engineering programs.

Dr. Donnelly has directed seven Research Experiences for Undergraduate students in the past five years. In addition, she has made presentations to faculty, administrators, and students on how to develop, manage, and succeed in a research experience. Dr. Donnelly will share her knowledge on this subject as well as insight into academic careers with participants of the 6TH Annual NC-LSAMP Undergraduate Research Conference.



ONDULLA TYVETTE FOYE

Ph.D. Candidate in Nutrition

North Carolina State University and NCSU GAANN Fellow

Ondulla Tyvette Foye earned a Bachelor of Science degree in biochemistry, a Bachelor of Arts degree in chemistry, and a Master of Science degree in physiology from North Carolina State University. She is a doctoral student in nutrition with a minor in biotechnology. Ondulla's doctoral research focuses on the effects of early feeding on enteric development in poultry.

Ondulla's laboratory experience began in 1996 with her employment as a chemical quality assurance technician at Abbott Laboratories of Rocky Mount, North Carolina. In addition, she has undergraduate and graduate level teaching experience in cellular and molecular biology, anatomy, and physiology laboratory courses. During the summer of 2001, Ondulla completed an internship with Pharmacia Corporation of St. Louis, Missouri in the Department of Arthritis and Inflammation.

Outside of her academic career, Ondulla has been a contender in the Miss America Scholarship Programs, and has held the titles of Miss Johnston County, and Miss Greater Raleigh. Moreover, she has toured the state of North Carolina as a motivational speaker. In addition, Ondulla enjoys singing, music composition, playing the flute and piano, and reading.

Currently, Ondulla is recipient of the 2001 National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) Predoctoral Fellowship, and the 2001 NCSU Graduate Assistance in areas of National Need (GAANN) Biotechnology Fellowship. Additionally, she is a professional member of the American Society of Cell Biology.



DR. WALTER E. JORDAN-DAVIS

*Director the Fairness, Accessibility, Multiculturalism,
and Equity (FAME) Initiative
Educational Testing Service (ETS)
Princeton, New Jersey*

Dr. Walter E. Jordan-Davis received the B.S. and Ph.D. degrees in psychology from the University of Texas at Austin. For a number of years, he has worked closely with members of several Texas and California school districts, Historically Black Colleges and Universities, Hispanic Serving Institutions, and The College Board to improve access for students wishing to pursue a postsecondary academic career.

Currently, Dr. Jordan-Davis is employed with the Educational Testing Service (ETS) in the Division of Graduate and Professional Education. He serves as Director of ETS's Fairness, Accessibility, Multiculturalism, and Equity (FAME) initiative. In this capacity, Dr. Jordan-Davis is responsible for developing a research agenda focusing on the validity of ETS products, services, and assessments, particularly as related to increasing diversity of ETS clients. He began his ETS career in August 1990 as a Field Service Representative in ETS's Southwest Field Service Office in Austin, Texas. Subsequently, he transferred to ETS's California-based Western Field Office in 1993, assuming the role as a Program Administrator. His specific function was to provide direction to several ETS programs based in California. In January of 1998, Dr. Jordan-Davis transferred to ETS in Princeton.

Dr. Jordan-Davis has provided research, planning, and evaluation services for numerous school systems in a variety of settings—federal, state, and local district levels. Prior to joining ETS, he worked for the Texas Educational Agency as a Division Director in the area of accreditation. He directed the agency's efforts related to the development of research, evaluation, and assessment efforts aimed at determining the organizational effectiveness of selected Texas school systems. In addition, he worked as a Senior Research Specialist at Powell Associates, Inc. in Austin, TX. In this role, Dr. Jordan-Davis provided technical assistance to school systems through a Chapter 1 Technical Assistance Center funded by the Department of Education. He also served as the Director of the Austin Independent School District's Chapter 1 Evaluation Team in the district's Office of Research and Evaluation.

Dr. Jordan-Davis has served on the board of several non-profit organizations in Texas and California. Additionally, he served on the California Department of Education's Technical Advisory Committee for the California Learning Assessment System. Moreover, he served as an adjunct professor at the University of Texas at Austin. In 1984, he was elected to membership in Phi Kappa Pi. Dr. Jordan-Davis has an impressive record of research and publications, consultation, community service, and participation in professional organizations, including a multitude of presentations. He has a primary interest in evaluation research with a focus on differential program impact for diverse populations.



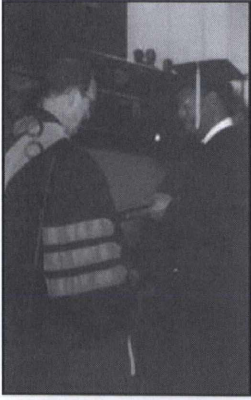
DR. JOHN CAREY KELLY, JR.

*Interim Department Chairman
Department of Electrical Engineering
North Carolina A&T State University*

Dr. John C. Kelly, Jr., received a B.S. degree in electrical engineering from the University of Delaware in 1981. Subsequently, he earned the Ph.D. degree in the same discipline in 1988, also from the University of Delaware. Dr. Kelly was employed at AT&T Bell Laboratories for five years developing high performance digital systems. Included in his work are the physical layer interface device, PHY, for Fiber Distributed Data Interface (FDDI), an Integrated Services Data Network (ISDN) Time Slot Interchanger, and an H.323 image compression device. Also, while with Bell Laboratories, Dr. Kelly worked with Hampton University in Hampton, Virginia to establish a VLSI (very large scale integrated circuit) design environment for the staff and students. In addition, he coordinated a seminar series.

In 1992, Dr. Kelly joined North Carolina A&T State University as Associate Dean for Graduate and Research Programs in the College of Engineering. He also served as Associate Professor in the Department of Computer Science at North Carolina A&T State University prior to his current position as Interim Chairman in the Department of Electrical Engineering at North Carolina A&T State University. As a member of the Electrical Engineering department, Dr. Kelly developed quad-tree image compression architectures. He is also leading an effort to establish a Computer Engineering Program. In the Computer Science Department, Dr. Kelly led an effort to create technology-assisted modules for the graduate and undergraduate curriculum. Additionally, he is developing performance metrics for computer networks.

Dr. Kelly, a native of Rockville, Maryland, is the oldest of three children of John and Joan Kelly. He is married and has two children, Julian and John III (Johnno). Dr. Kelly enjoys radio control helicopters and airplanes, model railroading, auto mechanics, and traveling.



DR. MARK KITHCART (right)

*Receiving the Ph.D. Degree in Mechanical Engineering
North Carolina A&T State University, December 2001
Postdoctoral Research/NASA Center for Aerospace Research
North Carolina A&T State University*

Dr. Mark Kithcart is engaged in postdoctoral research in the NASA Center for Aerospace Research at North Carolina A&T State University. He earned the B.S. and M.S. degrees in mechanical engineering at North Carolina A&T State University. Subsequently, he was awarded the Ph.D. degree also in mechanical engineering from North Carolina A&T State University. Dr. Kithcart's doctoral research focused on experimental and computational fluid mechanics. He has presented and published numerous papers in the areas of rough wall boundary layer flow and heat transfer enhancement as a consequence of surface roughness.

Along with Dr. Kithcart's research efforts, he has participated in a number of extracurricular activities while matriculating at A&T. He has worked as an instructor/advisor for two precollege programs: the NASA SHARP-Plus summer program for high school students, and the Summer Research Initiative for junior high and high school students. Each of these programs is sponsored by the College of Engineering. Dr. Kithcart has also participated in recruiting efforts at local high schools, at the National Black Graduate Student Conference, and at the American Association of Mechanical Engineers' Student Conferences.

Dr. Kithcart has received many prestigious honors. He was named a Summer Research Fellow and grant recipient by the Air Force Office of Scientific Research (AFOSR), a Kellogg Foundation Research Fellow, a NASA Ronald E. McNair Ph.D. Fellow, and an Office of Naval Research Fellow.

Dr. Kithcart has been an avid mentor for a number of undergraduate students in mechanical engineering. In addition, he has actively participated in annual NC-LSAMP Research Conferences.

Notes:

2002 Research Abstracts - Dedicated in Memoriam

Ms. Ronnetta Monique Mosby



January 18, 1980 – November 30, 2001

A life extraordinary. A special joy to all who knew her.

When students, faculty, administrators, and special guests assembled at North Carolina A&T State University on Friday, April 20, 2001, for the Fifth Annual NC-LSAMP Undergraduate Research Conference, how fortunate we all were to have the privilege of sharing a very special poster presentation. This research presentation was entitled, "Digital Communication Using Frequency-Shift Keying." The presenter was a vivacious, inspired, beautiful young lady, Ronnetta Monique Mosby, who was also an exemplary scholar in electronics and computer technology at North Carolina A&T State University. At that time, there was no way of knowing the full significance of this research presentation. But, on November 30, 2001, only six months and ten days later, we learned that the 2001 conference was the last opportunity for many of us to experience the brilliance of this young and gifted African American female scientist, taken away from us seemingly much too early.

Ronnetta, affectionately known as "Netta," was born on January, 18, 1980, in Welch, West Virginia. Her family relocated to Winston-Salem, North Carolina when Ronnetta was two years old. A 1998 graduate of Parkland High School, she was recognized for her scholarly achievements, leadership skills, and participation in extracurricular activities. In addition, Ronnetta possessed a genuine love for dancing, and during her senior year, served admirably as captain of the Dixie Debs Marching Band dance group.

Ronnetta was always focused and certain about the professional path she chose to follow. In August 1998, she enrolled at North Carolina A&T State University pursuing a B.S. degree in electronics and computer technology. She attained a grade point average of 4.00 her freshman year, and held a 3.73 in her major field of study as a rising senior. Additionally, Ronnetta was a member of several organizations and recipient of numerous prestigious honors and awards: Alpha Lambda Delta (National Freshman Honor Society), The Electronics Club, The Honors Program, National Association of Industrial Technologists, National Association of Radio and Telecommunications Engineers (served as vice president fall semester of 2001), Winston-Salem Aggie Club, mentor through North Carolina A&T State University for Big Brothers/Big Sisters, All American Scholar, Ford Motors Scholar, North Carolina Louis Stokes Alliance for Minority Participation Scholar, Dean's List, Henry Carter Academic Scholarship, Suther Scholarship, and General Motors Scholar. This impressive listing of accomplishments attests to the relentless quest for excellence by a young scholar determined to achieve her professional goals.

Ronnetta, a truly remarkable and lovely young lady, was highly disciplined in every facet of her life. Baptized at age 10, she professed her love for God through an unshakable faith and Christian principles, which guided her

daily in all walks of life. Ronnetta was highly active in Greater Cleveland Avenue Church, where she was a member, and genuinely loved her pastor, co-pastor, and church family at large. Besides God, there was no love that compared to the love Ronnetta held for her mother, and other family members. She has left for the world to enjoy several inspirational poems, short stories, and a wealth of pleasant memories for all who knew her.

Few individuals are blessed with such a wide array of attributes as those descriptive of Ronnetta. She set spiritual, personal, and professional goals early in life, and charted a clear path toward attaining them. Chronologically, her life was one of a few years; however, her achievements were immeasurable. Ronnetta can be described as a confident, highly intelligent and competent individual who knew and fulfilled the requirements for achieving her goals and dreams in life. Moreover, she was not afraid to undertake the work and face the challenges requisite for success. To be sure, Ronnetta was a young woman who exemplified remarkable strengths, both spiritually and academically.

Dr. Derrek Dunn, Ronnetta's faculty mentor, is perhaps one of the most fortunate members of the A&T family when one considers the close bond which he established working with her. Indeed, it is rare that a professor experiences the enjoyment of working with such a special student – one so focused, serious, and determined to strive for and attain excellence.

Ronnetta was, indeed, ecstatic about graduating from A&T in 2002 with a B.S. degree. Clearly, she would have been an honor graduate, and would have made the university quite proud as she ventured into the world leaving her mark of excellence. While Ronnetta will not march with the class of 2002, she now marches with her Lord and Savior, Jesus Christ.

AGAINST ALL ODDS

Inspired by God

Written by Ronnetta Monique Mosby

*When I hear of the violent acts of my fellow peers
A volcano erupting for several years
A generation who's lost the sight of hope
And turned their vision toward pushing dope
A generation who's given up on the best
And settled for a whole lot less.
A generation who could be so much more
But instead decided not to soar.
A group of lawyers, doctors, and teachers
Resting on unheavenly features.
Then I find confidence in me.
A survivor is what I want to be.
An eagle determined to endure
A scientist praying to God for a cure.
I'm determined, but most of all I'm God's
And I'll make it through ALL odds.*

Abstracts are displayed as submitted without editorial modification to content.
Abstracts are grouped according to presentation discipline.

ATMOSPHERIC SCIENCE/METEOROLOGY

Kibri D. Hutchison
North Carolina State University
Junior, Atmospheric Science
Dr. Daniel W. Israel

Influence of Long Term Swine Lagoon Effluent on Mineralizable Organic Nitrogen in Coastal Plain Soils

The swine industry in North Carolina expanded rapidly during the past decade, creating a large amount of waste that must be managed in an environmentally sound manner. Swine waste is treated in anaerobic lagoons. The lagoon liquid (effluent) is sprayed on fields to supply sufficient nitrogen for the realistic yield of receiver crops. If sprayfields are managed according to the nitrogen needs of the receiver crops, residual nitrogen (ammonium-nitrogen, nitrate-nitrogen, mineralizable and non mineralizable organic nitrogen) should not increase significantly with long-term effluent application. This idea is being tested by comparing nitrate-nitrogen, ammonium-nitrogen and mineralizable organic nitrogen concentrations in soil of a sprayfield that has received swine waste for six growing seasons with that in soil of a field that has received fertilizer nitrogen over the same period. Nitrate-nitrogen and ammonium-nitrogen in 1M KCl extracts are being measured colorometrically using a Lachat autoanalyzer system. Mineralizable organic nitrogen in these samples is being estimated as the net accumulation of ammonium plus nitrate nitrogen during an incubation of soil samples at a moisture level of 80% field capacity for 0,2,4,8,12 and 16 weeks at 28 C. These measurements will indicate the size of the mineralizable organic nitrogen pool in the long-term sprayfield soil and fertilized soil. Information from this study may enhance understanding of the impact of long-term waste application based on the size of different soil nitrogen pools and receiver crop requirements. We predict that this research will help lead to management strategies that decrease nitrogen movement to ground and surface water.

Aaron S. Pratt
North Carolina State University
Senior, Atmospheric Science
Dr. Sethu Raman

A study of 50-Year Variation in Precipitation, Maximum, and Minimum Temperatures over North Carolina

Climate change is a significant issue facing the world today. Many are wondering if climate is becoming more extreme over time. Vast swings in temperature and precipitation could signal a marked shift or change in the current climate regime. Previous research at the State Climate Office of North Carolina has shown an increase in precipitation along the coast during the winter during the past 50 years. The purpose of this study is to look at climate thresholds (e.g., number of days annually that maximum temperature exceeded a certain value) in maximum and minimum air temperatures, and precipitation and determine if any changes in the linear trends occurred during the time period, 1949-1999. Preliminary analysis of data show that the precipitation increase could be accounted for by an increased amount of heavy (> 1 inch) precipitation events, as well as a decreased number of consecutive days of no precipitation. The number of days where the minimum temperature failed to drop below 70 °F has increased for the majority of the stations in this study. A decrease in the number of days where minimum temperature dropped below 32° F also lends support to this increase in minimum temperature. There were a majority of stations that recorded a decrease in the number of days with maximum temperatures above 90°. This could suggest more cloud cover associated with an increase in precipitation or cooling related to increased aerosols. Thus the analysis of thresholds of temperatures and precipitation are mutually consistent and point to an increase in minimum temperatures, a decrease in maximum temperatures, and an increase in heavy precipitation events.

**Jonathan Wynn Smith, Dr. Wayne Higgins (Climate Prediction Center, National Weather Service, NOAA)
North Carolina A&T State University
Sophomore, Physics
Dr. Caesar Jackson**

The Impacts of El Nino Southern Oscillation and the Arctic Oscillation on Surface Air Temperature and its Variability in the Contiguous United States

The impacts of El Nino Southern Oscillation (ENSO) and the Arctic Oscillation (AO) on surface air temperature over the United States are pronounced during the cold season. The impacts of ENSO and the AO on temperature are fairly well understood. However, the combined effects of these two modes of climate variability are not. Daily temperature station data for the contiguous U.S. for the period 1950-1999 were gathered, archived, quality controlled, and analyzed. These data are used together with a classification of ENSO and the AO by season to understand the impacts of the combined modes of climate variability on temperature. These data are divided into four seasons, convenient for analysis (January-March [JFM], April-June [AMJ], July-September [JAS] and October-December [OND]). The study highlights results during the cold season. The ultimate goal is to improve the forecasts of ENSO and the AO. To complete this task the data must be compared to that of forecast simulations made with the Climate Prediction Center's Parallel Medium Range Forecast (MRF) Model.

BIOLOGY

**Porsha Carter, Jennelle Jones
North Carolina Central University
Junior, Senior Chemistry
Neuroscience/Drug Abuse Laboratory at the JLC-BBRI
Dr. Allyn Howlett and Dr. Kent Vrana**

Changes in Gene Expression of Cannabinoids and Aminoalkylindoles

Changes in gene expression patterns due to drug treatment were studied in cloned N18TG2 neuroblastoma cells, derived from a mouse spinal cord tumor. These cells express CB1 cannabinoid receptors and respond to agonists by activating G protein signal transduction pathways. We hypothesized that gene expression would be modified in response to chronic treatment with CB1 receptor cannabinoid and aminoalkylindole classes of agonists.

Neuroblastoma cells were treated with 1) cannabinoid agonist, CP55244, 2) aminoalkylindole agonist, WIN55212-2, or 3) vehicle control for forty-eight hours. The RNA was isolated using TriReagent and RNA samples were quantified and visualized by gel electrophoresis. cDNA samples were labeled with phosphorus-32 deoxynucleotides, and hybridized to Clontech mouse cDNA microarrays. Images of the hybridization pattern were scanned with a Phosphorimager, and data were analyzed using Clontech Atlas Software.

The comparison showed that mRNA for soluble guanylate cyclase Beta 1 subunit, sentrin, pre-synaptic density protein-95, and putative protein tyrosine phosphatase were up regulated by both CB1 receptor agonists. Continuing studies are examining the influence of chronic drug treatment on protein synthesis rates, with particular emphasis on the guanylate cyclase pathway.

Supported by funding from the National Institute on Drug Abuse, the MARC program at NCCU, the Schering Plough Foundation and WFU Summer Research Opportunities Program.

Eugene Gibbs-Flournoy¹, Brian Betz² and Dr. Bernard Weissman²,
Department of Biology, North Carolina A & T State University,
Department of Pathology, University of North Carolina at Chapel Hill
Junior, Biology
Dr. Bernard Weissman

Does Loss of hsnf5 Affect Cell Cycle Regulatory Proteins in Pediatric Tumor Cells?

Uncontrolled cellular proliferation of cells is a hallmark of cancer. Typically, this results from a malfunction of either of the two classes of genes, proto-oncogenes and tumor suppressor genes, that control cell division and DNA repair. In this study, we examined the expression of tumor suppressor genes in an attempt to understand pathways involved in the development of pediatric rhabdoid tumors. Using western blotting as the principle investigator, proteins of several pediatric rhabdoid cell lines were separated and detected with specific antibodies. The cell lines used in this experiment included G401, TM87-16, TTC 549, TTC 642, TTC 709, TTC 1240, and A204; all of which possess mutations in the hsnf5 gene. HeLa, an adult cervical carcinoma, was used as a positive control. We then assessed for expression of the following proteins to determine if hsnf5 loss affected their levels: RB, CD44, p53, BAF53, p21, p16, and p14. Several results were determined using this procedure, however the most significant data involved the hsnf5, RB, and p53 pathways. In the case of hsnf5, all the cell lines with the exception of HeLa were found to be negative for the protein. In the other two cases, the presence of the primary proteins RB and p53, and the minute expression of their compliments p14 and p16, suggests that both pathways remain functional. Consequently, the loss of hsnf5 may not directly affect either pathway, and loss of expression of the protein is likely the major cause of the development of rhabdoid tumors. Future work will be aimed at determining which pathways are affected by the loss of hsnf5.

Danielle Hughes, ¹Brian Westwood, ¹David Averill, Azeez Aileru & ¹Mark Chappell.
Winston-Salem State University and the ¹Hypertension and Vascular Disease Center, Wake Forest School of Medicine.
Senior, Biology
Dr. Azeez Aileru

Evidence for Angiotensin (1-7) in the Interstitial Compartment of the Rat Kidney

Previous studies have identified components of the renin-angiotensin system (RAS) within the kidney demonstrating significant concentrations of Angiotensin I & II (Ang) in renal tissue, tubular fluid and the interstitial compartment. In contrast Ang-(1-7) exhibits both natriuretic and diuretic actions and may counter-balance the effects of Ang II. In the present study, we determine whether Ang-(1-7) is present in the renal interstitial fluid (RIF) of the rat kidney. In anesthetized rats, a 5 mm linear microdialysis probe was introduced into the outer cortical region of the kidney and perfused with a Krebs-Ringer solution. The perfusate and dialysate were assayed for both creatinine and Ang-(1-7). Creatinine and Ang-(1-7) levels averaged 190 ± 24 mM and 5.5 ± 0.9 nM respectively. The RIF concentration of Ang-(1-7) is approximately 500 fold higher than that in the circulation. The demonstration of significant levels of Ang-(1-7) suggest interstitial processing from either Ang I or Ang II. Alternatively, Ang-(1-7) may be released into the interstitial compartment and contribute to the regulation of sodium and water transport. Supported by American Heart Grant-in-aid 151521 and NIH grants T35 HC07790, GM 08040, RR 11583 to AA.

Tanita Mitchell, Logan EM, Diz DI, Averill DB, Ferrario CM, +Ganten D, Department of Life Sciences, Winston Salem State University and Wake Forest School of Medicine
Senior, Biology
Dr. Azeez Aileru

Angiotensin II Produces Long-Term Potentiation In The Superior Cervical Ganglion Isolated From Inherited Form Of Hypertension.

Previous reports indicate that hypertension in (mRen2) 27 transgenic rats (mRen) is in part dependent on activation of the sympathetic nervous system. Angiotensin II (AngII) receptors are present in superior cervical ganglion (SCG) and facilitate synaptic transmission. We assessed the effects of bath applied AngII on indices of synaptic plasticity [post-tetanic potentiation (PTP) and long-term potentiation (LTP)] in Sprague-Dawley (SD) vs mRen rats. In addition, we used quantitative autoradiography to determine the relative number of AngII receptors. There were no differences in decay time constants of LTP and PTP between groups (PTP = 9 min; LTP = 120 to 150 min). However, Ang II increased PTP and LTP in mRen rats to a greater extent than SD. Candesartan (AT antagonist) blocked potentiation in both groups. There were no significant differences in AT receptors (In fmol/mg protein, SD: 204 ± 36 , n=7 vs mRen: 148 ± 28 , n=10; >90% AT in both groups). The enhanced effects of exogenous AngII do not appear to result from re-sensitization of receptors after removal of SCG from high endogenous AngII. The divergence of effects of AngII on LTP and PTP (greater in mRen than SD) may reflect different locations of receptors (pre- vs post-synaptic) or different signaling mechanisms in hypertension (RR11583, GM08040, HL6770 to AA).

Chanel Nichols, Brett D. Mahon
Winston-Salem State University
Junior, Life Science
Dr. Margherita T. Cantorna & Dr. Kim Tan

The Effects of Dietary Calcium on Inflammatory Bowel Disease in Interleukin-10 Knockout Mice

Inflammatory bowel diseases (IBD) are immune-mediated diseases affecting the gastrointestinal (GI) tract. Although the etiology of IBD is unknown, environmental factors including vitamin D status, genetic, and dietary factors have been shown to be associated with disease development. Interleukin-10 (IL)-10 knockout (KO) mice were used as a model for IBD to determine the association between vitamin D, calcium intake, and the development of IBD. Vitamin D deficient and sufficient IL-10 KO mice were maintained on diets, which did not contain calcium. Previous experiments (2,3) have shown that vitamin D status influenced the development of autoimmune diseases such as IBD and experimental autoimmune encephalomyelitis (EAE) when fed high levels of calcium. For EAE, vitamin D supplementation was less effective when calcium was removed from the diet. We hypothesize that vitamin D supplementation will be less efficient in suppressing IBD when mice are fed diets devoid of calcium. Due to slow breeding of IL-10 KO mice, ELISA assays were performed on samples of IL-10 KO mice with high levels of dietary calcium to analyze any changes in cytokine production due to dietary manipulations. The objective is to determine whether T-cell cytokine production can be regulated by $1,25(\text{OH})_2\text{D}_3$ in the absence of IL-10. Our research indicates that in-vitro treatment with $1,25(\text{OH})_2\text{D}_3$ did not significantly alter the cytokine production of TNF-a, IFN-g, and IL-10 in IL-10 KO T-cells, with the exception of IL-2.

Joseph R. Oxendine, Latrell Y. Jackson
University of North Carolina at Pembroke
Senior, Environmental Science
Dr. Kenneth L. Roberts

Surfactant/Supercritical Fluid Cleaning for Microelectronics Processing

A method involving the use of a supercritical carbon dioxide or a reverse micellar solution in a supercritical carbon dioxide to clean contaminants from silicon wafer coupons is presented in this work. Surfactant/supercritical fluid cleaning involves the use of carbon dioxide or a reverse micellar solution in carbon dioxide to clean industrial wastes from substrates [1]. Once the contaminants have been dissolved into solution, they can be separated from the supercritical fluid and later recycled back to the process.

The removal of model contaminants at fixed conditions was examined for the supercritical carbon dioxide system and an ammonium carboxylate perfluoropolyether (PFPE)/carbon dioxide/water system at low to moderate temperatures and pressures from 1100 to 3500 psig. Overall the removal of the grease contaminant was observed to increase with pressure for the carbon dioxide system. The effects of additional polar, ionic and oily model contaminants on removal efficiency were also examined. Earlier work in this group has reported that the cleaning effectiveness in surfactant/supercritical hydrocarbon systems has been observed to be strongly dependent upon such parameters as pressure, surfactant concentration, water solubility and temperature [2]. The prediction of surfactant solubility in these systems has been performed. The effects of pressure, surfactant concentration and contaminant composition on removal efficiency will be discussed.

References:

- [1] Roberts, K.L., Jackson, L.Y., Spence, T.S., Ubaka-Adams, N.C., and Oxendine, J.R., "Surfactant/Supercritical Fluid for Systems for Carbon Dioxide-Based Cleaning Applications", *Preprints of the ACS National Meeting*, Chicago, IL (2001).
- [2] Roberts, K.L., Spence, T.S., Forbes, J.E., Pritchard, V.E., Saunders, K.B. and White, G.L., "Surfactant/Supercritical Hydrocarbon Cleaning of Metallic Substrates," *Proceedings of the Fifth International Symposium on Supercritical Fluids*, Atlanta, GA (2000).

Eric Sturdivant, Angela Harris
Winston-Salem State University
Junior, Biology
Dr. Kim H. Tan

Angiotensin II Produces Long-Term Potentiation In the Superior Cervical Ganglion Isolated from Inherited Form of Hypertension

A number of evidence indicate that methylmercury (MeHg) neurotoxicity could arise from a glutamate-mediated excitotoxic mechanism and other mechanisms such as reactive oxygen species (ROS) formation and the activation of phospholipase A (PLA). Astrocytes swell more readily than neurons upon exposure to MeHg. Increased $[Ca^{2+}]$ associated with cell swelling activates cytosolic PLA to arachidonic acid from phospholipids. We studied the expression level of PLA by RT-PCR in the control and MeHg-exposed primary astrocyte cultures. The results indicated that both the PLA mRNA transcript in astrocytes chronically exposed to 1-5 μ M MeHg. Higher dosage of MeHg led to cell death. The activation of PLA was accompanied by inhibition of glutamate transport in MeHg-treated astrocytes. This suggests that MeHg neurotoxicity in astrocytes involves interplay of glutamate excitotoxicity and oxidative stress mechanisms. Supported by RIMI/NCRR grant # P20RR0 11-583-06S from the National Institutes of Health.

Isis Carolina Valladares
North Carolina Central University
Sophomore, Biology and Chemistry
Ken Alexander, MD-PhD, Duke University

The Purification of the HPV E1 protein from the E. Coli Bacterium

Yearly 500,000 new cases of cervical cancer, the second leading cause of cancer death in women in the world, are diagnosed. Human paillomaviruses (HPVs) are responsible for 94% of all cervical cancer. As of now, no antiviral therapy has been developed for the treatment of HPV. Since HPV cannot be cultured, molecular biology techniques must be used to study HPV viral transcription and replication. The three important elements that play a role in HPV replication are: the origin of replication, E1 and E2. E2 has been successfully expressed and purified but E1 has not. My research this summer therefore focused on the production and purification of E1. E. coli bacteria containing the pET 32a expression vector were used to express an E1-thioredoxin fusion protein. The E2 protein was also expressed without fusion by using pET 11. E1 expressing bacteria were grown at a range of temperatures to determine the optimal temperature for E1 expressions; 30°C was optimal. A His-tag affinity column was used to purify the E1 protein and was shown to have effectively performed the first part of the E1 purification.

Saul Villalobos
Fayetteville State University
Junior, Chemistry
Mrs. M.B Ragland

Is It Really Just Water?

The most common bacteria found in water are *Helicobacter pylori*, *Shigella*, *Vibro organisms*, *E. coli*, *Campylobacter*, *Legionella*, *Yersinia enterocolitica*, *Salmonella* and *Pseudomonas*. Research was done to test the water supply of Fayetteville State University dormitory and facilities. Samples were collected from nine different buildings. Three different growth media (agars) were used to cultivate any bacteria present. Individual colonies were tested to positively identify the bacteria. Data and results were collected and recorded to confirm the identity of the bacteria found in each facility. The tests performed detected the presence of enzymes found in *Helicobacter*, *E. coli*, *Campylobacter*, *Legionella*, *Yersinia enterocolitica*, *Salmonella*, and *Pseudomonas*.

CHEMISTRY/FOOD SCIENCE

Tiffany Nicole Boyce
North Carolina A&T State University
Senior, Chemistry
Dr. George S. Robinson, Jr.

The Effects of Different Background Tone Frequencies on the Elicitation of Visual Cognitive Evoked Brain Potentials in Humans

Cognitive evoked potentials are recorded brain waves in response to performing a task that requires information processing and thinking. Sensory evoked potentials on the other hand are in response to a discreet physical stimulus that does not require any cognitive processes. Evoked potentials are measured as alterations in amplitude and frequency. Certain portions of the waveform (amplitude and frequency) vary with task demands or variations and types of cognitive activity. The main objective of this project was to determine whether different background tone (physical stimulus) frequencies would have an effect on visual cognitive evoked potentials (P300) in humans. Any effects that the tones have on the cognitive processing of the visual stimulus will be shown by alterations in the amplitude and frequency of the waveform. The analysis of the brainwaves of ten participants indicated that background tones did have an effect on the elicitation of visual cognitive evoked potentials. Specifically, when the 1000HZ background tone was presented with the target stimulus, it decreased the latency of the P300, whereas when random tones were presented simultaneously with the target stimulus, they interfered with the generation of the P300. (Supported by MARC Grant T34GM07649-23)

Deidra Felton
North Carolina A&T State University
Sophomore, Human Environment and Family Sciences
Dr. C.W. Seo and Mrs. Sarah Williamson

Nutrient Composition of Black Sea Bass Cultured in North Carolina

Fish consumption had increased to 4.01 billion pounds in 1998 in America because the omega-3 fatty acids, such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), found in fish are known to protect against coronary heart disease, rheumatoid arthritis and certain types of cancer. Aquaculture may be the answer to meet the demand for fish. Levels of EPA and DHA in fish vary depending on many factors. For example, the species of fish, age, season, and location of catch can affect the levels of the fatty acids. It is well known fact that the diets of fish and culture conditions have a significant influence on the nutritional composition of their tissues. The black sea bass is a marine finfish species. Captive wild-caught sea bass readily accept and efficiently convert commercially available diets and can grow much faster than wild stocks. The objective of this study is to evaluate the relationship between the nutritional quality and the stocking density of wild-caught juvenile sea bass. The T-75 fish/tank had significantly higher amount of fats than the T-10 fish/tank group. Four major fatty acids, such as palmitic, oleic, EPA and DHA, were found in fish tissues. Amount of EPA and DHA in the T-75 fish/tank was significantly higher than in the T-10 fish/tank group.

Marcus A. Hunt
North Carolina State University
Senior, Material Science & Engineering
Dr. C. Maurice Balik

Diffusion and Solubility of Polymerizable Liquids in Ethylene Propylene Diene Monomer Rubber

The objective of this work is to obtain the diffusion coefficients of several polymerizable liquids in ethylene propylene diene monomer (EPDM) rubber over a temperature range of 10 – 70 °C. The diffusion coefficient is obtained for the polymer/liquid systems of 5-methylene-2-norbornene (MNB), 5-ethylidene-2-norbornene (ENB), cis-cyclooctene (CCO), dicylopentadiene (DCPD), and methylene chloride (MC) in EPDM rubber using the soak-and-weigh technique. A rubber sample is placed in each liquid penetrant using a water bath to maintain constant temperature. The sample is removed from the liquid many times during the experiment to measure the mass of the absorbed penetrant. Each sample is allowed to absorb liquid until the system reaches equilibrium. A plot of mass absorbed versus square root of time is used to determine the diffusion coefficient of each polymer/liquid system. Activation energies are obtained from Arrhenius plots of the diffusion coefficient as a function of temperature. This data is compared with activation energies and diffusion coefficients for the same liquids obtained in natural and nitrile rubbers.

LaTosha N. Robertson, Shawn K. Blue, Desiree A. Young, Dr. Abdul K. Mohammed
North Carolina A&T State University
Senior, Chemistry
Dr. Kenneth L. Roberts

Synthesis of Titania-Based Zeolites and Nanocatalysts for the Photocatalytic Oxidation of Azo Dye

Current nondestructive methods such as filtration, granulated active carbon (GAC), or chemical coagulation have been primarily used to treat dye waste. Although these nondestructive methods can remove dye, the primary disadvantage of these methods concerns the transfer of the contaminant from a liquid phase to a solid phase that requires further treatment. Due to the relative stability of these dyes, biological degradation is not advantageous for this application.

In recent years, alternative approaches have been under development for the treatment of dye wastewater. Nondegradative processes have been almost completely replaced by degradative processes. These processes can be referred to as advanced oxidation technologies (AOT). AOT's are those aqueous phase oxidation processes associated with the production of the hydroxyl radicals and results in the destruction of the target pollutant. Heterogeneous photocatalytic remediation has received wide attention as an advanced oxidation technology for the treatment of organic pollutants.

In this work, titania nanoparticles and titania-based zeolite photocatalysts were synthesized using ultrasonic dispersion methods and a modified wetness impregnation technique, respectively. The photocatalytic activity of titania-based catalysts in the degradation of an azo dye has been measured using a batch reactor system equipped with an ultraviolet-visible (UV-VIS) light spectrometer for the identification of species formed after complete dye oxidation. The effects of catalyst type (i.e., powder or zeolite) on dye photodegradation will be discussed.

Cynthia L. Sherman
UNC Pembroke
Senior, BioChemistry
Dr. Gautam Sarath, Department of Biochemistry
University of Nebraska - Lincoln

Can Plant Non-symbiotic Hemoglobins Function as In-vivo Sensors for Nitric Oxide

In this research, I will try to determine if recombinant plant non-symbiotic hemoglobins (ns-Hb) will specially react with nitric oxide (NO). I will purify recombinant rice ns-Hb2 from bacterial cells and use the purified protein to detect nitrothiolation of specific surface exposed to cysteine residue. Purified ns-Hb will be incubated in the presence of molecules that decompose to produce NO in solution. Using probes that will specifically target nitrosothio-cysteine, I will determine the conditions that promote this process. Once conditions have been standardized for this reaction, I will attempt to document if native ns-Hb molecules in crude extracts of rice tissues will also undergo this reaction. NO has been documented to be an important second messenger in animal cells, and has been implicated to play a role in plant signaling processes. My research will determine if plant ns-Hbs can act as a sensor for NO.

Corrie Stowe and Travis Moore
North Carolina A&T State University
Senior, Food Science and Nutrition
Dr. Ipek Goktepe

In Vitro Toxicity Evaluation of Organosulfur Compounds in Allium Vegetables

Organosulfur compounds in Allium vegetables have been the focus of studies for decades because of their beneficial effects against several diseases such as acute coronary heart diseases and cancer. Although organosulfur compounds are possible cancer-preventive agents, clinical trials might be required to define the effective dose that has no toxicity in humans. Therefore, this study is aimed at investigating the toxic dose evaluation of organosulfur compounds in Allium vegetables.

Organosulfur compounds were extracted using potassium phosphate buffer containing glycerol, polyvinylpyrrolidone, phenylmethylsulfonyl fluoride, EDTA, and cyteine from onion. Seven extracts (Sample #1 –7) were collected and the toxicity of each extract was tested at concentrations ranging from 0 to 100 mg/mL using Hybridoma cells. Cell culture suspensions were treated with extracts at different concentrations. Experimental plates also contained control wells without extract sample. Plates were incubated at 37°C with 5% CO₂ for 48 and 72 h. The number of living cells after 48 and 72 h incubation period was determined by MTT colorimetric assay.

None of the seven extracts used in this study showed any toxicity to hybridoma cells at the concentrations tested. This indicates that organosulfur compounds in onion at concentration of 100 mg/mL may be used safely. Further studies are needed to test the toxicity of the above compounds at concentrations higher than the concentrations investigated in this study.

Bryant Parnell Suitte
North Carolina A&T State University
Senior, Chemistry
Dr. D. Flowers and Dr. J. DeSimone

Designing Photoresist Systems for Carbon Dioxide

Currently, in the microlithography industry, the procedure for developing semiconductors, consists of using aqueous and organic solvents that are expensive and hazardous to the environment. We are trying to solve this problem by developing a new format for processing semiconductors, which is cleaner and safer, by reducing the amount of hazardous waste produced in this process. The development of new chemistry and equipment will allow industry to develop photoresists by using supercritical carbon dioxide (scCO₂) as a casting solvent, developer, and stripping solvent. First, before this new procedure can be implemented by industry, polymers must be created that are compatible with scCO₂ and the microlithography process. Currently, it is believed that fluorinated-polymers are the ideal candidates for our compatible polymers in scCO₂, because of their high solubility in CO₂ and their low absorbance at 157 nm. With fluoropolymers implemented into the process, the approach to designing photoresists in scCO₂ becomes simpler and cleaner. This will facilitate the improvement of optical transparency at 157nm and to develop excellent etch resistance. Fluorinated-norbornene groups have been reacted with maleic anhydride and have produced polymers with minimal solubility in scCO₂. In current and future synthesis, attempts will be made to react trifluoromethacrylate with norbornene groups to produce polymers with higher solubility in scCO₂. This process will eliminate hazardous waste streams and drastically reduce the cost for developing photoresists. (Supported by MARC Grant T34GM07649-23)

Dalton Young
Fayetteville State University
Sophomore, Chemistry
Dr. Booker Juma

Isolation and Structural Determinations of 11-keto-β-Boswellic Acid

Four pentacyclic triterpene acids were isolated from *Boswellia Serrata* resin. Structures of the individual acid extracts were obtained using NMR analyses, FT-IR, and ELSD-HPLC. They were characterized as β-boswellic acid, 2-Acetyl-β-boswellic acid, 11-keto-β-boswellic acid, and 4-Acetyl-11-keto-β-boswellic acid. 11-keto-β-boswellic acid was isolated and identified as the principal ingredient of *Boswellia* resin. Preliminary data suggest that the conditions chosen for the workup of *Boswellia* extracts could significantly influence the potency of their biological actions and their potential therapeutic effectiveness.

ENGINEERING / MATERIAL SCIENCE

Danielle Brown, Tiffani Teachey
University of North Carolina at Charlotte
Juniors, Computer Science/Mechanical Engineering
Mr. Stephen Myers

Applying Engineering Mechanics to Inspire Middle School Students to Consider Academic Studies and Careers in Engineering and Technology

The purpose of this project is to show the use of practical engineering concepts can inspire middle school students to consider engineering and technology fields in their future. Students are given a short pre- and post-test to determine their level of understanding of engineering concepts and interest in pursuing studies and careers in Engineering and Technology.

The project allows the students to build a straw structure that must meet specific height requirements in addition to being able to sustain weight. Construction of the structure allows students to gain a better understanding of engineering mechanics and math. An analysis of the completed projects will encourage students to discuss possibilities and problems connected with the structure. The post-test will measure whether new information regarding engineering concepts was attained and whether or not attitudes related to pursuing studies and careers in Engineering and Technology changed.

Korey F. Craig, Meecca L. Hamilton,
North Carolina Agricultural and Technical State University
Junior, Chemical Engineering
Dr. Kenneth L. Roberts

Solid-State Kinetics of the Topotactic Synthesis of Nanostructured Molybdenum Nitride Catalysts

Porous nanostructured molybdenum nitride ($g\text{-Mo}_2\text{N}$) produced by means of temperature programmed reduction (TPR) has found application as a highly reactive catalyst for hydrogen-assisted reactions which include petroleum hydrotreatment reactions [1,2]. Molybdenum nitride has been reported by this group to consist of interconnected, crystallographically aligned particles with diameters between 4 to 15 nm [3]. $g\text{-Mo}_2\text{N}$ catalysts were characterized using BET surface area analysis, RTXRD, HTXRD, TGA, and various electron microscopies including SEM, TEM, and STM. The reactivity of these nanostructured catalysts was also characterized for the hydrodesulfurization (HDS) of thiophene. Molybdenum nitride nanocatalysts have been synthesized using temperature programmed reduction of molybdenum oxide powder with reactant feed gases consisting of nitrogen/hydrogen mixtures. The prediction and analysis of the solid-state, topotactic synthesis reaction of nanostructured $g\text{-Mo}_2\text{N}$ catalysts using fundamental will be discussed.

References:

- [1] Markel, E.J. and Van Zee, J.W., *J. Catal.*, 126 (1990) 643.
- [2] Markel, E.J., Burdick, S.E., Leaphart, M.E., and Roberts, K.L., *J. Catal.*, 182 (1999) 136.
- [3] Roberts, K.L., Hu, M. Z.-C., Payzant, E.A. and Allard, L.F., "Nanostructured Molybdenum Nitride Catalysts for Environmental and Energy Applications", Proceedings of the 2nd Georgia Tech Conference on Nanoscience and Nanotechnology, September 19-21, 2001, Atlanta, GA.

Melina Lubin
North Carolina A&T State University
Sophomore, Chemical Engineering
Dr. Keith Schimmel

NASA Microgravity Bioreactor Multimedia Module for Use in Chemical Engineering
Course Numerical Methods

In recent years, tissue growth is one of the basic tools of medical research. In cooperation with the medical community, the NASA bioreactor design is being used to culture mammalian cells into organized tissue. Also, NASA's bioreactor, as a precursor to cell culturing in space, has opened the possibility of improving tissue sample growth in on Earth outside the human body, but due to gravity the shear forces may damage cells. Scientists are performing experiment after experiment to over come this obstacle, and also find new uses of the bioreactor.

The information obtained from experiments performed by students and faculty at North Carolina A&T State University are being integrated into an undergraduate curriculum. This project explores the feasibility of creating multimedia programs that will enhance the problem solving skills, as well as provide exposure to commonly used numerical methods and data analysis techniques. Another integral part of the project is the emphasis on interactivity. The module will attempt to use multimedia imagery developed in Macromedia Authorware Attain to further illustrate ideas and concepts as well as keep students engrossed in the project. In doing so, engineering students are able to better demonstrate mastery of numerical methods concepts and experience alternative learning techniques.

Mahogany Mead
North Carolina A&T State University
Sophomore, Chemical Engineering
Dr. Keith Schimmel

Supercritical Fluids Multimedia Module for Undergraduate Studies

Supercritical fluids are very powerful solvents and as a result can be used to penetrate nearly everywhere. When used they do not leave behind any toxic residue, cause any contamination of the product, nor do they take away from the quality of the product unlike many organic solvents. More importantly they are environmentally safe and very inexpensive. These particular properties make them very useful for cleaning semi-conductors and replacing harmful organic solvents in certain industrial processes.

Graduate students in the NASA-Pair program at North Carolina A&T State University are carrying out further research on supercritical fluids on behalf of NASA. The data collected from these experiments will be analyzed and organized in a working multimedia module. This module will give a detailed description of what supercritical fluids are, their uses, and their effect on the work of chemical engineers. It will be used, as a trial teaching aid to see if a more hands on experience of chemical engineering work created by their peers will help students learn and appreciate more what they are being taught in the classroom. The module itself will be interactive and created by Authorware software.

Katif A. Peay, Alexander Anim-Mensah
North Carolina A & T State University
Junior, Chemical Engineering
Dr. Shamsuddin Ilias

Recovery of Liquid CO₂ From Process Solutions Using Membrane-Based Separations

In recent years the idea of replacing hazardous solvents with environmentally benign CO₂ has sparked great interest in the dry cleaning industry. The most commonly used solvent in dry cleaning, perchloroethylene, has been found to cause serious health and environmental problems.

Perchloroethylene is being replaced by liquid CO₂ as the primary cleaning solvent and surfactants are added to remove dirt from clothing, forming the process solution. This process solution is then used to remove dirt from clothing. The process solution, now mixed with dirt has to be separated so that the CO₂ can be recycled.

In this research the process solution was separated without phase change using membranes. To achieve this CO₂ in its supercritical state, or supercritical CO₂ (SCF CO₂), must be used. The relatively low critical temperature (31.1 °C) and pressure (73.7 bar) of CO₂, coupled with its wide availability, tunable properties, and low cost has made it the solvent of choice in extractive processes.

The membrane acts as a selective barrier that can distinguish solvent from solute based on their difference in molecular size. In this process Triton X-100 was used as the solute to test the functionality of the system. Using in-house designed fiber optic cells and a UV-VIS spectrophotometer the solute concentrations of the permeate and of the feed streams were measured. The feed flow rates, solute concentrations, and the effects of trans-membrane pressure were investigated. The membrane offers a good resistance to pure CO₂ and a high reactivity on low concentrations of the TX-100.

Kenya Pye
North Carolina A & T State University
Sophomore, Chemical Engineering
Dr. Keith Schimmel

Fuel Cell Multimedia Module for Use in All Applicable Areas

Recently, there has been a need for machines that will endorse cleaner air. Fuel cells are at the forefront of this revolution of environmentally safe mechanisms. They are the new alternative to the regular gas-functioning machines, such as rockets, cars, and planes. A fuel cell is an electrochemical device that converts the chemical energy of a reaction directly into electrical energy in a continuous process. The efficiency of conversion from chemical to electrical energy in a fuel cell is between 65% and 80%, nearly twice that of the usual indirect method of conversion. Recently, NASA officials have begun development of a solar-powered regenerative fuel cell system that will one day provide clean and efficient renewable electric power. I believe that the data acquired from NASA's experiments, which is being integrated into a multimedia module, can be used for Chemical Engineering students, who will now be able to incorporate new concepts learned in their Numerical Methods class or any other Chemical Engineering classes to evaluate real experimental data. Macromedia's Authorware software allows information to be interactively presented. By doing this, these Chemical Engineering students are better able to comprehend the concepts demonstrated to them by their Numerical Methods Class and experience unconventional methods for learning.

Raynard Sumpter
North Carolina A&T State University
Senior, Electrical Engineering
Dr. Clinton Lee

Dielectric Measurement Studies of Liquids

The utilization of electrical impedance analysis is put forth to evaluate the properties of liquids. Increasing import has been applied to liquids in the study of electronic materials. Beginning with water, structural properties of fluid substances are drawing increasing attention. Various properties of liquids are evidential of such parameters as particle size, cluster dynamics, particulate profile, and crystallinity. These properties are exploited in modern technology via optical, electronic, and magnetic processes. Besides dielectric constant, the loss tangent of the materials and the dielectric relaxation spectra of these materials will also be noted. A comparative study will be made based on the above investigation.

Reginald Watson
North Carolina A&T State University
Senior, Electrical Engineering
Dr. Clinton Lee

Novel Method for the In-Situ Patterning of Metal Thin Films

The in-situ manipulation of evaporated metal atoms during the deposition process is put forward as achievable through the use of the Stern-Gerlach Effect. A method for affecting the rate and precision of metal film deposition would be of great benefit to industry. Some type of focusing effect could reduce operation and material costs dramatically, while greater placement control would enhance versatility during the deposition process. Until now, methods of magnetically controlling the deposition process have not been extensively studied. Through this study, the feasibility of using the Stern-Gerlach Effect to magnetically control metal species in the evaporation process is to be examined. The usefulness of this method will be determined by the degree of modification produced by the existing rare earth magnet setup. The shadow mask pattern will facilitate thickness measurements by profilometer at locations all around the film. Repeatable effects will be statistically scrutinized in order to determine value added.

MATHEMATICS / COMPUTER SCIENCE

Toby Crandall
North Carolina State University
Junior, Applied Mathematics
Dr. Winser Alexander

Signal Characterization and Implementation Using Real Time and Data Simulated Signals

Our Goal is to create a Musical effects Pedal that can be used by musicians and vocalist in live performances. This portable device will enhance creativity and artistic style of the performer. I will model the input and output signal functions of the pedal using Matlab, will give understanding to real time implementation of the device in hardware.

Samantha D. Fields
North Carolina A&T State University
Senior, Computer Science
Dr. Mingxiang Chen

The Geometrical Structure of Some Fractals

Fractals are geometrical figures in which identical motifs repeat themselves on ever-diminishing scales, which is also characterized as computer art because of the beauty of the pictures generated. Fractals have many applications such as landscapes, compression, game programming, population growth, and galaxies. It is possible to generate fractals by hand, but it is very complex and time consuming even for mathematicians to do it. Therefore, most fractals are generated by using computer programs and many other visual programming languages.

The poster will illustrate the geometrical structure and the mathematical theory behind Fractals such as the Ternary Tree and the Sierpinski Sieve. It will also display the details about how these fractals are generated. Finally, some more efficient techniques regarding algorithms and programming will be highlighted and discussed.

Ahmad Harvey
North Carolina State University
Senior, Mathematics
Dr. Earnest Stitzinger

An Analysis of the RSA Encryption Method

The RSA encryption method is the best known of a family of systems whose security is dependent on the difficulty of the integer factorization problem. A large number n , which is a product of two prime numbers p and q , is encoded carefully as a secret message. RSA relies on the fact that for a large number n (say 100 digits), it is difficult for an intruder to decode the message.

The main objective of my analysis is to find the quickest algorithm that would be able to factor a 100 digit number that is the product of two primes. The first thing that had to be established was primality testing; the determination if a certain number is prime. Once the primality tests have been conducted (using the $6n+1$ method and a program that I wrote) the next task was to determine if the prime numbers were a factor of the given number n . I have used four different algorithms to determine the factors n . I have combined Pollards $p-1$ method, Pollards rho method, Fermat's method, and my own "brute force" method. Each method has a particular strength and I have incorporated each method into one algorithm to make use of their strengths.

Currently my factoring technique can factor a 14 digit number in less than 1 second. However, using my technique to factor a 15 digit number is not feasible. The ultimate goal of my analysis is to find a method that will factor a message of unlimited size in a very small amount of time.

Marcus White
North Carolina Agricultural and Technical State University
Junior, Computer Science
Dr. Albert Esterline

A Bid-Step heuristic to Increase the Efficiency of the Multi-Agent Implementation of the A* Algorithm

Through the use of heuristic search known as A* algorithm, we worked on path planning for a multiple or unknown number of mobile agents. The A* algorithm is a traditional algorithm that is used for finding the shortest source-to-goal path for an agent (robots) as long as the heuristic estimate does not overestimate the distance from the agent's present location to the goal. The traditional A* algorithm takes into account the starting point and goal point for an agent and the obstacles in its environment. Distances were estimated as Euclidean distances to give a lower bound on distance in a grid, where the paths of the mobile agent are measured as Manhattan distances. We extended the traditional A* algorithm to several mobile agents, where the search space is now the Cartesian product of the search spaces for the individual agents. However, the size of the search space used to calculate the shortest paths become exponential as the search space increases for multiple agents. A possible solution we have devised increases the number of steps each agent can take at the time of the A* algorithm's evaluation and simultaneous movement of all agents. This is applicable when all agents are at least a certain distance from the nearest obstacle and from each other.

PHYSICS

Shareed Ali

North Carolina Central University

Senior, Mathematics and Computer Science

Dr. Jyotsna M. Dutta and Dr. Branislav Vlahovic

Modification of Amorphous Hydrogenated Silicon by Using Infra Red Irradiation.

In order to study the possibility of influencing the phase containing predominantly Si-H bonds, while having minimal influence on the surrounding material, samples of a-Si were exposed to Duke-FEL Mark III radiation. The wavelength of the radiation was selected to fit the absorption maximum of stretching vibrations of Si-H bonds (5 μm). By varying the wavelength in the vicinity of 5 μm , the illumination time and the power density, different types and degrees of structural ordering, of Si-H bonds and Si-Si bonds were obtained, and monitored by Raman spectroscopy. By increasing the energy density, at certain level the crystallization occurs. We were able to demonstrate a direct correlation between short and intermediate range ordering and the wavelength and intensity of the radiation. Using 5 μm at 10 kW/cm^2 leads to increase in structural disordering. However, increasing power to 60 kW/cm^2 improves both short and intermediate order in a-si:H, as demonstrated by Raman spectroscopy. Further increasing power density by an order of magnitude results in crystallization of the sample.

ACKNOWLEDGMENT

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Mariamamma A. Kambon

North Carolina Central University

Senior, Physics

Dr. Branislav Vlahovic

Development of the Computer Code for the Simulation of the Polarimeter for High Energy Photons

Our group has developed a beam line polarimeter for use in photoproduction experiments with high energy polarized photons. In the polarimeter the photons pair produce in a thin amorphous plate and the angle made by the electron positron pair is detected downstream in four overlapping silicon strip detectors.

The electron-positron pair production, main process for high energy photons interaction with the matter, has large analyzing power for photon linear polarization. Our calculation shows that in the GeV energy range a compact polarimeter based on silicon micro-strip detectors can be constructed. We found a cross section as a function of an angle between the polarization plane and vector between positron and electron crossings of the detector plane, which is normal to the photon momentum. For thin radiator and equal energies of an electron and a positron the high analyzing power was calculated. For a beam intensity of 10^6 photons per second a 1% statistical accuracy of the polarization measurement will require less than one hour data taking run. The theoretical results will be shown and compared with the experimental data that I collect at Spring-8 Synchrotron facility in Japan.

ACKNOWLEDGMENT

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Justice F. McConnell
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Sophomore, Physics
Dr. Jyotsna M. Dutta and Dr. Branislav Vlahovic

Recrystallization of a-Si:H by Laser Beams.

Several a-Si:H thin films, about 1 μm (micrometer) thick, with different hydrogen concentrations, deposited by hot wire deposition and magnetron sputtering, were crystallized by a cw Ar ion laser of 514.5 nm wavelength, with power density between $0.8 \times 10^6 \text{ W/cm}^2$ and $1.2 \times 10^6 \text{ W/cm}^2$.

The process was monitored in situ by Raman spectroscopy (ISA U-1000 spectrometer supplied by water-cooled photomultiplier). The transformation from the amorphous to crystalline phase was detected by the change in the peak position from about 480 cm^{-1} to $505\text{-}516 \text{ cm}^{-1}$ and the change in the peak shape. The initial crystalline peak intensity increases, peak frequency shifts towards higher wave numbers and their FWHM decreases. After increased exposure time, the process saturates and there were no further changes.

Analyzing the measured Raman spectra, the grain size was estimated by using a semi-empirical formula related to the peak position while the average temperature of the irradiated volume was determined using the ratio of the Stokes and Anti-stokes intensities of the Raman spectra. Analyzing the surface under the crystalline peak as a function of time, the activation energy of crystallization process was estimated. The dependency of crystals size and activation energy on the initial degree of ordering, hydrogen concentration and power density is discussed.

ACKNOWLEDGMENT

The DoD through Grant No DAAD19-01-1-0795 supports this work.

Fatoumatta N. N'Dure
Shaw University
Senior, Physics
Dr. Benjamin Crowe

Analysis of D(d,t) H Data Taken at an Incident Deuteron Beam Energy of 4.75MeV.

This research project was to analyze existing nuclear physics data taken at the Triangle Research Nuclear Laboratory (TUNL) located on the campus of Duke University. The main objective of this analysis was to extract information to determine the analyzing power, $iT(q)$, for the $D(d,t)^1\text{H}$ reaction at 4.75MeV. An analyzing power is a quantity that describes the change in cross-section of a nuclear reaction when a polarized beam is used, and therefore is a measure of the reaction. A cross section is just the relative probability for a nuclear reaction to occur.

Delbert J. Patterson
Shaw University
Junior, Physics
Dr. Nhan Levan, UCLA Department of Electrical Engineering

Construction of a Class of Multiparameter Signals

The goal of this project is to construct orthonormal signals depending on finite number of parameters. Systems were researched with single, and double parameters, and the double parameter systems were found to have the least error. The problem is that signals have errors, being it a telephone or a computer signal. If someone can find what the specific error is in a signal, one can adjust the receiver or transmitter to that error so that you can receive the best signal. First a Laplacian transform was used to illustrate a signal. Then numbers were inputted into the system. Finally the mean square error of the results were taken. Through a mathematical illustration it was proven that the double parameter system had less error than a single parameter system.

Tennille Delores Presley
North Carolina A&T State University
Senior, Physics
Dr. H. Hallen and Dr. T. Nagle

Modifications of the Patch Clamp Technique

The patch clamp technique monitors the electrical behavior of ion channels in the cell membrane. It enables one to explore how ion channels affect membrane voltage, cell-to-cell communication, cell maintenance and are the targets of new drugs. Previously, most laboratories used the pipette-based patch clamp, a technique that carried several negatives, such as, bulky wiring, vibrations that produced distracting noises, and difficulties in obtaining an uninterrupted flow of fluid through the cell membrane. In an effort to reduce or eliminate these problems, a novel flat-patch clamp was constructed. Seven thin Silicon wafers, engraved with a hole approximately one micron in diameter, were used. Silver wire was etched through an electrochemical process involving KCl, HCl and deionized water, and was placed into the hole of the wafer cell and drops of saline solution are placed on the chip. A patch of the cell membrane is then clamped and is expected to allow solutions to flow freely. Early trials have shown that the etching of the wire reduced the diameter and made it easier to enter the opening in the clamp and reduce the noise generated by vibrations. Preliminary results indicate that the flat-patch clamp is more effective than its predecessor in monitoring the electrical behavior of ion channels. (Supported by MARC Grant T34GM07649-23)

Kevin Ramkissoon
North Carolina Central University
Senior, Physics
Dr. Jyotsna M. Dutta and Dr. Branislav Vlahovic

Polarimeter for High Energy Photons

The physics program at many research facilities: JLAB, LEGS, GRAAL, DESY, SAL, MAMI, and INS, will benefit from an improvement in the polarimetry for linearly polarization photons measurements. The scheduled fundamental experiments at Thomas Jefferson National Accelerator Facility include polarized photons beam in few GeV energy range. Development of the photon polarimeter with an absolute accuracy better than 5% for use in Hall B experiments is the subject of my presentation.

At the lower energies the pair production method off nuclei is known to be the most successful. However, because the opening angle between the e^+e^- pair decreases as the energy of the photon increases, this method has not been applied to higher energies. We extended this method to entire JLab energies regions, by taking advantage of the recent progress in silicon micro strip detectors for measurement of the geometry and angle correlation in electron positron pair production from an amorphous converter. At the same time we also improved it at lower energies. We have already built and tested a prototype. The preliminary results are promising and the measured analyzing power is as high as predicted.

Our experiment at Spring-8 in Japan, from March 3 to March 18 2001, made the first direct measurement of the azimuthal asymmetry in e^+e^- pair production by linear polarized photons in the energy range 1.5-2.4 GeV. More than 8 millions events were recorded. The asymmetry signal is strong. We had found a preliminary value of $A=0.17$. The statistical accuracy of this preliminary result based on small portion of data is about 0.02. The preliminary value of the asymmetry is less than the expected value $A=0.22-0.24$. However, it is an online result, which need offline corrections on acceptance and accidentals. The use of the ratio of the pair components energies should increase the value of asymmetry and reduce the value of systematic error of calibration. Detailed theoretical description of the process of pair production, analyzing power calculation and detailed description of the polarimeter will be given. I will also present the data that I collected during the experiment at Spring-8 facility at Japan and analyzed by the PAW++ computer code.

ACKNOWLEDGMENT: (The NSF through Grant No PHY-0099487 supports this work.)

**David Robinson, Anna-Lisa Paul, and Robert Ferl. SLSTP Program: Space-Flight Simulation Emphasis Group, NASA- Hangar L, Kennedy Space Center, FL.
North Carolina Agricultural and Technical State University
Sophomore, Physics
Ms. Sunnie Howard**

The Stability of RNA of the Arabidopsis Plant as a Component of Thermal Profiling Techniques: A Molecular Biology Assessment

The purpose of this research was to evaluate which temperatures no longer maintain RNA stability in harvested Arabidopsis plants through the use of various thermal profiling techniques. Typically Ribonucleic Acid (RNA) is stored at a temperature of -80°C to preserve integrity. This storage temperature is not always in a space flight situation. Various thermal profiles for storing harvested tissue such as in liquid N_2 (-196°C), -80°C , -20°C and room temperature were used as a comparison for various space flight simulations. The Molecular Biology Assessment evaluates the various thermal profiling techniques in their stability to sustain the stability of RNA of harvested *Arabidopsis thaliana*, in both simulated flight and ground controls. A set number of samples were stored in the new, uncharacterized stability agent, "RNAlater". Results can be used for further investigation into the best protocols for handling plants on the International Space Station.

Non-transgenic arabidopsis plants were grown in soil on agar media in a nutrient support system for two to three weeks. Thermal profiling for tissue samples in moderate temperature variations of in liquid N_2 (-196°C), -80°C , -20°C and room temperature were examined. Leaves were collected from the arabidopsis plants and were either suspended in "RNAlater" (Ambion), a tissue storage reagent used to stabilize RNA at room temperature, or frozen in liquid nitrogen in microfuge tubes. Analytical methods were then used to retrieve the RNA through the use of the Qiagen RNAeasy kit. The purified RNA sample was quantified with a fluorometer and observed with gel electrophoresis. One indicator of a high quality of RNA was the pair of ribosomal bands on the gel.

When observing an experiment such as this, many things have to be accounted for, such as the total time it took for samples to freeze in general and the total time it took for the samples to go through temperature variations [i.e. -196°C , -80°C , -20°C and room temperature]. Temperature can be a disadvantage to the experiment there are certain temperatures where RNA would be readily degraded without the "RNAlater". In order to accommodate data, temperature had to be observed accurately, through the use of thermocouples and a hydro data logger. If the temperature was not checked, samples were quickly lost and could not have been retrieved.

Not only were the five different profiles observed, but a very important aspect of the experiment was that of the flight-simulated tissue samples as well. Although the thermal conductivity profiles were degraded, indicating no detection of RNA stability (on the gel), RNA of the arabidopsis plant was detected in high and low concentrations in the flight-simulation. However, a new phenomenon was detected in the process. It has appeared that the stability agent, "RNAlater", was able to maintain RNA at room temperature, while in flight. So it was observed that RNA can be detected beyond its controlled freezing temperature of -80°C .

**Doryne Sunda Meya
North Carolina Central University
Junior, Physics
Drs. Branislav Vlahovic and J. M. Dutta**

Efficiency of Solar Flat Plate Collectors for Durham Area

In order to calculate efficiency and appropriate use of solar cell technology of a flat-plate collector, different kind of systems are studied. For each system the ratio efficiency/cost is calculated for the case of the city of Durham, North Carolina. The compared systems are the fixed tilt collector, the one-axis tracking flat collector with axis oriented north-south, the two-axis tracking flat-plate collector and the concentrating collector. The total solar radiation they received is compared to show the variability of a station's solar resource. They can be therefore optimized by the choice of the tilt angle.

This work is supported by the DoD through Grant No DAAD19-01-1-0795.

Zengtao Xiao, Kai Wang
North Carolina Central University
Senior, Physics
Dr. Branislav Vlahovic

Residual Stress Modeling In Quantum Dots

One of the possible applications of quantum dots is in a new generation of photovoltaic cells. Theory predicts the efficiency of this type of solar cells to be up to 63 percent, which is substantially higher than the theoretical limits existing in mono crystal solar cells (34%) or hetero junction (39% three junctions and 42% four junctions). The differences in thermoelastic properties between the quantum dots and substrate materials, such as thermal expansion and lattice mismatch, will cause residual stresses. These stresses in turn will affect the electronic and transport properties in the quantum dots. Using known thermoelastic properties and the finite element modeling method, the residual stress distribution is studied. Various factors, such as structure, thickness and sizes, will be discussed.

ACKNOWLEDGMENT

The DoD through Grant No DAAD19-01-1-0795 supports this work.

TECHNOLOGY

Stacy Raynor
North Carolina A&T State University
Sophomore, Electronics and Computer Technology
Dr. Dewayne Brown

Tuned Band-Stop Filter

The goal of my research project is to build and test a tuned band-stop filter. Software will be used to generate the frequency response of the input sine wave. Filters of different values will be created. Theoretical and measured values of the cut-off frequencies will be calculated and measured. The transfer function will be examined. The instruments used in this project will be the oscilloscope, digital multimeters, and the function generators. The components will be the capacitors, inductors, and resistors.

Dion Stallings
North Carolina A&T State University
Sophomore, Electronics and Computer Technology
Dr. Dewayne Brown

Ohmmeter Circuit

My research objective is to design and test a series ohmmeter circuit, a shunt ohmmeter circuit, and a voltage divider ohmmeter configuration. This project requires resistor potentiometers, Digital Multi-Meters, DC power supply, and a 1000-ohm meter movement. The methods involve constructing the different types of ohmmeter circuits and record the values off the meter movement. The procedures will illustrate the variation of resistance against the meter movement. My poster will describe the advantages, disadvantages, and characteristics among the ohmmeter configurations, as well as the practical uses of these circuits.

Tamarah Walton , Heavenly Key
North Carolina A&T State University
Sophomore, Electronics and Computer Technology
Dr. DeWayne Brown

Transistor Based Motor & Hall Effect Motor

The goal of the project is to build a simple transistor based brushless DC motor. The poster will show the results of torque versus current and speed versus torque plots. This poster will describe the advantages of using transistors to control the speed of a DC motor. The operation of the motor as well as applications of this motor will be revealed.

The goal of the project is to build a simple brushless DC motor that is based on the Hall Effect. The poster will show the results of torque versus current and speed versus torque plots. This poster will also show the advantages of using the Hall Effect on DC motors. The operation and applications of this Hall Effect DC motor will be revealed.

BIOLOGY / LIFE SCIENCES / ANIMAL SCIENCE / ENVIRONMENTAL SCIENCE

Tameka Bentley
North Carolina A&T State University
Senior, Animal Science
Dr. Charles Talbott

Breed, Environment and “Technician” Effects on Pork Quality Assessment

In order for small farmers to receive a premium price for their pork, it is important that their product stands out from the commodity pork. One way to provide value to the meat is to enhance the flavor. Objective evaluation of pork quality can be assessed by using indicators such as sensory tests that examine intramuscular fat, ultimate pH, water holding capacity and color. Non-objective quantifiers include evaluations from a trained taste panel. There are many factors that influence the aroma and palatability of the pork. Genetics, diet, management, sensory traits and preparation all play an important role in how meat tastes. This experiment examined how different breeds of swine living in different environments can alter the quality of the meat. The results of the experiment showed that the meat quality from pigs raised on pasture was inferior (drip loss, pH, IMF) to those raised in confinement or dry lot pigs. In comparing the scoring results of two technicians (one experienced and one novice) there were no differences in scoring color, however, intramuscular fat scoring was different among the technicians.

Shylise Simone Griffiths
North Carolina A&T State University
Junior, Biology
Dr. C. L. Browne and Dr. M. Tytell

The Effects of Exogenous Hsp70 on Coelomocytes of *Lytechinus Variegates*

Heat shock proteins (Hsps) are chaperone molecules that aid in the folding of other proteins, and they also participate in the cell cycle. In addition, some Hsps take part in the cell's ability to withstand various forms of stress. In the sea urchin, *Lytechinus variegates*, a coelomic fluid-filled cavity contains phagocytes, called coelomocytes, that change physically when exposed to stressful conditions. When placed in a hypotonic solution, the cytoskeletons are dramatically altered, with the normally broad lamellipodia being transformed into numerous long and slender filopodia. However, in the presence of Hsp70, coelomocytes are mostly rounded, with fewer filopodial appendages. It is believed that these stress-related transformations are the results of changes in actin microfilaments, which are characteristically grouped around the nucleus. When Biotin labeled Hsp70 is applied to a cell culture, it aggregates in or around the nucleus, suggesting that exogenous Hsp is internalized in a way as to inhibit signals regulating polymerization of the cytoskeleton. When these cells are assayed without stress induction, they do not produce a significant amount of Hsp70, however, when hypotonically stressed, Hsp70 production is up-regulated to assist in the folding of denatured proteins. Thus, heat shock proteins such as Hsp70, allow cells to operate normally and survive in a stress-filled environment. Supported by MARC Grant T34GM07649-23).

James M. Harris
North Carolina Agricultural and Technical State University
Senior, Chemical Engineering
Dr. Kenneth L. Roberts

Characterization and Mechanistic Determination of Dithionite Permeability through Lipid Membranes for Anti-Cancer Treatment Applications

The use of lipids to create a biocompatible capsule has applications in drug delivery systems where toxic drugs (especially for anti-cancer treatments) are loaded and retained in a lipid membrane capsule or “liposome”. This experiment focuses on the mechanism of triggered release and the rate at which the drug comes out of the liposome. More specifically, the experiment will examine and compare the different rates at which Dithionite permeates through liposome made at narrow range of temperatures. This experiment will also determine the transition temperatures of different lipid membrane compositions to potentially find new viable candidates for additional research projects. From the results, the permeability rate at the transition temperature for DPPC: 10% MSPC was 0.07371 min^{-1} as compared to previously measured dithionite ion permeability rates through pure DPPC 0.06 min^{-1} and DPPC: 10% MPPC 0.4 min^{-1} . The results also pointed out that the transition temperatures for 5 lysolipid compositions increased with increased hydrocarbon chain length. The conclusions drawn from this experiment supported the hypothesis made with the DPPC: 10% MPPC permeability being higher than DPPC: 10% MSPC and each lipid membrane composition having a specific transition temperature. Determinations the kinetic and mass transport phenomena associated with this system will be discussed.

Exazevia Logan, Diz DI, Averill DB, Ferrario CM, and Aileru AA. Winston-Salem State University and Wake Forest School of Medicine
Senior, Biology
Dr. Azeez Aileru

Neuroplastic Behavior at the Ganglion Level: Comparative Studies Between (mRen-2)27 and mRen2x Models of Hypertension.

Synaptic plasticity in superior cervical ganglia isolated from hypertensive (mRen2)27 transgenic rats is increased relative to control Hannover Sprague-Dawley rats, as measured by decay time constants of post-tetanic potentiation (PTP) and long-term potentiation (LTP) after a tetanizing volley (20hz/20s) in the presence of hexamethonium. A new line of congenic hypertensive rats, developed by transferring the mouse rennin gene to the inbred Lewis background (mRen2.Lewis), is hypertensive and has many but not all the same characteristics of the parent strain. Our data show that 16nM Angiotensin II increases the internal carotid nerve compound action potential by 14% in (mRen2)27 and by 8% in mRen2.Lewis animals. After a titanic pulse, PTP and LTP were significantly longer (PTP: 36min, LTP: $1.03 \times 10^3 \text{ min}$; n=8) in (mRen2)27 than mRen2.Lewis (PTP: 15min, LTP: 255min; n=7) hypertensive rats. The mechanisms responsible for these disparities in transmission are not known, but the data suggest that we can dissociate ganglionic changes occurring during genesis and maintenance of sustained high blood pressure from those related to genetic differences in synaptic plasticity using these two strains of animals. (HL51952, RR11583, GM64249, GM08040, HL6770).

Simone Sandiford
North Carolina Central University
Senior, Biology and Chemistry
Drs. Somnath Mukhopadhyay and Allyn Howlett

**Palmitoylation of the CB1 Cannabinoid Receptor:
A Regulatory Mechanism for Marijuana Action in the Brain**

The CNS-active compound in marijuana, Δ^9 -tetrahydrocannabinol (THC), acts at the CB1 cannabinoid receptors in the brain. The CB1 receptor is a G protein coupled receptor and associates with G_i and G_o proteins. Palmitoylation is a reversible post-translational modification that proteins may undergo before reaching full functionality. The CB1 receptor is palmitoylated at a cysteine residue on the C-terminus near the membrane lipid bilayer. The purpose of this project was to study the role of palmitoylation on the CB1 receptor-G protein association. Rat brain and N18TG2 neuronal cell membranes were chemically depalmitoylated by treating with hydroxylamine. The control was incubated without hydroxylamine, and another control was repalmitoylated with palmitoyl CoA. The control, depalmitoylated and repalmitoylated membranes were solubilized in CHAPS detergent and the receptor-G protein complex was coimmunoprecipitated with an antibody to the CB1 receptor. The immunoprecipitated proteins were resolved by SDS-Urea-polyacrylamide gel electrophoresis and the CB1 receptors and G proteins were immunodetected by Western analysis with enhanced chemiluminescence. It was observed that after depalmitoylation, $G_{\alpha i3}$ and $G_{\alpha o}$ immunoreactivity could not be detected compared with untreated and repalmitoylated controls. It was also observed that $G_{\alpha i1}$ and $G_{\alpha i2}$ were detected at about the same levels as in the controls before depalmitoylation. These results suggest that changes in the palmitoylation could produce changes in the $G_{\alpha i3}$ -CB1 and $G_{\alpha o}$ -CB1 receptor association. These results imply that palmitoylation of the CB1 receptor may regulate the specificity of the CB1 receptor -G protein complex.

This research is supported by National Institute on Drug Abuse grants.

ClarLynda R. Williams
North Carolina Central University
Junior, Environmental Science Program
Dr. Ann M. Richard, National Health and Environmental Effects Research Laboratory, Office of Research and Development, US Environmental Protection Agency, Research Triangle Park, NC.

**Proposed Standard to Greatly Expand Public Access and Exploration of Toxicity Data:
Evaluation of Structure Data File Format**

The ability to assess the potential toxicity of environmental, pharmaceutical, or industrial chemicals based on chemical structure information is a shared goal of academic, commercial, and government regulatory concerns. Whereas these diverse interests often have different requirements for toxicity assessment, what they share is a need for broad, unrestricted access to existing public toxicity data linked with chemical structure information. The problem, however, is that public sources of toxicity data span diverse toxicity disciplines (e.g. ecotox, cancer, developmental tox), exist in many locations and in many different formats, and most often do not contain chemical structure information. Hence, current sources of toxicity information fail to address the needs of the research and regulatory communities to have flexible and unrestricted structure-searchable access to public toxicity data for use in toxicity screening, model development, or incorporation into chemical toxicity databases. The current project involves development of a distributed structure-searchable public toxicity database network that will enable free public access to toxicity data files, and effectively link knowledgeable toxicity data sources with potential users of this data from other disciplines (such as chemistry, modeling, and computer science). A key requirement of the project was to identify a suitable and universal format for data representation and exchange. After evaluation of various alternative data mining tools and formats a common, standard structure-data file (SDF) format was identified. SDF is a simple text-based format for storing structure and text information that is already being used as an industry standard for exchanging data between chemical relational databases. However, we have found many instances where application vendors have inadvertently corrupted the SDF standard in their exporting functions. The present research is exploring efficient means for generating and distributing SDF files of public toxicity data, as well as identifying and offering feasible solutions for maintaining the integrity of SDF as a standard file format.

This abstract does not necessarily reflect EPA policy or endorsement.

CHEMISTRY

Margaret H. Brown & Cynthia L. Sherman

UNC Pembroke

Department of Chemistry & Physics

Dr. Len Holmes & Dr. Siva Mandjiny

Plastocyanin: Protein Extraction and Purification

Plastocyanin is blue-copper protein. It is held in the chloroplast by moderately tight binding and accounts for almost one-half of the copper in that structure. Plastocyanin has been found in many higher plants including green, red and some blue-green algae. Its molecular weight will vary depending on the species' of origin. The protein is blue in the oxidized state and colorless in the reduced form. Its purpose in the plant is to function as a mobile electron carrier between the cytochrome b6 complex and photosystem 1 in the process of photosynthesis.

The objective of this research was to extract and purify the protein plastocyanin from spinach (*spinacea oleracea*). The protein was extracted according to an article feature mentioned in Methods in Enzymology (Ellefson, W., Krogmann, D., & Ulrich, E. *Plastocyanin*. *Methods of Enzymology*; Volume 69 pg. 223-228.). Techniques employed in this process included, homogenization, centrifugation, and ion exchange chromatography. The protein-potassium phosphate suspension was then concentrated using Amicon Ultra-Filtration Cell and The Lowry assay was used to determine the approximate concentration of the protein solution.

Genese Culp

North Carolina Central University

Senior, Chemistry

Dr. Saundra F. DeLauder

Changes in Hair Ultra-Structure Studied with a Spectroscopic Assay

The detection of therapeutic as well as illicit drugs in hair has the major advantage of an increased window of detection compared to detection in sweat, blood, or urine. While there are many advantages to hair analysis as a forensic tool, there are still questions concerning the mode(s) of drug incorporation into hair. Results from a previous spectroscopic analysis suggest that one route of entry for cationic moieties into the hair is through exogenous incorporation in aqueous media and that cosmetic treatments may also effect this phenomenon.

Using a previously developed assay, DMADA will be incorporated into virgin hair in the presence of 100mM sodium hydroxide, urea hydrochloric acid, and guanidine hydrochloride solutions in order to access the permeability of hair in solutions used in common hair preparations. These results will be compared with previous studies performed on the same hair type in the absence of chemical treatment as a control.

Ryan D. Kinloch

North Carolina A&T State University

Senior, Chemistry

Dr. H. Voegtle and Dr. T. Bryson

Electron Transfer Tools and Models for Molecular Wires

Molecular electronics and nanoscale devices are an interesting and exciting new field of technology that may prove to provide many breakthroughs to further advance society. One such nanoscale device that is a key component of molecular electronics is molecular wires. Organic molecules are of primary interest in the development of molecular wires and molecular electronics due to covalent double bonding and conjugation. Construction of one type of molecular wire involves preparation of an osmium terpyridine complex, synthesis of a boronic acid, and Suzuki coupling of the two components. The resulting molecule, triphenylterpyridine osmium complex, is predicted to help assist in the identification of proposed intermediates formed during the reaction cycle of Cytochrome P450. Identification of these compounds will hopefully lead to a better understanding of the Cytochrome P450 class of enzymes. Spectroscopic analyses indicate that key precursors of the components of triphenylterpyridine osmium complex were synthesized.

(Supported by MARC Grant T34GM07649-23)

N. Hazel Ogugua
North Carolina Central University
Senior, Department of Chemistry
Alan Vette and Ron Williams, U.S. EPA, National Exposure Research Laboratory RTP, NC

Exposure Analysis of Personal and Indoor PM_{2.5} Nephelometer Data from the NERL RTP PM Panel Study

The NERL Research Triangle Park Particulate Matter Panel Study was conducted from June 2000 to June 2001. The yearlong study involved two susceptible sub-populations (participants with built-in cardiac defibrillators and an African-American cohort having hypertension and living in a neighborhood of low-moderate socioeconomic status). All of the participants were non-smokers and at least 50 years of age living in individual residences. Personal and residential indoor PM_{2.5} nephelometer (MIE pDR-1000) monitoring for each participant was conducted for a total of 28 days (7/days per season). Each monitoring day represented a continuous 24-hour period. The participants completed a 15-minute interval time activity diary and an activity questionnaire each day. In addition, each participant was shown graphic representation of their personal and residential nephelometer readouts at the conclusion of each monitoring day and queried as to the possible sources/human activities might have influenced the observed values. Information from all of the above was then used to label data from the real-time personal and residential indoor monitoring in an attempt to characterize episodic PM_{2.5} emission/re-suspension sources. Results from the analysis indicate that cooking aerosols, environmental tobacco smoke, and cool mist humidifiers significantly contributed to PM_{2.5} concentrations. For example, during one 3-hour period of time, a peak concentration of 340 µg/m³ of cooking aerosols was observed. Data from this exposure analysis will be presented and progress up-to-date will be reported.

Akilah Skerrette
North Carolina Central University
Senior, Chemistry and Environmental Science
Dr. Eileen Birch, NIOSH/DART, Cincinnati, OH

Measurement of Diesel Particulate Matter by NMAM 5040: Blank Correction and Analytical Standard for Quality Assurance

Diesel exhaust has been classified as a probable human carcinogen and NIOSH has recommended that employers reduce workers' exposures. Recently, the Mine Safety and Health Administration (MSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) proposed new air standards for diesel particulate matter (DPM). The MSHA standard specifies measurement of particulate carbon, while the ACGIH standard targets elemental carbon. A National Institute for Occupational Safety and Health (NIOSH) analytical method, NMAM 5040, was recently developed for DPM measurement. The method is based on a thermal-optical analysis technique for organic and elemental carbon (OC and EC, respectively). Although NMAM 5040 was thoroughly evaluated, an OC-EC reference material is not yet available.

Preparation techniques for an analytical standard that could be used by laboratories for quality assurance were investigated. A second issue related to OC-EC analysis is blank correction for adsorbed organic vapors. High variability in OC results for filter blanks precludes accurate blank correction. Moreover, use of traditional field blanks is not appropriate for correction because the amount of OC on the blank may not be representative of the sample. An alternative means for blank correction is described. The approach involves collection of air samples with cassettes containing two stacked filters, with a bottom quartz filter being used for blank correction.

COMPUTER SCIENCE / MATHEMATICS

Beth Adams
North Carolina Agricultural and Technical State University
Junior, Computer Science
Dr. Albert Esterline

Modifying a Multiagent A* Algorithm to Favor Paths that Maintain Distance between Agents

Through the use of the heuristic search technique known as the A* algorithm, we worked on path planning for a multiple or an unknown number of mobile agents. The A* algorithm is a traditional algorithm that is used for finding a shortest path for an agent (robot) as long as the heuristic estimate of the distance from the agent's current location to its goal does not overestimate the distance. The traditional A* algorithm takes into account the obstacles and the starting point and goal point for the agent. Distances were estimated as Euclidean distances to give a lower bound on the distance in a grid, whereas the paths of the mobile agent are measured as Manhattan distances. We extended the traditional A* algorithm to several mobile agents, where the search space is now the Cartesian product of the search spaces for the individual agents. The straightforward generalization of the A* algorithm to two or more agents, however, does not anticipate when two agents may be about to collide. This results in unrealistic paths (with sharp turns) and wasting time searching multiple paths that are clearly suboptimal. So we penalize multiple paths that bring pairs of agents too close to each other. This is implemented by adding a term to the heuristic function; this term is a decreasing function of the distance between the agents.

Carl Baker Jr., Lesley Hosein, Lovella Parker, and Brenda Love
North Carolina Central University
Senior, Mathematics and Computer Science
Dr. Alade Tokuta

University Internet Class Enrollment

The University Internet Class Enrollment system is an Internet application to allow students at any university that utilizes the system to enroll in their classes. The system is designed to be flexible enough to allow other universities to remotely import their class schedule and data, via the Internet, into the system without any further interaction. The system also tracks student progress in the major. In addition to the web application, there is another separate Windows desktop application to allow administrators to do general maintenance on the system (add/delete classes, update class data, etc).

Kenshasa Barnette
North Carolina Agricultural and Technical State University
Junior, Computer Science
Dr. Albert Esterline

A Multiagent A* Algorithm

The A* algorithm is a traditional algorithm that is used for finding a shortest path for an agent (robot) as long as the heuristic estimate of the distance from the agent's current location to its goal does not overestimate the distance. The traditional A* algorithm takes into account the obstacles and the starting point and goal point for the agent. Distances are estimated as Euclidean distances to give a lower bound on the distance in a grid, whereas the paths of the mobile agent are measured as Manhattan distances. We extended the traditional A* algorithm to several mobile agents, where the search space is now the Cartesian product of the search spaces for the individual agents. The value we minimize is the sum of the lengths of the source-to-goal paths of the agents. This can be a weighted sum to reflect priorities among the agents. We concentrate on the two-agent case, but we are developing an implementation that can handle any number of agents.

Haverlean Bradshaw and Bejai Powell
Fayetteville State University
Junior, Computer Science
Mr. O.C. Holloway

Fibonacci's Numbers - An in-depth look at Pascal's Triangle and Rabbit Reproduction

Fibonacci first investigated the concepts of how rabbits reproduce in the year 1202, since then Fibonacci's Numbers and Sequencing can be found in everyday life. It can be found in the regeneration and patterns of plants, fruits, garments, animal life, etc. For this research venture, we will discuss two methods of applying the use Fibonacci's Numbers and Sequencing. The two methods used are the Pascal's Triangle and Rabbit Reproduction. Detailed explanations of how to make and find Fibonacci's Numbers and Sequencing using those methods will be given. As part of the discussion a brief summary of the background information on the history of Fibonacci and Pascal's triangle will also be discussed. [This work was part of a Fall Semester research project sponsored by the National Science Foundation (NC-LSAMP)]

Nickolia Coombs, Malcolm Player
North Carolina A&T State University
Sophomore, Computer Science
Dr. Albert Esterline

Multi Agent Motion Planning

If you train a number of dogs to find something the same way and let them louse on a field they are bound to run it to each other. Dogs will probably have enough sense to walk around each other. A computer on the other hand does not have this sense and that's where I come in. My job as part of the motion planning team is to design what to do when agents collide. By adding code to Lee's algorithm I cause agents to either never collide with each other or move around each other if they do. Lee's algorithm is a process of calculating the shortest path from a starting point to a goal. It assigns numbers to every path from point a to b then calculates the shortest path.

Michael C. Faulcon, Jr.
North Carolina A&T State University
Senior, Computer Science
Dr. Albert Esterline

Coordinating the Paths of Multiple Agents Independently Planned Using an A* Algorithm

This project is part of an undergraduate research study supported by NASA through a grant entitled "Motion Planning in a Society of Intelligent Mobile Agents." We are working towards a package that will plan paths for mobile robots to travel from their start positions to their goal positions on a grid without colliding with one another. In addition, these agents will be avoiding other task-hindering obstacles, and the shortest feasible paths are sought. The implementation is being carried out using an A* heuristic search algorithm. The algorithm uses Euclidean distance to give a lower bound on distances in a grid, where the paths of the mobile agents (robots) are measured by Manhattan distance. The A* algorithm is run for each agent, but paths that result in collisions are not expanded. We also allow for some control through human-computer interaction. This way they will be intelligent enough to function on their own and we will still be able to modify their goals or add subgoals if the need or desire arises.

Jaspreet K Gill
North Carolina A&T State University
Senior, Computer Science
Dr. Albert Esterline

Joint Activity Coordination and Planning in Multi-Agent Environments through Computer Integrated Communication

The idea of having people on common ground allows for the production of communication and completion of tasks. Computers have the potential to increase the efficiency with which these tasks are successfully completed, but problems related to the integration of computers toward solutions must be resolved. Modeling human cooperation through joint activities, common ground, and joint projects utilizing the action ladder can serve to guide the integration of these tasks. Our research attempts to find such methods of using computers as the arbiter of tasks that require intensive cooperation. We concentrate on identifying effective types and important content of communication, which guide the cooperation toward successful completion of a joint activity. The project, which I am working on right now, addresses human coordination in multi-agent environment, where communication is contained in simple interface objects. The joint activity involved here is completed via using pop up menus, a white board and also involving human controlled proxy agents traversing a static environment split into a grid of discrete cells either empty, or containing an agent or obstacle. The most important thing necessary to complete this joint activity successfully is a handshake that is the constant agreement between the multi-agent controllers. I am involved in creating a grid of discrete cells, the whiteboard via pop up menus. The controllers will be able to access the whiteboard and the grid and discuss their moves to communicate with each other to complete the given task.

Twilya McNeal, Merrily Neill, Xeng Tao Xio, and Julius Asubonteng
North Carolina Central University
Senior, Mathematics and Computer Science
Dr. Alade Tokuta

My Vote Voter Registration System

The “My Vote” voter registration system is a database to support the voter registration process for North Carolina. It is designed to that ensure all eligible voters are registered within their county. Based on North Carolina’s new centralized voter registration system, voters can be entered directly into the database by data entry clerks. Information about the voter is logged into the registration and can be tracked by a unique voter number. This project is implemented in Lotus Notes with Domino R5.

Stacey Moore, Renard Mckenzie, Damien Berahzer, and Sarah Sandiford
North Carolina Central University
Senior, Mathematics and Computer Science
Dr. Alade Tokuta

Jacobsen Airport Security System

The Jacobsen Airport Security project implemented as an internet application is intended to serve as a means for managing camera security for some of the major airports in the world. Currently, there is a push for better security in airports around the world. This system tackles one aspect of improved security innovations. The functional purpose of the system is to allow users to view security cameras located in various airports from one centralized location. The user logs in to the system, selects a particular secured airport location, and monitors the selected camera areas.

Malcolm Player
North Carolina A&T State University
Junior, Computer Science
Dr. Albert Esterline

Using a Distance Function in Collision Avoidance in an Application of Lee's Algorithm for Multiagent Path Planning

My project was on the topic of Multi-Agent Motion planning. This involves having more than one agent go across the same space or grid. Imagine if you had two robots in your house. One of the robots vacuums your floor and the other one is getting you something to eat. Well the robots are going to be on the part of the house as you. So they some how have to get to their goals with out colliding into one other or colliding into other objects on the floor. So by using Lee's algorithm we figure out the shortest path for the agents to take. Then we basically gave the agents a little AI by giving it the choice to either wait for while, change paths, or keep going on the path its on. We develop a function that computes the distance the agents are form one another. So we had to create a standard mean of how many clicks or paces that when the agents get within that limit then we call the function that decision function.

Edward Saddler
North Carolina A&T State University
Senior, Computer Science
Dr. Albert Esterline

Coordination and Motion Planning in Multi- Agent Environments through Computer Integration

This research that is being conducted is part of an undergraduate project supported by NASA titled "Motion Planning in a Society of Intelligent Mobile Agents." "The research we conduct attempts to identify certain methods done with computers that can be used to perform certain tasks through cooperation from multiple users. With this we can identify effective types of communication between joint users and also from the agents to the user. Instructions for agent movement through cells on a grid are traded back and forth to eventually lead it to a final destination, avoiding collision from other agents that are within the grid and avoiding obstacles that may keep the agent from moving through the static environment without interruption.

Patrick Spears
North Carolina A&T State University
Senior, Computer Science
Dr. Albert Esterline

Rules of Engagement for Computer Facilitated Cooperation

This research is part of an undergraduate research project supported through a NASA grant titled "Motion Planning in a Society of Intelligent Mobile Agents." In modern computer science, the communication between multiple users is highly valued. The aim of our research is to establish and explore ways to support joint activities such as communication between computers and users. The test application we are using, involves users navigating agents around a grid to reach a common goal. Each user controls exactly one agent and must avoid obstacles to reach that goal from there initial position. Agents must not collide with each other; therefore communication is vital between the two users. The test application is synonymous to a face-to-face conversation involving two people. In most cases there are two roles in a conversation, the speaker and the addressee. For the conversation to proceed correctly, it is critical that the addressee remain engaged in the conversations by performing certain acknowledgement actions, such as shaking his/her head to verify that they are still engaged in communication. It is also critical that the two participants switch roles smoothly or take turns in communication. We are exploring ways to support such activity in computer-facilitated cooperation by the use of a communication medium. The medium we are using is between the two users which allow them to relay plans to accomplish a goal. To implement this form of communication we are using client/server technology to form a graphical user interface. We plan to use Java to establish and maintain communication between all involved parties over a network.

Renard D. Spratling
North Carolina A&T State University
Sophomore, Computer Science
Dr. Albert Esterline

Multi-user Distributed Workspace for Human-Computer Integration and Joint Motion Planning

In modern computer science, the communication between multiple users and transfer of data is highly valued. The aim of our research is to establish effective means for allowing users to work together towards a common goal while at separate machines as well as identify methods of using computers as the arbiters of tasks that require intensive cooperation. The goal consists of the users cooperatively planning and navigating mobile agents from a starting to a finishing point on a grid while avoiding collisions with static obstacles and other agents. We have also introduced into the environment intelligent agents, which plan and traverse their paths with no human assistance. The ideal is to find the solution that gets all the agents to their destinations in the shortest time possible. To determine these optimal paths, we use two methods: a modification of Lee's algorithm and a heuristic search known as the A* algorithm. In addition, we have successfully implemented an integrated version, which can include human controlled and/or intelligent agents. A communication medium has been established that allows the human users and planning agents to relay plans for accomplishing the goal by using message passing functionality and whiteboards. We are implementing such communication by utilizing graphical user interface functionality and client/server technologies available with the Java programming language. We are currently incorporating the human controlled aspect of the project with the automated process, all the while ensuring the proper distribution of data to all users.

ENGINEERING / TECHNOLOGY

Darius Helton and Dencil Antonio Rolle
North Carolina A&T State University
Senior, Architectural Engineering
Dr. Sameer Hamoush

The Flexural Performance of Masonry Wall Systems Externally Reinforced with FRP Composites

The flexural behavior of the masonry wall systems reinforced in the tension side with various cross-sectional areas of FRP (Fiber Reinforced Polymer) composite was investigated. The focus of the study was to validate the basic strength of material concepts in terms of the deflection calculation and the stress distribution across the section. Nine compact masonry wall panels (3' x 2' x 8") will be tested as a simply supported beam under out-of-plane static loads. Three different configurations were tested in which a total of 3 for each configuration. An MTS machine was used to test each panel under three point bending conditions. The applied loads, mid-span deflection were investigated. Based on the results of the experimental program, it was concluded that the mid span deflection obtained from the experimental measurements matches the calculated deflection using the basic equations of strength of materials. Also, the deflection validation was extended to include calculation of moment of inertia for the section consists of two different materials. The stress distribution across the section was also compared to the prediction by the strength of materials bending stress formula and it was in good agreements with the measured values.

Christopher L. Murphy
Center for Advanced Materials and Smart Structures
North Carolina A&T State University
Senior, Mechanical Engineering
Dr. Devdas Pai. PE

High-temperature Properties of Ceramic Fibers and Composites

Ceramic Matrix Composites (CMCs) have great potential to replace many components currently manufactured from Titanium and Nickel super-alloys. Possible uses of CMCs include combustion liners, turbine blades, hot gas ducts, and exhaust nozzles. CMCs are not currently used for design because there is not enough empirical test data on these materials.

We are testing a CMC that uses Nextel 720™ fiber with an alumina matrix. Bare fibers of this material degrade at temperatures above 1150°C. The fibers in our study have been coated with a non-wetting oxide, in an effort to weaken the strength of the interface between the matrix and the fibers, thereby allowing the matrix to stay intact and protect the fibers from oxidation.

Tension tests have been developed to test mini-CMCs at temperatures of 1300°C. The goals are to both develop an effective test method that will give very high statistical reliability (measured by the Weibull Modulus parameter). If successful, this experiment could lead the way for materials of this type to be used in standard design applications, with published design values like those found for metals and plastics.

Rigoberto Nova-Matute, Eric Adams, Josh Waring, Khang Dang, Chris Cameron, Tai Ho, Chris Elliot
University of North Carolina at Charlotte
Senior, Mechanical Engineering
Dr. James F. Cuttino

The Charlotte Moonbuggy

The Marshall Space Flight Center in Huntsville, AL (NASA) sponsors an annual competition event among US high schools and universities. This event requires students to design a vehicle that addresses a series of engineering problems that are similar to problems faced by the original Moonbuggy team.

The purpose of this project was to create a moonbuggy that satisfied the conditions for participating in the NASA sponsored competition. Our “buggy” was designed to fit in a 4' x 4' x 4' box unassembled and be human powered. There had to be room enough to seat two drivers and the layout had to be based on the engineering designs, with specified criteria. The product met expectations of a prototype but should not be considered as a final solution to the problem. The completed project had to meet safety and performance guidelines in addition to possessing a TV monitor, 2 batteries, antenna, and a U.S. Flag. These do not have to be “real” products, but rather constructed things (in our case from cardboard boxes).

The prototype will be presented through Microsoft PowerPoint where it will cover in greater detail the aspects of alternatives, design, calculations, and other important factors.

William Rhinehart, Melanie McEwen, Katherine Bagley, Tameka Riddick
North Carolina A&T State University
Senior, Industrial Engineering
Dr. Sanjiv Sarin

Waste Reduction in the Inspection, Packing, and Shipping Department of Alcoa Davenport Works

Dangerous Minds consists of four focused Senior Industrial and Systems Engineering students. The intent of this project is to enable the students to combine theoretical practice with real-life applications and industry design. The industry practice will ultimately enhance the academic experience while aiding industry participants. The assigned facility is Alcoa Davenport Works, a business unit of Alcoa that manufactures aluminum sheets for commercial usage. The project focus is driven towards Industrial Engineering aspects specifically inspection, packing, and shipping (IPS). As a professional organization, Dangerous Minds will also focus on several factors to ascertain a specific outcome in every job addressing facility enhancement.

Improvement opportunities have been identified in the H-Frame, Mill Pack, Straight Pack, and No Mar area of Inspection, Shipping, and Packing used for processing flat and plate products. Alcoa Davenport Works has expressed the need to reduce set up times between specifications that could possibly exceed 10,000 dimension changes. Dangerous Minds was contracted to fulfill the major objective of reducing all types of waste including time, space, and money while improving productivity. By conducting this study and applying Industrial Engineering principles, we will benefit Alcoa Davenport Works with increased production of flat and plate products through the work centers. The process of the project will be conducted using the scientific method. The guidelines for all work will be cited from the Alcoa Production System. The concepts used are stated below:

- The work of each person should be highly specified.
- Binary Communication.
- Improvements must occur at the lowest possible level of the organization.
- Continue to improve towards the ideal.

With our recommendations, we adamantly believe that Alcoa Mill Productions will have a vibrant and thriving foundation for success.

Cornealious Scott and Joshua Locklear
North Carolina A&T State University
Senior, Architectural Engineering
Dr. Sameer Hamoush

Axial and Bending Strengths of Various FRP Composite Systems

This research focuses on manufacturing various FRP (Fiber Reinforced Polymer) composite systems that are to be tested under axial loads and bending flexures. In this research program, an experimental program was performed to evaluate the axial and flexural engineering properties of various FRP architectural configurations. In the testing program, eight configurations were tested in axial tension and the remaining eight configurations in flexural bending. The evaluated configurations consisted of two fiber materials, carbon and glass, and two lay-ups of the fiber orientations. The fiber orientations were limited to $0/90^\circ$ and $\pm 45^\circ$. The fiber balance was maintained for all specimens of the experimental program. Also, the basic concepts of axial deformation and mid span deflection adopted by the strength of material were used to validate the measured values of both axial deformation and mid-span deflection. It was concluded in this investigation that the basic strength of material concepts present actual deformation values when the stress level is in the elastic zone.

Also in this program, the elastic modulus of various FRP system configurations (E) using the direct tension specimens and the equivalent moment of inertia using the flexural testing specimens for each of the proposed configuration were estimated.

LaToya Sylver, Chris Murphy, David Blood, Jotiva Hobbs, Jamie Provost, Leigh Reeves
North Carolina A&T State University
Seniors, Industrial Engineering
Dr. Samuel Owusu-Ofori, Dr. Celestine Ntuen, Dr. Shih-Liang Wang

Ergonomics in Aircraft Production: Sealant Gun Applications

The aircraft industry requires that the head and tail of each fastener be sealed in order to avoid loss of cabin pressure due to air leakage. The average aircraft is assembled with millions of fasteners each of which is sealed manually with hand-held sealant guns. The sealing process leaves a stream of sealant that must be cleanly sheared or “swirled” off the surface by the operator. The swirling motion has been determined to cause injury to the joints of the operator. Operators are also at risk of developing injuries to the fingers and wrist leading to lost time. The objective of this project is to design or modify a sealant gun in order to reduce harmful repetitive motions. The gun must enhance the ease of operation while meeting Boeing Company specifications. The paper and presentation will discuss (1) the ergonomic issues relevant to this process, (2) the development of a suitable design, (3) manufacturing of a prototype, and (4) testing and evaluation of the prototype.

Terrence Willoughby
University of North Carolina at Charlotte
Junior, Electrical Engineering
Mr. Nathan Cheung

The I-V Electrical Characterization of GaN (Blue LED Material)

The search for light emitting diodes (LED's) emitting in the blue spectrum began early in the 1960's. The discovery of gallium nitride was the only type of LED material capable of producing blue light. The I-V characterization of gallium nitride light emitting diodes shows that sapphire has a higher serial resistivity than silicon. The experiments show that silicon is a better substrate material for gallium nitride for optoelectronics devices, because it reduces the amount of power consumed.

JeVon Wilson
University of North Carolina at Charlotte
Junior, Mechanical Engineering
Dr. Petru Petrina, Jaime Ballester
Cornell University, Ithaca NY

Composite Helical Springs

Composite helical springs are among the most unique and useful types of springs being fabricated today. These helical structures cover a broad spectrum of applications, and in many cases bring an added ingredient that previously was never thought of, or incapable of reaching. The goal of my research was to ultimately find a way to design a more rigid carbon-composite helix by incorporating a variety of pitch and coil patterns. This enhanced spring could then be used as a potential substitute for the same applications that steel springs have today. The main reason that carbon composites themselves lack a substantial amount of stiffness is because of their low shear modulus. The shear modulus is a numerical value that tells the maximum load a particular material can take before it shears and the material fails, or buckles. A properly designed carbon-composite spring would be non-corrosive, offer fatigue resistance, and essentially be lightweight without compromising any of the composite material's strength. These key characteristics of carbon are lacking qualities of steel, which are joined by other drawbacks of steel spring production. Such drawbacks include steel's magnetic properties, conductivity, and high coefficient of thermal expansion. Hence, by finding a way to increase the stiffness of carbon-composites to match that of steel, one finds the opportunity to significantly enhance industry with new and innovative technology.

Michael Wright, Angela Marks
North Carolina A&T State University
Junior, Sophomore, Technology
Dr. Derrek B. Dunn

Design of an Optical Transceiver

This oral presentation will discuss the design and implementation of an optical transceiver that can be used in wireless local area network (LAN) that allows for secure communication between multiple computers. The design of the transceiver is implemented using infrared LED's and phototransistors. Using infrared LED's as a means of communication has some unique properties when compared to other forms of media. Infrared LED's are useful where wires cannot be physically connected to a remote location. Unlike wires, infrared LED's do not require any special shielding over a long distance. The design of the optical transceiver allows full duplex communications.

PHYSICS

April Lynn Cox
Fayetteville State University,
Junior, Chemistry
Mr. O. C. Holloway

Material Balance and Heat Transfer Calculations for ^{237}Np Targets

The Department of Energy supplies NASA with long-life portable heat sources for use in remote locations such as deep space. To perform this task DOE provides a special isotope, ^{238}Pu (plutonium), produced from reactor irradiation of ^{237}Np (neptunium) targets and subsequent post-irradiation chemical processing. The Radiochemical Engineering Development Center (REDC) at ORNL has been selected to carry out this project. As part of the planning studies, the REDC fabricated ^{237}Np targets for irradiation and processed those targets to recover and purify the ^{238}Pu . Once processing was finished, the data were analyzed using a spreadsheet format (Microsoft Excel). Material balance flow sheets were constructed for understanding product recovered, waste products, and analysis of the ^{236}Pu impurity. The results will aid in determining future ^{237}Np target design. Also, a detailed calculation of the heat transfer and temperature profiles across a neptunium oxide-aluminum target rod was performed based on calculation techniques using a previous model for a curium oxide-aluminum target rod. [This work was part of a summer internship at ORNL sponsored by DOE and NSF (NC-LSAMP).]

Ibrahima Mbaye
North Carolina A&T State University
Junior, Physics
Dr. Soloman Billign

Far Wing Studies of $\text{Li}(4p) + \text{Ar}, \text{H}_2$ and CH_4 Collisions

The direct collisional energy transfer process $\text{Li}^*(4p) + \text{H}_2, \text{Ar},$ and CH_4 is investigated under gas cell conditions. In particular, we measured the nonreactive far-wing absorption profile of $\text{LiH}_2, \text{LiAr}, \text{LiCH}_4$ complexes in the red wing by monitoring the $\text{Li}(4s) \rightarrow \text{Li}(2p)$, and $\text{Li}(3d) \rightarrow \text{Li}(2p)$ fluorescence. Unlike the $\text{Li}(3p)$ states where line shapes were independent of the colliding partner, the $\text{Li}(4p)$ profiles were different for each collision partner, indicating that very different potential energy curves can be expected from such Rydberg states. We discuss the line shape based on existing potential energy curves.

Destiny Reeves-Hebert, Lamont Booker, Vanessa Richardson, and Angelo Crews
Fayetteville State University
Junior, Physics
Dr. Abdirham Y. Abokor

The Debye-Scherrer Diffraction of Electron Beams on Polycrystalline Graphite Lattices

The diffraction of electron beams at crystalline structures is evidence of the wave properties of matter as first suggested by Louis de Broglie in 1924. Experiments using x-ray crystallography later confirmed de Broglie's theory. These experiments demonstrated the diffraction of electrons at polycrystalline structures. Using the Bragg condition, we calculated the wavelengths of electron beams from experimental results. From the electrons emitted by the hot cathode in a diffraction tube, we singled out a small beam of electrons through a pin diaphragm. After passing through a focusing electron-optical system, a sharply limited "monochromatic" electron beam is made incident on a polycrystalline graphite foil whose atoms are arranged similar to a space lattice and act as a diffraction grating. The diffraction pattern showed two concentric rings centered around the undiffracted electron beam. The diameter of the concentric rings changes with the wavelength, determined by the acceleration voltage, and the two rings corresponds to a Bragg reflection at the atoms forming a plane of the graphite. From the measured values of the radii of the concentric rings and the distance between the graphite foil and the screen, we calculated the wavelength of the electron beam for a particular acceleration voltage. We then compared the experimental wavelength with the theoretical value from the de Broglie's equation. The values of the wavelengths agree to within 2.0%. We also determined the value of Planck's constant, h , and the interplanar spacings of the polycrystalline graphite. These values are in good agreement with the accepted values.

Carl William Seward
Elizabeth City State University
Sophomore, Mathematics and Computer Science
Dr. Claudia Rankins

Form Factors and Distribution Amplitudes for Positively Charged Pions

We worked with a low momentum transfer model, the Rankins Model, to describe positively charged pions and to evaluate the pion electric form factors. We used available experimental data to determine how the pion distribution amplitudes looked at small Q^2 (or small momentum transfer). In addition, we performed the chi square distribution test to show the fit of the experimental form factors data compared to the calculated data, followed by determining the charge radius of the pion.

Dana Maurice Warren
North Carolina Central University
Senior, Physics
Dr. Jyotsna M. Dutta

Using RMS Roughness and 2-Dimensional Correlation Function as Tools for AFM Image Analysis

In contemporary photovoltaic research, nanoscale surface characterization plays an important role in the analysis of solar cell materials. Scanning Probe Microscopes (SPMs) such as the Atomic Force Microscope (AFM) and the Scanning Tunneling Microscope (STM) are two high-resolution instruments that provide digital data that can be used in the characterization of semi-conducting materials. The data from these microscopes can then be used to provide a quantitative description of the degree of roughness of the sample. In this quantitative description of the surface, one of the most important parameters used to describe the surface is root-mean square (rms) roughness. Another parameter, known as the two-dimensional discrete correlation function provides a correlation between all points on the surface of the sample. When paired, these two parameters provide enough information to describe the topography of any sample.

To aid in the analysis of this data, Visual Basic has been implemented. The program modifies the data to the proper form and calculates the rms roughness as well as the two-dimensional discrete correlation function by the use of two expressions, thus making the comparison and analysis of samples significantly easier. Some preliminary results will be presented and the accuracy of the results will be discussed.

*Work supported by a grant from National Renewable Energy Laboratory

DISPLAYS

Azeez Aileru, Mike Callahan, M. Penny, C.M. Ferrario, T.M. Coffman, T. Smith, D.Diz.
Winston Salem State University and Wake Forest University School of Medicine
Faculty

Angiotensin-(1-7) Produces Vasodilation In The Mesenteric Bed Of Both Normal And Agtr1a(-/-) Knock Out Mice.

Angiotensin-(1-7) (Ang1-7) is a vasoactive peptide which can decrease arterial pressure possibly through increased production of NO or vasodilatory prostaglandins. In the current study we determined whether Ang1-7 would produce vasodilation in the mesenteric bed of control and Angiotensin AT1a receptor knock out mice, Agtr1 a (-/-). Mice were anesthetized with pentobarbital (60mg/kg) and received a femoral artery catheter for arterial pressure determination and a jugular vein catheter for peptide delivery. A 0.5VB transit time blood flow probe (Transonic Systems, Inc.) was placed on the superior mesenteric artery. Mice were given i.v. injections of 0.9% NaCl or Ang1-7 (1.5–1500 nmol/kg). Arterial pressure and mesenteric blood flow were determined for 8 minutes after each injection and the hemodynamic change at the peak changes in flow were examined. Higher doses of Ang1-7 (150-1500 nmol/kg) produced a significant increase in mesenteric blood flow. There was no significant difference between control and knockout mice and no dose x strain interaction. Ang1-7 also produced a significant decrease in mesenteric vascular resistance. Again there was no significant difference between the groups and no group x dose interaction. The peptide had no significant effect on arterial pressure or heart rate at the time of peak flow changes. These results suggest that Ang1-7 can have hemodynamic actions independent of its action on Angiotensin AT1a receptors. Since we previously identified Ang1-7 receptor sites on vascular tissues and in the kidney in control and Agtr1a knock out mice, it is possible that these sites mediate some of the hemodynamic actions of this peptide. Supported by HL 07790, HL51952, RR-11583 and HL 55082.

Egbe Eni
North Carolina State University
Graduate
Dr. Perry Grady, Dr. Jeffery Joines,

Energy Analysis of the Yarn Production Process

Ring spinning, Rotor spinning, and Air Jet spinning are three primary methods of yarn production used in today's industries. Each specific yarn production method encompasses certain machines and processes to which the fiber must be subjected to before yarn formation is complete, for example: opening, carding, drawing and lapping. Each process employed consumes various amounts of energy depending on certain parameters such as; the amount of motor horsepower required, the weight and amount of product produced, the speed the product is fed into the machine, as well as the speed of the product exiting the machine. Every additional process adds to the total amount of energy required to produce the final product. By analyzing each process one can determine the optimal machine settings required to increase efficiency. Improving the efficiency of individual procedures will inevitably decrease the total energy usage as well as the total production cost. Energy models focusing on the analysis of yarn production methods were developed in C++ and Excel. These models and equations were translated into VB script and Html which are now available on line. In the future the energy web site will be connected to a database containing the results and progress of participating manufacture, which will be accessible by way of password. The results and analysis of each yarn plant will be contained in a database developed with Access.

**CONGRATUALIONS TO THE FOLLOWING STEM SCHOLARS FOR OUTSTANDING
ACADEMIC ACHIEVEMENT
GPA OF 3.2-3.49**

Beth Adams-North Carolina A&T State University
Julins AsusonTeng-North Carolina Central University
Jermaine D. Avery-Winston-Salem State University
Burley Baker-North Carolina A&T State University
Derrick Barbee-Saint Augustine's College
Marreo Burch-Winston-Salem State University
Sonya Covington-North Carolina A&T State University
Richelle Dawson-Fayetteville State University
Tamara N. Evans-North Carolina A&T State University
John P. Ford-Winston-Salem State University
Samantha Fields-North Carolina A&T State University
Eugene Gibbs-Flournoy-North Carolina A&T
State University
Shylise S. Griffiths-North Carolina A&T State University
Ahmad J. Harvey-North Carolina State University
Glori Henderson-Saint Augustine's College
Nghi Vo H.-North Carolina A&T State University
Frank Ingram-North Carolina State University
Jermelle Jordan-North Carolina A&T State University
Louis Judge III-North Carolina A&T State University
Charles Kearney-North Carolina A&T State University
Sharita D. Lea-North Carolina A&T State University
Christa Leggette-Fayetteville State University
Frederick Livingston-North Carolina State University

Melina Lubin-North Carolina A&T State University
Samuel Mason-North Carolina A&T State University
Mary A. McLean-North Carolina A&T State University
Mahogany K. Mead-North Carolina A&T State University
Thomas Moore-Winston-Salem State University
Valencia Newell-North Carolina A&T State University
Delbert Patterson-Shaw University
Tennille D. Presley-North Carolina A&T State University
Keshona Quivers-Saint Augustine's College
Davida Robinson-North Carolina A&T State University
Shirlene J. Rogers-North Carolina A&T State University
Taihesia Ross-North Carolina State University
Chasiree Stone-North Carolina A&T State University
Corrie Stowe-North Carolina A&T State University
Eric Sturdivant-Winston-Salem State University
Bryant P. Suitte-North Carolina A&T State University
Raynard Sumpter-North Carolina A&T State University
LaToya Sylver-North Carolina A&T State University
James T. Trice-North Carolina A&T State University
Isis C. Valladares-North Carolina Central University
Reginald Watson-North Carolina A&T State University
Winfred Wilkerson-North Carolina A&T State University
LeTomas P. Wilkins-North Carolina A&T State University
Lewis E. Winstead Jr.-Winston-Salem State University



**CONGRATUALIONS TO THE FOLLOWING STEM SCHOLARS FOR OUTSTANDING
ACADEMIC ACHIEVEMENT
GPA OF 3.5 AND HIGHER**

Elizabeth Adetobl- *Saint. Augustine's College*
Kenshasa Barnette- *North Carolina A&T State University*
Tiffany Nicole Boyce- *North Carolina A&T State University*
Kevin C. Broadnax- *North Carolina A&T State University*
Kakeasha S. Brown- *Fayetteville State University*
Portia Carter- *North Carolina Central*
Jarrett Chapman- *North Carolina A&T State University*
Howard J. Conyers- *North Carolina A&T State University*
Nickolia Coombs- *North Carolina A&T State University*
April Cox- *Fayetteville State University*
Jasmine Davenport- *North Carolina A&T State University*
Rosie Dibanza- *North Carolina A&T State University*
Egbe Eni- *North Carolina A&T State University*
Michael Faulcon- *North Carolina A&T State University*
Deidra Felton- *North Carolina A&T State University*
Jaspreet K. Gill- *North Carolina A&T State University*
Gregory Girssett- *North Carolina State University*
Corey Goolsby- *North Carolina State University*
Bryanne D. Grainger- *North Carolina A&T State University*
Dana Harris- *Fayetteville State University*
James M. Harris- *North Carolina A&T State University*
Larry C. Harris Jr.- *North Carolina A&T State University*
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Patricia Henderson- *Fayetteville State University*
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Antwaun D. High- *North Carolina A&T State University*
Jonathan Jennings- *North Carolina A&T State University*
Tiffanee N. Jones- *Shaw University*
Heavenly Key- *North Carolina A&T State University*
Ryan D. Kinloch- *North Carolina A&T State University*
Angel Lee- *Bennett College*
Andreas M.T. Lloyd- *Winston-Salem State University*
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