Final Report

Project Title:
The National Society of Black Physicists Meeting, NSBP

(Period: March 1, 2002 till February 28, 2003)

The 16th National Conference of Black Physics Students (NCBPS) and National Society of Black Physicists (NSBP)

2002 Meeting
March 13-17, 2002

Submitted to:
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DOE GRANT NO. DE-FG02-02ER54671

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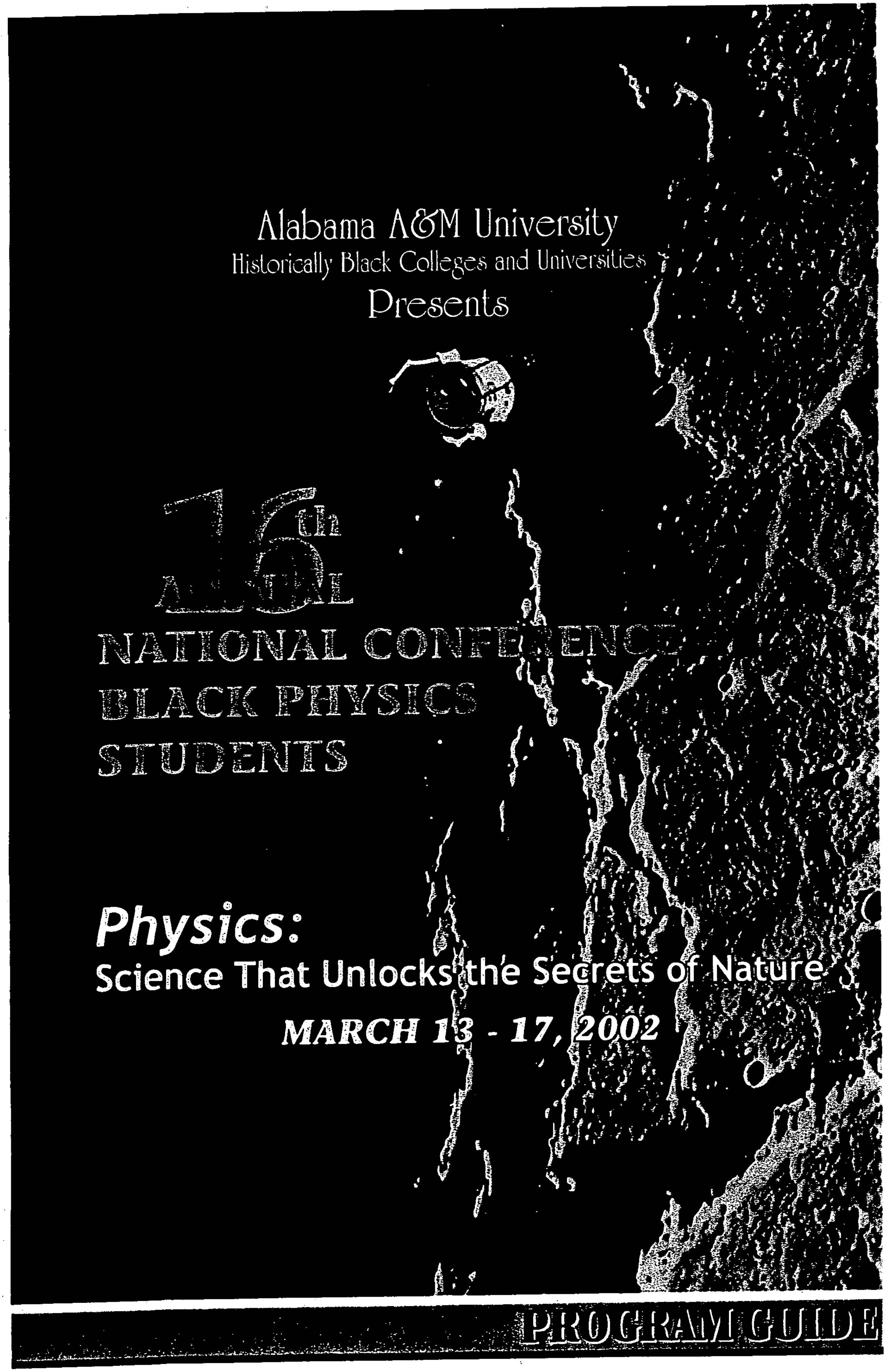
booths including the NASA/Goddard Space Flight Center and NASA/Marshall Space Flight Center.

The keynote speakers at various occasions included: Mr. Arthur Stephenson, Director, NASA/Marshall Space Flight Center, Gen. James Link (Retd), President, Teledyne Brown Engineering Company, Major General Reginald Clemmons, US Army Commandant of the Naval war College, Dr. Keith Jackson, President, NSBP, Dr. Evelynn M. Hammomds, Massachusetts Institute of Technology, and Mr. Michael Dyson, DePaul University.

The joint conference was sponsored by Alabama A&M University, Brookhaven National Laboratory, Department of Energy, Office of Science, Lawrence Berkley Laboratory, Lawrence Livermore National Laboratory, **U. S. Department of Energy (DOE)**, National Institute of Standards and Technology, National Institutes of Health, National Science Foundation, Oak Ridge Associated Universities, Office of Naval Research, Science and Engineering Alliance, Teledyne Brown Engineering Company, US Army Aviation and Missile Command, NASA/Goddard Space Flight Center and Wright Patterson Air Force Materials Laboratory.

The organizing committee of NSBP/NCBPS specially wants to thank the **U. S. Department of Energy (DOE)** for their support in making this conference a great success. Special thanks are due to Mr. Donald H. Priester, DOE Project Officer. A copy of the programs for NSBP and NCBPS are attached with this report.

THE DANI Group from Oakland, California was the conference planner.


Alabama A&M University
Historically Black Colleges and Universities
Presents
16th
ANNUAL
NATIONAL CONFERENCE
BLACK PHYSICS
STUDENTS
Physics:
Science That Unlocks the Secrets of Nature
MARCH 13 - 17, 2002
PROGRAM GUIDE

16th ANNUAL NATIONAL CONFERENCE OF BLACK PHYSICS STUDENTS

Physics:

Science That Unlocks the Secrets of Nature

MARCH 13 - 17, 2002

In 1986, several Black physics graduate students from MIT and Harvard decided to address the issue of the continuing paucity and isolation of African Americans in the field of physics by organizing a conference for Black graduate and undergraduate physics students.

The goals of the conference were:

to develop a network within the Black physics community

to make Black students in physics, particularly at the graduate level, aware of academic and professional opportunities

to bring important issues and developments in the field to the attention of these students.

By providing the opportunity to share experiences and learn from each other, the National Conference of Black Physics Students was and is an important step toward encouraging Black students to successfully pursue careers in physics.

In addition to MIT having hosted the first conference, other previous locations have been Howard, Southern, Hampton, Stanford, Michigan State, Georgia Institute of Technology, The American Physical Society/University of Maryland, Fisk University, the University of Kentucky, UC Berkeley and North Carolina A&T.

Wednesday March 13, 2002

Huntsville Marriott

Students arrive all day

8:00 AM - 5:00 PM Registration *Pre-Function area*

12:00PM - 3:00PM Box lunches *Pre-Function area*

1:45 PM Bus leaves for AAMU tours

2:15 PM - 3:45 PM AAMU Physics Lab Tours

4:00 Bus leaves AAMU for Marriott

4:00 PM - 4:30 PM Break *Pre-Function area*

4:30 PM - 6:00 PM **Session I** *Salon C*

GRE Workshop

- Dr. Byron Freelon, Lawrence Berkeley Laboratory
- Dr. Anthony Johnson, Dept Chair, NJ Institute of Technology
- Dr. C. Reddy, Dean, Graduate School, AAMU

Session II *Salons A B*

"A Solid Physics Education as a Platform for Success Alternative Careers in Physics"

- LaTonya Pegues, Boez Enterprise
- Timothy Childs, TLC Precision Wafer Technology
- Dr. David Beam, President, Beam & Associates LLC

6:15 PM Bus leaves for dinner from front of hotel

7-9 PM Dinner Off-Site *Greenbrier Bar-B-Que*

Welcome Address

- Shawn Smith, AAMU Student Committee

Thursday March 14, 2002

Marriott Hotel

7:00 AM -8:30 AM Breakfast *Salons A B C*

Greetings

- Drs. Dorothy Huston and Ravi Lal, AAMU

8:00 AM - 5:00 PM Registration *Pre Function Area*

9:00 AM -10:00 AM **Session III** *Salons E F*

"Fellowship Opportunities"

- DiOnetta Jones, Mgr of Programs - The National GEM Consortium
- Dr. Beth Brown, NASA Goddard Space Fight Center

Session IV *Salon D*

"Fellowship Opportunities"

- Dr. Lynwood Randolph, Les Associates, Inc
- Dr. Rudolf Danner, Michelson Fellowship Program, Jet Propulsion Laboratory (JPL)

10:00 AM - 10:30 AM Break

10:30 AM - 11:30 AM **Session V** *Salons E F*

"Physicists and the Black Community: Using education for social uplift"

- Lawrence Jackson, AAMU
- Aisha Fields, AAMU
- Nicole Green, AAMU
- Dr. Paul Ruffin, US Army Missile Command

Session VI *Salon D*

"How to Identify Understand and Destroy the 'stereotype theory' in Black Physics Students"

- Dr. Darnell Diggs, Wright Patterson, AFB
- Dr. Apriel Hodari, Research Analyst, The CNA Corporation

12:00 PM - 1:30 PM Lunch *Salons A B C*

Moderator:

- Deborah Jackson,
- Dr. Arlene Maclin, *Alexander Gardner Memorial*
- Dr. Hakeem Oluseyi, *ABC Walker Memorial*
  Lawrence Fellow, Lawrence Berkeley National Laboratory

Keynote:

- Dr. Arthur Stephenson,
  Director NASA/Marshall Space Flight Center

2:30 PM - 3:30 PM **Session VII** ***Salons E F***

General Session

- Dr. John Day, Chief Electrica, NASA Goddard Space Flight Center

3:30PM - 4:00PM Break

4:00PM - 6:00PM **Session VII** ***Salons D E F***

Physics In Africa

Moderator:

- Dr. Abede Kebede, NC A&T State University

"Initiatives toward Development of Physics in Africa"

- Dr. Edmund Zingu

"Interdisciplinary research and partnerships: Strategies for effective development"

- Dr. Alfred Msezane, Clark Atlanta University

Scientific Societies of Maoi

- Dr. Diola Bagayoko

Edward Bouchet and African Laser Center

- Dr. Sekazi Mtingwa and Dr. Charles Brown,

"COSMOS Education and its African Activities"

- Kevin Hand

"The CD ROM Project and the African Physics Student Network"

- Reginald Smith, Graduate Student, University of Virginia

6:15 PM Depart for dinner

6:30 PM - 9:00 PM Reception ***Space and Rocket Center***

- Gen. James Link (Retired),
  CEO/President, Teledyne Brown Engineering Company

Friday March 15

Alabama A&M University

7:00 AM - 8:00 AM Breakfast ***Salons A B C***

7:45 AM Recruiter shuttle leaves for campus

8:15 AM Bus leaves from front of hotel for AAMU

8:00 AM - Noon Recruiters set up in Gymnasium AAMU

7:30 AM - 12:00 PM Conference Registration *Bibb Graves Lobby*

9:00AM - 9:15AM *Welcome*
- Dr. Ravindra B. Lal, University Eminent Scholar, AMU
- Dr. Dorothy Huston, VP for Research and Development, AAMU
- Mr. Brian Hilson, President/CEO Huntsville Chamber of Commerce

9:15 AM - 9:45 AM **Session IX** ***Bibb Graves Auditorium***
General Session, Keynote
- LT. COL. Benjamin Alvin Drew, The NASA Astronaut Program

NSBP Technical Session
9:45 AM - 10:15 AM ***Bibb Graves Auditorium***
Introduction to Microgravity Science
- Dr. John Whitehead, Professor and Chair of Physics
  University of Southern Mississippi

10:15 AM -10:30 AM Break ***Bibb Graves Auditorium***

10:30 AM-11:00 PM
Space Plasma Physics
- Dr. Edward Thomas, Auburn University

11:00 AM - 11:30 AM
Protein Crystallography
Ms. Felicia Ewing, Marshall Space Flight Center

11:30 AM - 12:00 PM
Laser Optics
- Dr. Paul Ruffin, US Army Missile Command

12:00 PM - 12:30 PM
Space Materials

12:45 PM - 2:00 PM Lunch — ***Knight Reception Center***

Greetings

- Dr. James Hicks, Provost, AAMU
- Dr. Jerry Shipman, Dean, School of Arts and Sciences

Moderator:

- Deborah Jackson

Warren E. Henry Memorial

- Dr. Hattie Carwell

Harry Morrison Memorial

- Dr. Pete Bragg, Professor Emeritus, UC Berkeley Materials, Science and Engineering

Keynote Address:

- Major General Reginald Clemmons, USA, Commandant of the National War College

2:30 PM - 5:00 PM Recruiting Session — ***Gymnasium***

5:15 PM Transportation to Hotel Begins

6:30 PM - 7:30 PM Reception — ***Pre-Function area*** *(cash bar)*

7:30 PM - 9:00 PM NSBP Awards Banquet — ***Ballroom***

Keynote:

- Dr. Evelyn Hammond

Saturday March 16, 2002
Marriott Hotel

7:00 AM - 8:30 AM Breakfast — ***Salons A B C D***

Expressions from AAMU Students

7:00 AM - Noon Poster set up — ***Pre-Function area***

9:00 AM - 10:00 AM *Student Technical Presentations*

Group 1 — ***Discovery***

	Group 2	*Atlantis*
	Group 3	*Columbia*
	Group 4	*Challenger*
10:00 - 10:30 AM	Break	
10:30 - 11:30 AM	*Student Technical Presentations*	
	Group 5	*Discovery*
	Group 6	*Atlantis*
	Group 7	*Columbia*
	Group 8	*Challenger*
11:30 AM - 12:15 AM	Conference Photo	*(on site or Space Center)*
12:30PM - 2:00PM	Lunch *Keynote*	*Grand Ballroom*
2:00PM - 4:30 PM	Poster Session	*Pre-Function area*
4:30PM - 7:30 PM	Free time	
7:00PM - 9:00 PM	**Edward Bouchet Awards Banquet**	*Grand Ballroom*

Mistress of Ceremonies

- Dr. Cynthia McIntyre, Chief of Staff Rensselaer Polytechnic Institute, Founder NCBPS

Keynote:

- Mr. Michael Dyson, Professor of Religion and African American Studies, DePaul University

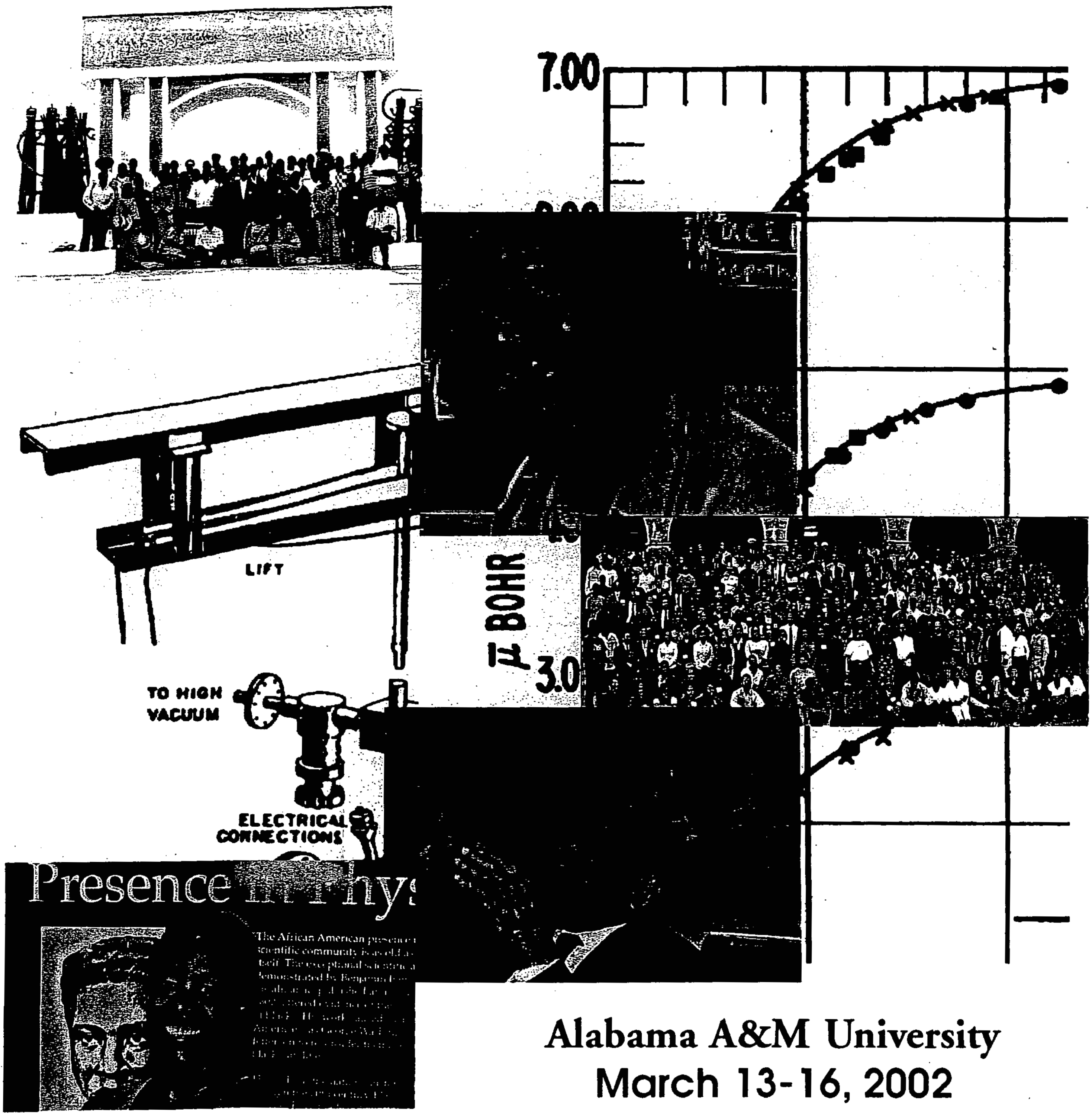
9:15 PM	Turn in student evaluation forms	*Enterprise*
9:30 PM - 12:30 PM	*Student Party*	*Grand Ballroom*

Sunday March 17

5:00 AM	Airport transportation begins	
7:00 AM - noon	Continental Breakfast Buffet	*Salon A B*

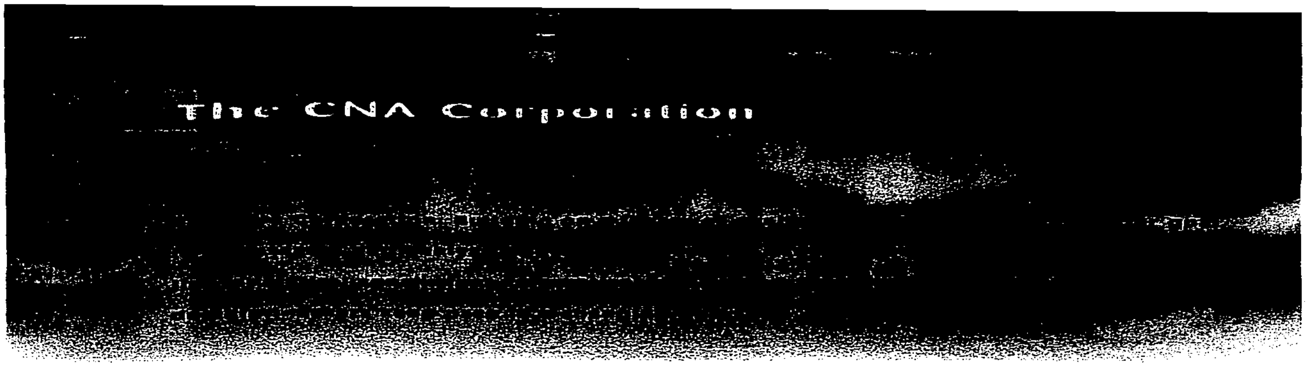
NATIONAL SOCIETY OF BLACK PHYSICISTS

25th Anniversary Conference



Alabama A&M University

March 13-16, 2002



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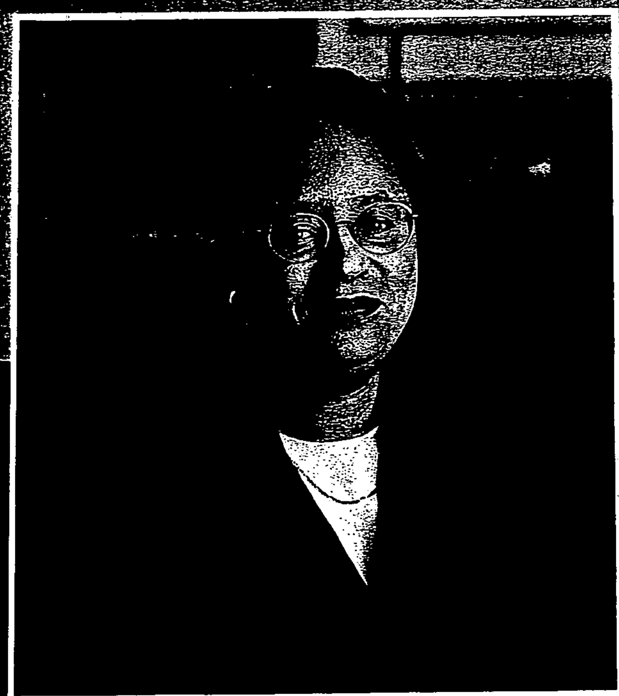

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this is fermilab.

Located on a 6,800 acre campus 40 miles west of downtown Chicago, Fermi National Accelerator Laboratory operates the world's largest and highest energy particle accelerator for research into the fundamental building blocks of matter. **Fermilab is a proud supporter of the National Society of Black Physicists.** We are always looking for accomplished professionals to join us.

Fermilab is a recent recipient of the Golden Family Award presented by the Society of Women Engineers for excellence in work/life issues, and offers exceptional benefits in a dynamic and collaborative work environment, including medical/dental/life insurance, on-site fitness center and daycare. For consideration, candidates should submit a resume with salary history to: **jcthomas@fnal.gov**.

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B.A./B.S. Opportunities

Accelerator Operators

Ph.D. Opportunities

Post-Doctoral (various groups)
Research Associates
Associate Scientists

Fermilab

A U.S. Department of Energy Laboratory
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NSBP/NCBPS Conference Schedule Overview

Wednesday, March 13

8:00am	NSBP/NCBPS	Registration Booth Opens
10:00am	NSBP	NSBP Board of Directors Meeting
12:00pm	NSBP/NCBPS	Box Lunch
1:00pm	NSBP/NCBPS	Tours of US Space Rocket Center and NASA Marshall Space Flight Center
4:00pm	NSBP	Opening Session *Strategic Plans and Actions for the Role of NSBP in the Global Physics Enterprise*
4:00pm	NCBPS	Opening Sessions *GRE Workshop* *Alternative Careers in Physics*
6:30pm	NSBP/NCBPS	BBQ at Greenbrier

Thursday, March 14

7:00am	NSBP/NCBPS	Breakfast
9:00am	NSBP	Session NSBP-II. Training, Education and Public Policy: *Alexander Gardner Memorial Session*
9:00am	NCBPS	Session NCBPS-III. *Fellowship Opportunities - Graduate Students*
9:00am	NCBPS	Session NCBPS-IV. *Fellowship Opportunities - Undergraduate Students*
10:30am	NCBPS	Session NCBPS-V. *Physicists and the Black Community: Using Our Physics Education for Social Uplift*
10:30am	NCBPS	Session NCBPS-VI. *How to Identify, Understand and Destroy the "Fraud Complex" in Black Physics Students*
12:00pm	NSBP/NCBPS	Luncheon
2:00pm	NSBP	Session NSBP-III. Nanoscience
2:00pm	NCBPS	Session NCBPS-VI. Undergraduate
2:00pm	NCBPS	Session NCBPS-VII. Graduate
4:00pm	NSBP/NCBPS	Plenary Session I. Physics Opportunities in Africa
7:00pm	NSBP/NCBPS	Dinner at the Space Rocket Center

Friday, March 15

9:00am	NSBP/NCBPS	Plenary Session II. Space, Life and Materials Science
12:00pm	NSBP/NCBPS	Luncheon
2:00pm	NSBP	Session NSBP-IV. Solar Imaging: *Art B.C. Walker Memorial Session*
2:30pm	NCBPS	Career Fair
4:00pm	NSBP	Session NSBP-V. Condensed Matter and Materials Physics *Warren E. Henry Memorial Session*
7:00	NSBP/NCBPS	NSBP Awards Banquet

Saturday, March 16

9:00am	NSBP	Session NSBP-VI. Optics
9:00am	NCBPS	Session NCBPS-VIII. Scientific Presentations
12:00pm	NSBP/NCBPS	Luncheon
2:00pm	NSBP	Session NSBP-VII. Environmental Physics
2:00pm	NCBPS	Session NCBPS-IX. Scientific Presentations
4:00pm	NSBP	NSBP Business Meeting
4:00pm	NSBP/NCBPS	NSBP/NCBPS Poster Session
7:00	NSBP/NCBPS	Bouchet Awards Banquet

National Society of Black Physicists
March 13-17, 2002

Wednesday March 13, 2002 – Marriott Hotel

8:00AM – 5:00PM	Registration	Pre function area
1:00 – 4:00PM	NSBP Board Meeting	DAC
4:00 – 4:30PM	Break	Pre function area
4:30 – 6:00PM	Strategic Plans and Actions for the Role of NSBP in the Global Physics Enterprise	
	The NSBP International Committee	Charles McGruder
	The NSBP Public Policy Agenda	Keith Jackson
	The Infrastructure of NSBP and Changes to the NSBP Constitution and By-laws	Beth Brown
	NSBP Chapters and Programs for Outreach, Student Support and Career Services	Lawrence Norris
6:15PM	Bus leaves for dinner	
7:00 – 9:00PM	Dinner off site - Greenbrier Bar-B-Que	

Thursday March 14, 2002 – Marriott Hotel

7:00AM – 8:30am	Breakfast Greetings Drs. Dorothy Huston & Ravi Lal, AAMU	Saloon ABC
8:00AM – 5:00PM	Registration	Pre function area

Policy and Education

9:00 – 9:30 AM	NSBP @ 25	Dr. Ron Mickens
9:30 –10:00 AM	Issues in Congress	Dr. Njema Frazier
10:00 –10:30 AM		Break
10:30 –11:00 AM	Physicists and Modern Questions of National Security	Dr. Desmond Saunders-Newton
11:00-11:30 AM	Assessment of Student Learning	Dr. Dan Smith
11:30 –Noon AM	21st Century Challenges of HBCU Physics Departments	Panel Discussion (Mtingwa, Treadwell, Shaw-Williams, Judd
12:00 PM	Luncheon Salon ABC	Dr. Arthur Stephenson, Director NASA/Marshall Space Flight Center
	Alexander Gardner Memorial ABC Walker Memorial	

National Society of Black Physicists
March 13-17, 2002

Nanotechnology		
2:00 –2:10 PM	The US Nanotechnology Initiative	Dr. Keith Jackson
2:10 – 2:35 PM	Artificial Retina	Dr. Lee Johnson
2:35 – 3:00 PM	X-ray processing of microbeads	Dr. Frank Underdown
3:00 – 3:25 PM		Dr. Michael Williams
3:25 PM	Entrepeurial Opportunities and the Venture Capital Market	Mr. Mujhidid Muhammed
3:50 PM	MEMS For Military Applications	Dr. Paul Ruffin
Plenary Session I. Physics in Africa		
4:30 PM	Introduction	
	IUPAP and physics in Africa:	Professor Edmund Zingu
	COMPROMAPH II: Mathematical Physics and the Benin Experience:	Professor Alfred Z. Msezane
	Scientific Networking with Mali	Professor Diola Bagayoko
	COSMOS EDUCATION African Experience, where help is needed: COSMOS EDUCATION GROUP	Mr. Kevin Hand
	Break	
	The CD-ROM Project: The African Physics Student Network Initiative	Mr. Reggie Smith
	Overview of the Edward Bouchet Institute	Drs. Charles Brown, Kennedy Reed and Sekazi Mtingwa
	The LAM Network	Professor Sekazi Mtingwa
	African Scientific Network and The Prospect for an African Physical Society	Professor Abebe Kebede
6:30 PM	Session Ends	
7:00 PM	Reception - Space & Rocket Center	Lt. General James Link, USA(Ret.) President Teledyne Brown Engineering

National Society of Black Physicists
March 13-17, 2002

Friday March 15, -- Alabama A&M

7:00AM - 8:00am	Breakfast	Salon ABC
7:45AM -	Recruiters leave for campus	
8:00AM – noon	Recruiters set up	Gymnasium
7:30AM – 12:00PM	Conference Registration	Bibb Graves Lobby

Plenary Session II Space, Life and Materials Sciences

9:00 – 9:15 AM	Welcome Dr Dorothy Huston, AAMU Dr. Ravindra B. Lal, AAMU Brian Hilson, President/CEO *Huntsville Chamber of Commerce*	Bibb Graves Auditorium
9:15 AM	The NASA Astronaut Program	LTCOL Benjamin Alvin Drew, NASA Astronaut
9:45 AM	Liquid Crystals in Microgravity Conditions	Dr. John Whitehead
10:15 AM		Break
10:30 AM	Space Plasma Physics	Dr. Ed. Thomas
11:00 AM	Protein Crystallography in Space	Felicia Ewing, MSFC
11:30 AM	Fiber Optical Waveguides	Dr. Arjun Tan
12:00 PM	Broadband Characterizations of Moon-Reflected Solar Radiances	Mr. Robert Lee
12:45 PM	Lunch Warren E. Henry Memorial Harry Morrison Memorial	Major General Reginal Clemmons, US Army Commandant of the National War College
Astronomy and Astrophysics		
2:00 PM	Personal Reflections on Working with Professor Art Walker	Dr. Richard Hoover
2:25 PM	Space Weather and the Sun-Earth Connection	Dr. George Carruthers
2:50 PM	The Hessi Mission	Dr. Gordon Emslie
3:15 PM	Solar Imaging and Astrophysics	Dr. Carl Rouse
4:40 PM	The New Solar Atmosphere & Q-STREET	Dr. Hakeem Oluseyi
	Break	
Condensed Matter//Materials		
4:15 PM	High Tc Cuprate Oxide Superconductors	Dr. Philip Phillips
4:45 PM	Magnetic Materials	Dr. Conrad Williams
5:15 PM	Behavior of Filament Proteins	Dr. Tannie Liverpool
5:45 PM	TBA	Dr. Byron Freelon
6:00 PM	Buses depart from Bibb Graves for Hotels	
6:30 – 7:30PM	Reception – cash bar	Pre function area
7:30PM – 9:00	NSBP Awards Banquet Keynote Speaker: Dr. Evelynn M. Hammonds	Grand Ballroom

National Society of Black Physicists
March 13-17, 2002

Saturday March 16– All session at On Site

7-8:30AM	Breakfast	Salon ABCD
Optics		
9:00 AM	TBA	Dr. Willie Rockward
9:20 AM	Novel Fiber-Based Refractive Index Sensor	Dr. Erica Thompson
9:40 AM	Femtosecond Z-scan and Pump-probe Measurements of Silicon Nanoclusters	Ms. Elaine Lalane
10:00 AM	Break	
10:20 AM	Time-Reversed Image Synthesis of Dielectric Objects	Dr. A. Boh Ruffin
10:30 AM	TBA	Dr. Darnell Diggs
10:50 AM	TBA	Mr. Curtis Banks
11:10 AM	TBA	TBA
11:30 AM	TBA	TBA
12:00 noon – 12:15 PM	Conference Photo	
12:00 PM	Lunch	Dr. Keith H. Jackson, President-elect, NSBP
2:00 – 4:30PM	Student Poster Session	Pre function area
Environmental Physics		
2:00 PM	The NOAA Cooperative Center in Atmospheric Sciences (NCAS) and Atmospheric Sciences Research at Howard University	Dr. Vernon Morris
2:30 PM	Studying the African Environment in the 21st Century	Dr. Gregory Jenkins
3:00 PM	TBA	TBA
3:30 PM	TBA	TBA
4:00 PM	Scientific Sessions End	
4:15 PM	NSBP Business Meeting	
4:15PM -		NSBP Business MeetingDAC
7:00 – 9:00PM	Edward Bouchet Awards Banquet Keynote: Dr. Michael Eric Dyson, Professor of Religion and African American Studies, DePaul University	Grand Ballroom

Sunday March 17

5:00 AM	Airport transportation begins
7:00- 12:00-Noon	Continental Breakfast w/NCBPS

National Society of Black Physicists
March 13-17, 2002

7:30PM – 9:00	NSBP Awards Banquet Keynote Speaker: Dr. Evelynn M. Hammonds	Grand Ballroom

Saturday March 16– All session at On Site

7-8:30AM	Breakfast	Salon ABCD

Optics

9:00 AM	Dr. Willie Rockford
9:20 AM	Dr. Erica Thompson
9:40 AM	Ms. Elaine Lalane
10:00 AM Break	
10:20 AM	Dr. A. Boh Ruffin
10:30 AM	Dr. Darnell Diggs
10:50 AM	AAMU Graduate
11:10 AM	AAMU Graduate
11:30 AM	AAMU Graduate

12:00 noon – 12:15 PM	Conference Photo	
12:00 PM Lunch		Dr. Keith H. Jackson, President-elect, NSBP
2:00PM – 4:30PM	Student Poster Session	Pre function area

Environmental Physics

2:00 PM	Dr. Joseph Francisco
2:30 PM	Dr. Gregory Jenkins
3:00 PM	Dr. Vernon Morris
3:30 PM	
4:00 PM Scientific Sessions End	
4:15 PM NSBP Business Meeting	

4:15PM -	NSBP Business Meeting	DAC
7:00PM – 9:00PM	Edward Bouchet Awards Banquet Keynote: Dr. Michael Eric Dyson, Professor of Religion and African American Studies, DePaul University	Grand Ballroom

Sunday March 17

5:00 AM	Airport transportation begins
7:00- 12:00-Noon	Continental Breakfast w/NCBPS

History of the National Society of Black Physicists

The first meeting of African-American physicists was held in 1973 at Fisk University in Nashville, Tennessee. The purpose was to honor three outstanding African-American physicists: Dr. Donald Edwards, Dr. John McNeil Hunter, and Dr. Halson V. Eagleson. Included among those in attendance were Dr. Ronald Mickens, Dr. James Young, Dr. James Davenport, Dr. Harry Morrison, and some forty other African-American Ph.D. physicists.

The present organization, the National Society of Black Physicists, was established in 1977 at Morgan State University in Baltimore, MD out of a need to address many of the important issues of concern for African-American physicists. The first elected leaders of the organization were designated as Co-Chairs, and they were Dr. Walter Massey, then Dean of the Faculty and Professor of Physics at Brown University, and Dr. James Davenport, then and still currently Chair of the Department of Physics at Virginia State University.

A Constitution and Bylaws were written shortly after 1977, which called for the election to two-year terms of the following officers: President, President-Elect/Past- President, Treasurer, Administrative Executive Officer, and Technical Executive Officer. Many outstanding physicists have served as President through the years, including Drs. Carl Spight, Shirley Jackson, Warren Eugene Collins, Ernest Coleman, Steve Mcguire, Joseph Johnson, III, Kennedy Reed, Sekazi Mtingwa, Sylvester James Gates, Lonzy Lewis, James H. Stith, and Charles McGruder.

During Dr. Sekazi Mtingwa's tenure as President from 1992-1994, the legal structure of the organization was put into place. The Constitution and Bylaws were amended to establish a Board of Directors, the first national office was established in the Department of Physics at North Carolina A&T State University, NSBP was incorporated in the State of North Carolina as a nonprofit organization, and the organization received state and federal tax-exempt status as a nonprofit organization under Internal Revenue Code Section 501(c)3. Thus, financial contributions to NSBP became tax-deductible.

Today, NSBP is the largest and most recognizable organization devoted to the African-American physics community. Among its many activities, NSBP has named Science Ambassadors to give lectures to elementary, middle, high school, and university students encouraging them to pursue careers in science, engineering, and mathematics, with a special emphasis on physics. NSBP annually awards a $5,000 undergraduate scholarship (funded by Lawrence Livermore National Laboratory and renewable for up to four years), and annually awards a $500 Outstanding Graduate Student Dissertation Award. One or two physicists are annually inducted into the NSBP Society of Fellows for outstanding contributions to NSBP, physics research, and/or physics education. The NSBP has also given out other awards to African-American physicists for their contributions to the field.

The annual NSBP Conference is the single biggest event for the entire membership of NSBP. The NSBP Conference provides a mechanism for African-American physicists to meet at least once each year to discuss physics, exchange insights on the overall state of the discipline, and develop a network for student support and encouragement. Furthermore, the meeting provides a unique opportunity to introduce students to a homogeneously supportive professional society. The membership is keenly aware that the number of working African-American physicists is small. In fact, the pool of students studying physics is not as large as it should be. This situation has sparked an informal network to develop at the yearly meetings, whereby graduate and undergraduate students are provided academic and informational support and encouragement. Previous conferences have been held at a diverse set of institutions, including several Historically Black Colleges and Universities.

Under years of able leadership, the National Society of Black Physicists has developed into a truly viable organization with a mission that strongly supports our country's leadership role in science and technology.

NATIONAL SOCIETY OF BLACK PHYSICISTS

Art Stephenson is director of NASA's Marshall Space Flight Center in Huntsville, Alabama. He heads one of NASA's largest field installations, with more than 6,500 civil service and contract employees and an annual budget of $2.3 billion. Stephenson manages a broad range of research and development activities for the U.S. space program at the Marshall Center.

Since joining Marshall in September 1998, Stephenson has led the Center during a period highlighted by the launch and successful operation of the Chandra X-ray Observatory — the world's most powerful X-ray telescope. He oversees Marshall's work on critical NASA initiatives such as the development of new reusable launch vehicles, microgravity research, various Earth and space science projects, and operations support to all science payloads aboard the International Space Station.

Stephenson arrived at NASA with more than 35 years of experience in the space industry. His career started with TRW in 1964, working on the design of test equipment for the Lunar Module Abort Guidance System in the Apollo program. Over the next 27 years, he took on even greater roles in the nation's space program. He led the development of the Pioneer Jupiter Spacecraft Receiver, the first spacecraft to exit our Solar System, as well as the development of the Space Shuttle Orbiter S-band Network Transponder that is still in use today. He managed several spacecraft programs and space transportation programs before leaving TRW in 1992to become vice president of Oceaneering Space Systems in Houston. He led the expansion of the Space Systems organization from 30 to 220 people, and oversaw the design and manufacture of hardware that included thermal protection subsystems for several launch vehicles, advanced life support systems, extravehicular activity astronaut equipment, advanced robotics and robotic test beds and space refrigerators. In 1997, he became president of Oceaneering Technologies, which includes divisions working with the U.S. Navy, NASA, Department of Energy and the entertainment industries.

For his exceptional contributions to the space program and the Nation, he has been recognized with the NASA Outstanding Leadership Medal, The NASA Group Achievement Award, and the NASA Exceptional Achievement Medal. In 2001, he was awarded an honorary doctorate by The University of Alabama and was selected by the American Society for Engineering Management as the 2001 Engineering Manager of the Year. Stephenson is an Associate Fellow member of the American Institute of Aeronautics and Astronautics, and a member of the National Space Society and American Astronautical Society.

NASA's Marshall Space Flight Center is NASA's premier organization for development of space transportation and propulsion systems, NASA's leader in microgravity research — unique scientific studies conducted in the near-weightlessness of space — and NASA's leader for advanced large optics manufacturing technology. In the past, Marshall played key roles in the development and operation of the Saturn V rocket, Skylab, the Lunar Roving Vehicle, Spacelab and the Hubble Space Telescope. Today, the Center's primary management responsibilities include Space Shuttle propulsion systems; the Space Launch Initiative and associated Space Propulsion effort; the Chandra X-Ray Observatory, future large-scale space optics systems; and science operations aboard the International Space Station. Marshall also is responsible for developing advanced space transportation systems designed to further humankind's exploration of space while slashing the cost of getting there from today's $10,000 per pound to only hundreds of dollars per pound, or even less. The Center is working to bring a future among the stars closer to reality for the people of Earth.

National★Defense ★University★

Major General Reginal G. Clemmons
United States Army
Commandant, National War College

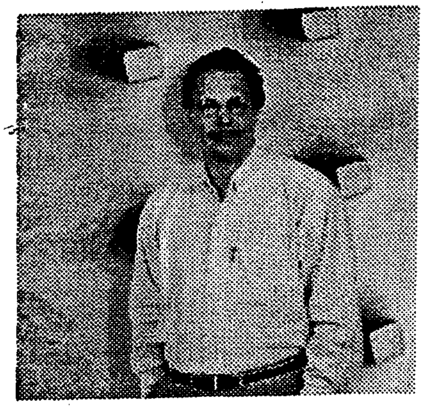
Major General Clemmons was born in Wilmington, North Carolina. As a graduate of North Carolina Agricultural and Technological State University he was commissioned through ROTC as a field artillery second lieutenant in 1968. He earned a Masters Degree in Education from South Carolina State College. His military education includes the Field Artillery Officer Basic and Advanced Courses, the Armed Forces Staff College, and the Army War College.

On August 31, 2000, the general became the 23rd Commandant of the National War College, one of the National Defense University's senior colleges.

His career path includes a variety of command and staff positions. He served as Forward Observer and Liaison Officer, 7th Battalion, 13th Field Artillery, Republic of Vietnam. In Colorado Springs, Colo., he was a Battery Commander, Headquarters and Service Battery, and Bravo Battery, 5th Battalion, 80th Field Artillery, 5th Infantry Division (Mechanized) and Battery Commander, Bravo Battery, 1st Battalion, 27th Field Artillery, 4th Infantry Division (Mechanized). Upon his assignment to Germany he was the Assistant Operations Officer and Battery Commander, Bravo Battery, 3d Battalion, 21st Field Artillery, and the Assistant Operations Officer, 1st Battalion 80th Field Artillery (Lance). He was an Assistant Professor of Military Science, South Carolina State College. Upon transfer to Korea he was the 2nd Infantry Division Assistant Fire Support Coordinator and Executive Officer, 1st Battalion, 38th Field Artillery. He served as an Operations Research Analyst at the US Army Logistics Center, Fort Lee, Virginia. He also served as the Operations Officer and later the Executive Officer, XVIII Airborne Corps Artillery, Ft Bragg, North Carolina. He commanded the 2d Battalion, 319th Field Artillery, 82d Airborne Division, Ft Bragg. He was the Senior Observer/Controller, United States Army Joint Readiness Training Center, Little Rock Air Force Base, Ark., and later served as the Commander, 1st Battlefield Coordination Detachment, XVIII Airborne Corps, Ft Bragg. He commanded the 25th Division Artillery, Schofield Barracks, Hawaii. He was the Director, Fire Support and Combined Arms Operations Department, United States Army Field Artillery School, Ft Sill, Oklahoma. He was the Assistant Chief of Staff for Operations, Allied Land Forces Central Europe from August 1995 to October 1996. He was the Assistant Division Commander, 1st Infantry Division, Germany from October 1996 to November 1997. He served as the Deputy Commander, Allied Land Forces Southeastern Europe and Turkey from November 1997 to August 1999. Prior to his assignment at NDU, the general served as the Deputy Commanding General for the Army's V Corps in Germany.

General Clemmons' decorations and awards include the Defense Distinguished Service Medal (with 1 Oak Leaf Cluster), Legion of Merit (with 1 Oak Leaf Cluster), the Bronze Star Medal, the Meritorious Service Medal (with 5 Oak Leaf Clusters), the Army Commendation Medal (with 2 Oak Leaf Clusters) and the Master Parachutist Badge.

Major General Clemmons and his wife Sylvia have two daughters, Regina and Adrienne.



Born and raised in Columbus, Ohio, Dr. Keith Jackson earned his B.S. in physics from Morehouse College, and his B.S. in electrical engineering from Georgia Tech, both in 1976. Jackson's M.S. in 1979 and Ph.D. in 1982 were both in physics, from Stanford University.

Since 1992 he has been at Lawrence Berkeley Lab. Immediately prior to that he was with Rocketdyne division of Rockwell International, where he developed diamond films and optical elements for synchrotrons and free electron lasers. He has also been a physics professor at Howard University and Morehouse College.

The focus of his current research is on a deep-etch lithography technique known as LIGA, from a German acronym for lithography electroplating molding. Using this technique he uses high-energy x-rays to penetrate the transparent portion of a lithography mask. Then exposed material is removed, and a metal is electroplated into the open space. This produces either a working 3-D device or a master mold.

In 2001 Dr. Jackson was elected President of the National Society of Black Physicists. Picking up on the goals of his immediate predecessor, Dr. Charles McGruder, he has worked to make NSBP more visible and active. His main goal is to grow to the size the Society, including increasing the number of student members and the establishment of college chapters, and reaching out to our colleagues in African and the Caribbean.

Radiation-induced Segregation in Austenitic Alloys

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Radiation-induced changes in grain boundary composition are studied because these changes can potentially lead to premature failure of materials irradiated in nuclear reactors,. In this work, the effect of alloy composition on radiation-induced segregation is presented. Five alloys, Fe-18Cr-8Ni, Fe-16Cr-13Ni, Fe-18Cr-40Ni, Fe-16Cr-13Ni+Mo, and Fe-16Cr-13Ni+Mo+P (all compositions in at. %), were irradiated with 3.2 MeV protons at 400°C to a dose of 0.5 displacements per atom. The change in grain boundary composition was measured using field emission gun scanning transmission electron microscopy. After irradiation, Cr depletes and Ni enriches at grain boundaries. Increasing bulk Ni concentration causes greater Cr depletion and Ni enrichment at grain boundaries. For alloys with 16 Cr, the addition of P reduces the Cr depletion and Ni enrichment. The amount of void swelling in the irradiated material is shown to correspond inversely with segregation. Those alloys with greater segregation tend to swell less.

Recrystallization of a-Si:H by laser beams.

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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 0.8x106 W/cm^2 and 1.2x106 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 505-516 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. The DoD through Grant No DAAD19-01-1-0795 supports this work.

"Space Weather" and the Sun-Earth Connection

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The subject of "space weather" is one of the practical manifestations of space science research. It has effects on radio communications, electric power distribution, and the health and safety of astronauts and spacecraft in the near-Earth (and more distant) space environment. Space weather involves Earth's upper atmosphere, ionosphere, and magnetosphere, and the deeper (solar system) space environment. It also involves the Sun, which is the major controller of space weather by means of its outflowing solar wind, its occasional emission of more highly energetic charged particles and high-energy electromagnetic radiation (far-ultraviolet and X-rays). As is true of weather in Earth's lower atmosphere, space weather is highly variable and difficult to predict in detail far in advance (but generally is associated with the Sun's 11-year cycle of solar activity).

Two major aspects of space weather-related space science research are (1) studies of the Sun and its output of electromagnetic and particle radiation, specifically to understand associated features such as solar flares and their time variations; and (2) studies of Earth's upper atmosphere and ionosphere, specifically to understand variations with solar activity (the most obvious visible manifestations being the polar auroras).

Recent space missions relevant to this topic include NASA missions such as the Solar Heliospheric Observatory (SOHO) and the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE), the European Space Agency's CLUSTER satellites, and the Department of Defense's Advanced Research and Global Observation Satellite (ARGOS).

The Space Science Division of the Naval Research Laboratory has had major involvement in several NASA (and other) solar physics missions, as well as upper atmosphere and ionosphere studies in the recent DoD ARGOS mission (for which the author is principal investigator for one of the investigations, the Global Imaging Monitor of the Ionosphere [GIMI]).

This presentation will give an overview of some of the recent developments in both of these two major topic areas associated with the Sun-Earth Connection and space weather.

The Investigation of Crystals doped with rare earth elements used in energy up-conversion

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Using a UV divisible spectrophotometer, we investigate the absorption intensities of a Lanthanum Fluoride doped with Holmium crystal and halide glass doped with Lanthanum Fluoride used in up conversion lasers. This investigation will be designed to show the absorption spectrum of a $LaF:Ho^{3+}$ crystal doped with rare earth ions during the lasing process. A similar investigation will be done using halide glass doped with rare earth ions. The results of this investigation will suggest that halide glass doped with rare ions can be used in up conversion lasers producing a more costly efficient material. The comparison of the observations of both the $LaF:Ho^{3+}$ crystal and halide glass will suggest that the absorption spectrums are closely related, showing suitable lasing in up conversion lasers.

Gravitational Field Fluctuations and Gamma-Ray Bursts: Is there a Connection?

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This is a review on whether gravity field fluctuations are associated with gamma-ray bursts. Constraints on Energy and geometry will be discussed as well as choice of cosmology. If there are gravitational field fluctuations associated with gamma-ray bursts, how might this new characteristic be used as a tool to probe the GRB source, distant universe and the environment around the GRB?

A Composite Fermion Superconducting Model of the $\nu = \frac{5}{2}$ Quantum Hall State

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Our project involves investigating the Fractional Quantum Hall (FQH) state with filling fraction \$5/2\$. This state's unusual features [1] are the impetus for our quest to describe it theoretically. We propose to use the machinery of composite fermions to model the 5/2 state as a superconductor. The model assumes that the composite fermion pairs [2] interact as spin-polarized Cooper pairs in a p-wave superconductor. The mean field theory of Bardeen, Cooper and Schrieffer [3], was used to characterize these composite fermion interactions.

To evaluate the viability of our superconducting composite fermion model, we calculate σ_{xx}, the longitudinal conductivity of the FQH system as a function of frequency ω and wave number k. Our calculated σ_{xx} values can serve as predictions for yet-to-be-performed surface acoustic wave experiments on the $\nu = \frac{5}{2}$ state.

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The New Face Of Science Policy

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The events of September 11th have changed the social and political climate of our nation. With the threat of terrorism at our doorstep, and the nation struggling for normalcy and an end to the recession, Congress is forced to perform a difficult juggling act. We will take a look at the recent political climate, the legislation that it has spawned, and where science and engineering fit into the picture.

$$\frac{ds_1}{dt} = v_1 - k_1 s_1 x_1 + k_{-1} x_2,$$
$$\frac{ds_2}{dt} = k_2 x_2 - k_3 s_2^{\gamma} e + k_{-3} x_1 - v_2 s_2,$$
$$\frac{dx_1}{dt} = -k_1 s_1 x_1 + (k_{-1} + k_2) x_2 + k_3 s_2^{\gamma} e - k_{-3} x_1,$$
$$\frac{dx_2}{dt} = k_1 s_1 x_1 - (k_{-1} + k_2) x_2.$$

s1 is ATP
s2 is ADP
x1 represents the activated form of the enzyme
x2 represents the product molecule of ADP

The non-linear dynamics of this system is characterized by using dimensionless variables. The energy of the system will be graphed as well as the dimensionless form of this energy.

Testing Binary Black Hole Codes in Strong Field Regimes

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Center for Gravitational Physics and Geometry
The Pennsylvania State University

In order to further our understanding of the instabilities which develop in numerical relativity codes, I study vacuum solutions of the cosmological type (T^3 topology). Specifically, I focus on the 3+1 ADM formulation of Einstein's Equations. This involves testing the numerical code using the following non-trivial periodic solutions, Kasner, Gowdy, Bondi and non-linear "gauge" waves. I look for constraint violating and gauge mode instabilities as well as numerical effects such as convergence, dissipation and dispersion. I will discuss techniques developed to investigate the stability properties of the numerical code.

Sundry Aspects of Magnetospheric Dynamics

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A magnetosphere is formed through the interaction of the intrinsic magnetic field of a magnetized celestial body and its plasma environment. Magnetospheres serve as natural plasma physics laboratories in which we can observe and study a variety of plasma phenomena over a far larger range of parameter values than those which can be studied in terrestrial laboratories. Earth's magnetosphere can be considered to be a prototypical magnetosphere; it is certainly the example with which we have become most familiar throughout the Space Age. Studies of the terrestrial magnetosphere have utilized a variety of tools, including: observations of auroral phenomena from the ground; measurements of the terrestrial magnetic field from ground stations distributed throughout the world; both in-situ measurements and direct observations from spacecraft; theoretical investigations; and numerical models. These studies have resulted in, among other things, a basic understanding of the magnetospheric substorm as a fundamental `unit' of magnetospheric dynamics. A substorm is a period of enhanced energy transfer from the solar wind (the plasma environment in which Earth's magnetosphere is embedded) to the magnetosphere. Substorms are typically divided into three phases: the growth phase, during which energy is extracted from the solar wind and stored as magnetic field energy in the magnetotail lobes; the expansion phase, during which this stored energy is dissipated, largely through the ionosphere and out the magnetotail; and the recovery phase, during which the magnetosphere returns to a sort of `ground' state. One of the phenomena observed in the late growth phase is the formation and thinning of a thin current sheet in the near-Earth region of the magnetotail. The study of this phenomenon is important because of its role in either establishing the required conditions, or actually being responsible, for the onset of the expansion phase, at which time the energy stored in the magnetotail lobes is released. Ongoing research which investigates a proposed mechanism for this process of current sheet thinning will be briefly described.

Laser Cooling and Trapping of Alkali Atoms

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Laser cooling and trapping is a new and exciting area of research in the field of Quantum Optics. Here we discuss the trapping of alkali atoms. The resonance reaction these atoms can be analyzed by a two-level atom model consisting of two states, i.e. $|g,S=0\rangle \rightarrow |e,S=1\rangle$, ground and excited states respectively. The transitions are excited by laser light. Due to the Doppler effect the atomic energy levels are spread in frequency hence the lasers are detuned with respect to resonance. To trap the atoms we use anti-Helmholtz coils to provide a quadropole magnetic field. The energy level of the atoms undergo Zeeman splitting of the spectral lines and they experience a force depending on direction of the atoms velocity. The magnetic fields shifts the atoms back into resonance with the principle transition frequency. The gas is forced toward the zero of the fields, which in our case is at the center of the chamber. With the proper trapping potentials and resonating transitions frequencies we there by form a magneto-optical trap (MOT). In particular we cool cesium ^{133}Cs in a MOT by exciting the atomic gas with 6 orthogonal counter-propagating beams at $0.7mW/beam$, with a laser at $\lambda = 852nm$ derived from two custom made semiconductor diodes. The light is detuned from resonance with respect to the optical transitions by adjusting the cavity length and referenced to using saturation cell spectroscopy techniques. The resonance trapping transition frequency of cesium is 6 $S_{1/2}$, F=4 to 6 $P_{3/2}$, F'=5. To re-pump the atoms that decay to other hyperfine ground state we use a second diode laser tuned to resonance with 6 $S_{1/2}$, F=3 to 6 $P_{3/2}$, F'=3. The magnetic field gradients used where $\left|\frac{dB}{dz}\right| \approx 20G/cm$. With a Cs MOT temperatures on the order of $100\mu K$ and 10^6 trapped atoms can be obtained. Applications of the MOT include loading atomic chips, Bose-Einstein condensation (BEC) with all-optical trapping, and atomic Bragg diffraction. Here we shall study the atomic chip and the all-optical trap in detail. Probing the atomic cloud of the MOT with a high-power far-off resonance CO_2 laser operating at high powers $P \geq 20W/beam$ can form an optical trap. Such optical dipole traps have no magnetic fields and provide a deep trapping potential to offer tight confinement. The strong electric fields ac Stark shift in atomic energies is proportional to the far-off resonant laser beam intensity. We are presently studying loading of an atomic chip via MOT. Here we can manipulate the cloud of atoms inside the chamber with magnetic fields produced by small current carrying wires. Utilizing various trapping and cooling techniques, both cases can yield ultra-cold atoms at BEC temperatures $T \leq 1\mu K$.

The Lithium Niobate Crystal and the Electron Paramagnetic Resonance Study

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The electron paramagnetic resonance has matured into a powerful, versatile, nondestructive and nonintrusive analytical method. Unlike many other techniques, EPR yields meaningful structural and dynamical information even from ongoing chemical or physical processes without influencing the process itself. Therefore, it is an ideal complementary technique for other methods in a wide range of studies and application area. EPR applications are commonly used in physics, chemistry, biology, and medicine.

The Lithium niobate crystal is a ferroelectric crystal; also, it is a transition metal that has increased photorefractive sensitivity. Lithium Niobate have useful dielectric, elastic and optoelecronic properties. The Lithium niobate crystal I am currently working with is grown from melt by the use of the Czochralski technique that was implemented at the Alabama A&M University. The Lithium niobate crystal is a switching modulator has optical switching speeds as fast as 50 ps. My objectives of this project are: To understand the EPR technique (theory and experiment), familiarize myself with the use of the spectrometer, investigate some of the simple optical materials using the EPR technique, and conclude the study with results. Next month I am actually working in the labs and running experiments on the actual Lithium Niobate crystal doped with Ni and Zn.

Application of Nano-Channel Glass Technology: A Microelectronic Retinal Prosthetic Electrode Array

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Interest in nano-scale technologies is rapidly increasing, due in part to the new applications for these technologies. We utilized a variation of a method of creating porous nanochannel glass wafers to make a new electrode for use in a retinal prosthetic device. The two main advantages of the channel glass/wire electrode is the increased surface area of the electrode, resulting in lower impedances, and the ability to conform the electrode to the retinal surface. The approximately 250-800 micron thick electrodes are fabricated in a multi-step process utilizing fiber optic bundling and electroplating technologies developed at the Naval Research Laboratory. The electrode is driven by a multiplexed, 80 x 40 current source microelectronic image array. We discuss the fabrication of our test device with micro-wires, preliminary evidence of decreased impedance versus a gold electrode and evidence of retinal response to stimulation, performed at the Johns Hopkins University. Our test device will enable acute human experiments in an operating room environment to demonstrate a massively parallel interface between retinal tissue and a microelectronic array.

Residual Stress Modeling In Quantum Dots

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

Keywords: Quantum Dots, Lattice Mismatch, Thermal Expansion, Critical Thickness, Residual Stress.

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Mechanical Properties of Filament/Motor mixtures

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We develop a microscopic theory for the linear viscoelastic response of disordered mixtures of filamentous proteins (such as F-actin) and molecular motors (such as Myosin). We review the dynamics of semiflexible polymers and the complex viscoelastic response of entangledsemiflexible polymer solutions. Finally we describe how the activity due to the motors affects the filament dynamics and hence the rheological properties of the solution.

LIGO:At the frontier of gravity wave astronomy*

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The Laser Interferometer Gravitational Wave Observatory (LIGO) project seeks to make the first direct detection of gravitational radiation as predicted in Einstein's general theory of relativity. In doing so various aspects of the theory can be tested, such as the predicted quadrupole nature of the radiation, the propagation velocity of the waves, and the existence and spin of the graviton. Sapphire (Al2O3), because of its optical, mechanical and thermal properties, is being considered as a test mass material in advanced versions of the interferometer. In this talk we provide a discussion of the LIGO experiment with emphasis on sapphire characterization studies that are being conducted as part of the LIGO materials development program. This work supported by National Science Foundation Grant No. PHY-0101177.

Laser-Induced Damage Effects in DKDP Crystals

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The damage initiation and growth process in optical materials for large aperture laser systems plays an important role in determining the lifetime of the optics, and thus the cost of operation. In this work, we investigate laser-induced damage processes initiated in the bulk of DKDP crystals. Experimental results show that at fluences greater than 10 J/cm^2, damage sites are formed with increasing number as a function of the laser fluence. Following plasma formation, cracks are observed which grow in size within seconds from the termination of the laser pulse. Experimental results suggest that there is also relaxation of the stresses adjacent to a damage site for several hours after initial damage.

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Differentiating Between Chemical and Magnetic Roughness at an Interface.

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Many of the envisioned devices that employ the properties of electron spin are affected by the interlayer interfaces the electron has to pass through. Thus, understanding the magnetic and chemical characteristics of these interfaces is essential to the design and success of these devices. We use X-ray magnetic circular dichroism (XMCD) and X-ray resonant magnetic scattering (XRMS) to study and characterize magnetic interfaces. These techniques have demonstrated great interface sensitivity and the ability to differentiate between the chemical and magnetic aspects of the interface. Data on EuO, taken at the MSU/NRL Magnetic Materials X-ray Characterization Facility located at beamline U4-B of the National Synchrotron Light (NSLS), Brookhaven, NY is analyzed. Important roughness parameters are extracted by fitting the data with a simulation model.

The New Solar Atmosphere andThe Quiet-Sun Transition Region Explorer EUV Telescope *(Q-STREET)*

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The goal of deriving a global model of the solar atmosphere eluded scientists for several decades due to the difficulty of incorporating the solar transition region (20,000 K < T_e < 1,000,000 K) into the models that were presented. Recently, our group was able to resolve this long-standing problem, successfully predicting the morphology and energy balance of the solar transition region by fitting models to observations of unresolved quiet-Sun emission features observed by our spaced-based platform, the Multi-Spectral Solar Telescope Array (MSSTA), in a 171 – 175 Å bandpass. This work resulted in the discovery of a new feature in the solar atmosphere, which we have given the name *lukewarm loops* – small plasma loops with peak temperatures between 250,000 K and 900,000 K. These loops are the most abundant family of structures on the Sun's surface and may be responsible for the bulk of solar EUV radiation. The study of these lukewarm loops can address one of the most fundamental questions in solar physics – how energy is transferred from the solar magnetic field into the solar plasma – and will require observations of diagnostic quality on a spatial scale of 50 – 100 kilometers; this is a full order of magnitude beyond the capability of any current or planned mission. We will present a mission concept *The Quiet-Sun Transition Region Explorer EUV Telescope (Q-STREET)* that is designed to investigate the mechanisms underlying the generation of the hot solar atmosphere by attaining spectroscopic observations of the solar atmosphere over the temperature range of the solar transition region, with very high angular resolution (0.1 arcseconds) that will permit models of physical processes that underlie the phenomena of solar activity to be formulated and tested at the scale, 50 – 75 kilometers that appears to be fundamental.

Construction of the photo voltaic cell based on Nikola Tesla principle

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Nikola Tesla was one of the greatest scientists who did major contribution to the filed of the electricity and magnetism. Some of his achievements are discovery of the alternate current electrical engine, generation of high frequency and high voltage electrical pulses and wireless distribution of energy. He was so ahead of his time that even today we are not able to reproduce some of his experiments, which he demonstrated in front of many people

One of his less known patents is the production of the electricity by light. That patent can be considered as the first description of the photovoltaic solar cell. However in the time when he made the experiment there are many limitations. The theory of electro magnetism was still not developed, even electron was not discovered in that time. Also many materials that we have today were not available in that time.

My experiment took all the advantages of the presently available material and theory. I use the newest technology, which provide me with low work function materials. It will present what efficiency of the photovoltaic cell can be achieve and what are the limits of the photovoltaic cell proposed by Tesla.

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

Reexamination of Davisson-Germer Class Experiments and Implications

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The Davisson-Germer experiments are generally regarded as the definitive empirical verification of the de Broglie postulate $\lambda = h / p$. Schrödinger's equation rests on the so-called wave nature of matter. We show an alternative interpretation of the Davisson-Germer experiment, along with an empirical test of our assertion. This analysis would apply to any crystal-based instrumentation. We also suggest that there may be a way to do atomic mechanics that does not imply non-physical felines.

Comparison of particle transport in rf and dc glow discharge complex plasmas - implications for microgravity experiments.

Mottness and the Hall Coefficient in the High T_c copper oxides

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In any electronic system, the Hall coefficient is the key experimental probe of the sign of the charge carriers. In the copper-oxide high-temperature superconductors, hole-doping the parent materials, which are all half-filled Mott insulators, leads to several anomalous features of the Hall coefficient: 1) in all cases, a decay faster than the inverse doping level, in contrast to a non-interacting system and 2) in some cases, a sign change beyond some critical concentration. We show here that these features are natural consequences of the strong correlation physics of Mott insulators, which we term Mottnes. Consequently, all weakly-interacting schemes fail. We demonstrate that all Mott insulators having an initial positive Hall coefficient upon doping must undergo a sign change beyond a critical doping level. Experimental measurements performed on the archetypal doped Mott insulator, a single hole-doped copper-oxide layer, confirm that the Hall coefficient changes sign at the hole doping level of $x_c = 0.24$. Consequently, we conclude that all cuprates, even $Bi_2Sr_2CaCu_2O_{8+\delta}$ must undergo a sign change as all of the relevant physics of the cuprates appears to emanate from the copper-oxide plane.

Time-Reversed Image Synthesis of Dielectric Objects

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We demonstrate the reconstruction of one- and two-dimensional dielectric objects exhibiting both amplitude and phase contrast, by numerically back-propagating measured scattered single-cycle terahertz transients. An image obtained via tradition THz imaging is also compared with the time-reversed method.

Typically, the inverse problem has employed frequency domain techniques to reconstruct an object from directly measured scattered fields. Recently, time-domain approaches to the inverse problem have been demonstrated using both electromagnetic and acoustic pulses[1, 2]. More recently, we developed another time-domain imaging technique in which diffracted transients from amplitude-contrast (metallic) objects were used to reconstruct their spatial transmission functions[3]. In a similar vein, we now demonstrate the effectiveness and completeness of this technique using 1D and 2D dielectric objects, for which the image arises from both amplitude and (perhaps even more importantly) phase contrast.

Following Goodman's approach to represent the Huygens-Fresnel integral in the time-domain[4], it can be shown that the diffracted fields from a phase object with transmission function,

$$u(P_1,\omega)=T(P)\exp(-i\phi(P_1))=T(P)\exp(-i\omega\tau(P_1)),$$

still yield the familiar time-dependent diffraction expression: (1)

$$u(P_0,t)=\iint_{\Sigma}\frac{\cos(\hat{n},\hat{r}_{01})}{2\pi v r_{01}}\frac{\partial}{\partial t}u(P_1,t-\Phi)d\sigma,$$

where □ represents the modified retarded time, ($r_{01}/c+$□(P_1)). Since the Eq. (1) is congruent with the standard diffraction integral, and because of the time-reversal symmetry of Maxwell's equations, the diffracted field at the far-field position P_0 can be mathematically time-reversed and then used as an input field in a time-reversed form of the Kirchoff diffraction integral to reconstruct the field at the object's position P_1.

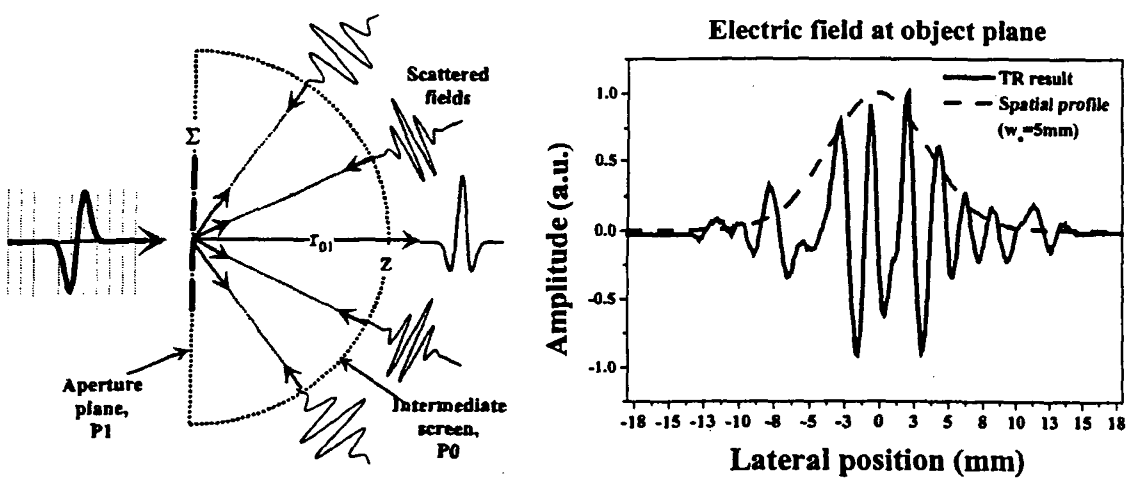

Fig. 1: (left) 1D experimental configuration, (right): back-propagation result

MEMS Technology Development for Military Applications

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It is well known that MicroElectroMechanical Systems (MEMS) offers the potential solution to size, weight, and cost issues for the soldier, missile, gun, ground vehicles, and aircraft applications. The intent of this paper is to discuss the recent progress of ongoing efforts at the Army Aviation and Missile Command (AMCOM) to develop MEMS technology for military applications. The current maturity level of low cost, low power, micro devices in industry, which range from simple temperature and pressure sensors to accelerometers in airbags, provides a viable foundation for the development of rugged MEMS devices for dual-use applications. Early MEMS technology development efforts at AMCOM emphasized inertial MEMS sensors. An Army Science and Technology Objective (STO) project was initiated to develop low cost inertial components with moderate angular rate sensor resolution for measuring pitch and yaw of missile attitude and rotational roll rate. Leveraging the Defense Advanced Research Projects Agency and other Government agencies has resulted in the development of breadboard inertial MEMS devices with improved robustness.

Several Government programs have been initiated to develop MEMS devices for use in military applications requiring systems and sub-systems that have wide operational and storage range capability. Advanced technologies are being exploited to achieve the performance and cost goals dictated by the emerging missions of the Transformed Army. It has been determined that MEMS arrays or ganged sensors can improve system performance and provide more robust mission capability. A STO research and development project is currently underway to develop controlled arrays of MEMS sensors to provide for full military dynamic performance ranges using miniature sensor systems. Multi-range MEMS inertial sensors that are being developed at AMCOM, as well as under DARPA and other Government agencies programs, will be multiplexed to provide performance range expansion. MEMS angular rate sensors are enhanced with vibration feedback for signal stabilization in high-vibration environments. An array of integrated feedback accelerometers is expected to increase the dynamic range by a factor of 10. The MEMS array technology will be applicable to a broad range of military applications, which include environmental sensor suites and arrays of phase shifters, RF switches, steered antennas, steered mirrors, etc.

Recently, MEMS research at AMCOM was expanded to include environmental MEMS sensors for missile health monitoring, RF-MEMS, optical MEMS devices for beam steering, and micro-optic 'benches' for opto-electronics miniaturization. The Army has a critical need for smart structural health monitoring systems to improve the reliability of aviation and missile systems. Combining photonics and MEMS technologies will produce low-cost, robust smart systems that are capable of sensing, producing actuation, and transferring systems structural health information for use in determining when maintenance actions are required for ground equipment, aviation vehicles, and missile systems. It is anticipated that a suitable marriage of MEMS and nano-technology will significantly enhance system performance and provide more robust mission capability. Additionally, MEMS packaging and integration issues have come into focus and are being addressed. Selected ongoing research efforts in these areas are presented, and some horizon MEMS sensors requirements for Army and law enforcement are presented for consideration.

Second Harmonic Generation of Light at 461nm

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We produce 461nm light by frequency doubling a cw titanium sapphire laser in a Potassium Niobate ($KbNO_3$) crystal. The crystal is placed in a linear enhancement cavity for the infrared. With an input infrared power of 389mw, we achieved a maximum stable output of blue at 232mw. The 461nm light is used for laser-cooling of Strontium atoms.

Large Dielectronic Recombination Satellite Transitions in Heliumlike Ti XXI

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We have obtained the dielectronic recombination satellite spectrum for heliumlike Ti XXI using the LLNL electron beam ion trap, EBIT II \cite{Sample} and a high resolution Bragg crystal spectrometer in von H\'{a}mos geometry \cite{Sample1}. We observe x-ray photons, emitted at 90° to the electron beam, as doubly excited states formed by the capture of a free electron and a simultaneous excitation of a bound electron become stabilized. We have calculated the photon energies for these satellite transitions using an MCDF theory, and we find that the theoretical and experimental photon energies are in good agreement. In this study, we have looked at transitions in the KLM series of dielectronic recombination resonances, which correspond to the satellites of the Kβ \cite{Sample2} lines in heliumlike Ti XXI.

We gratefully acknowledge support by the U. S. Office of Basic Energy Science, Chemical Sciences Division, and the LLNL Research Collaborations Program for HBCU's. This work was performed under the auspices of U. S. Department of Energy by Morehouse under contract No. DE-FG02-98ER14877, and by LLNL under contract No. W-7405-ENG-48.

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An Investigation of the Behavior of LaF_3 Doped WITH Ho^{3+}

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Rare earth elements are the most ideal materials used in laser development. Due to the high amounts of clustering, metallic earth elements are not considered to be good host elements. The absorption and emission of photon energy will be diminished considerably if they are present in the system. Electrons are absorbed by photons and are natural seeking the ground state of a system. When the electrons are excited by some energy source, they are bumped to a higher level of energy. Two things occur at this point, radiating emission and irradiating emission. In the first case, a photon is emitted and a laser is produced. In the latter case, a phonon is produced and a vibration is given off producing heat. Rare earth elements are the only metal ions that allow lasing to occur in glass like materials. Because of their forbidden transitions, the condition for up converting energy is able to take place. The doping of crystals and oxide glasses with rare earth ions will generate multilevel energy schemes producing effective lasing systems. The host element selected in this investigation make precise transitions between states, and these transitions are noticeable around the visible part of the spectrum. This investigation will also show the efficiency of the oxide glass in comparison to that of a single crystal. We will concisely show upon conclusion the data attained will give way to more material that will be useful in future laser development and research.

Analysis of the Network Topology of Instant Messenger Networks and Investigation of Correlation to Known Evolving Graph Models

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Much recent work has been done in investigating evolving non-equilibrium networks on both a theoretical and experimental basis. These networks are found to have relatively short average shortest paths, larger clustering coefficients than similar random graphs, and often a degree distribution that corresponds to a power law. This research will investigate whether instant messenger networks display this topology due to the traits they share with evolving networks such as increasing node number and preferential linking. The possible consequences regarding human social behavior, the spread of computer viruses, etc. will also be discussed.

The Development of a Novel Fiber-Based Refractive Index Sensor

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Some economical methods for placing periodic structures on the surface, as well as, within the interior of silica-based optical elements using both a pulsed ultraviolet (UV) source at 193 nm and a continuous wave (CW) source at 244 nm are presented in this paper. The research illustrated here is an extension of previous work that investigated the affects of intense UV radiation fields on both SiO_2 and Ge-doped SiO_2-based structures (specifically optical fibers and preforms). In addition, these techniques were devised in order to satisfy two experimental tasks set forth by NASA Glenn Research Center (Cleveland, Ohio). The first task led to the integration of a diffractive optical element into a miniature cross correlation setup. The second task, which is the focus of this paper, involved the production of a novel non-intrusive prototype refractive index sensor for the dynamical measurement of chemical reactant densities of rocket fuel during combustion. Additionally, when fully developed, this technology can be extended to other aerospace, agricultural, and biomedical applications, such as the early detection of icing on airplane wings, to warn farmers against impending frost, and to monitor the flow of fluids in blood vessels.

Physics Outreach in South Africa: *mini-Exploratorium?*

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A connection between the Quarknet institutions of Columbia University, Hampton University, and University of Pittsburgh on the US side and some schools in Africa began in summer, 2001, with visits of 4 African teachers to the US. The teachers participated in Research Experiences for Teachers and Quarknet programs. In February, 2002, Dodd and Thompson traveled to Johannesburg and Capetown, South Africa, in order to plan a trip in July and August, 2002. Members of the teams in July/August 2002 will include a US high school teacher and US graduate students and undergraduates. The teams will present a small number of "mini-Exploratorium" style experiments, will work with students and teachers on hands-on activities related to the local science curriculum, and will consult as desired with teachers on other teaching issues. The present plans for the trip will be described.

New methods in semiconductors processing and characterization and NCCU research program

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First I will give a short overview of the NCCU facility and experimental methods available to our group. Some of the techniques and experimental equipment are really rare, but powerful tools, which are up to now for some reason not sufficiently applied in the semiconductor research. After that I will present our plan for further research.

The experimental techniques available to our group are unique. NCCU posses far Infra Red wave sources, very useful for low absorbance material characterization. NCCU also posses a powerful electron gun, which can be used for both, material processing and characterization. In addition, we have access to unique Free Electron Lasers (FEL), which are the best in the world. We are already using Duke FEL, which has available wavelength from 180 nm up to 9 μm (the only one in the world with so broad range). The FEL at Jefferson Laboratory, also available to our group, is the world the most powerful laser in the IR region. And finally through collaboration with Fisk University we have available Vanderbilt FEL, which is well known in its fine beam control and tuneability. At the Duke FEL the NCCU group has installed PL and is in the process of installing Raman spectroscopy. The NCSU group has installed at DFEL the instrumentation for Internal Photo Emission, which will be available to our group too. High DFEL power, several order of magnitude higher than for conventional laser, and broad range of available wavelength, together with short pico seconds pulses, have the potential not only for improving existing methods, but also for developing new ones, as for instance fast non-linear methods.

Integral to our effort of building one of the best laboratories in materials characterization is our collaboration with the Institute Rudjer Boskovic (IRB) at Zagreb Croatia. In recent years, in collaboration with IRB, we have been developing Rutherford Back Scattering (RBS), Elastic Recoil (ERDA) and Ion Beam Induced Current (IBIC) techniques. We have already published several results[3], which demonstrate the power of these methods in semiconductor characterization. In addition we demonstrated how these techniques can be useful when combined with Raman, PL and standard electrical methods, such as Deep Level Transient Spectroscopy (DLTS)[2,4].

Our final goal is actually to combine these two fields, material treatment and characterization, and to have in-situ material processing, where the quality of a material and its characteristics will be monitored at each step of material formation.

Using the unique facilities at NCCU, DFEL, JLab and Vanderbilt we will improve semiconductor materials. For instance we are able to change the internal structure of semiconductors, from amorphous to nanocrystalline or microcrystalline, and to improve short and intermediate order in semiconductors, by exciting specifics bonds in the semiconductor, using appropriate wavelengths[1,2]. We are able to induce changes in only one phase in composite materials and to study its influence on electrical, optical and other properties. This opens the way to engineer completely new materials or in an effective way to improve the characteristics of existing inhomogeneous materials.

The plan for our further research can be grouped in the following categories.

I Materials modification Study the low temperature crystallization and the influence of selective bond breaking on the structure and electrical activity of defects in semiconductors.

II Materials characterization by FEL Develop photo luminescence, Raman spectroscopy, internal photoemission (IPE), thermal stimulated current (TSC) and fast optic measurements using the FEL beam for excitation.

III Materials characterization by nuclear methods Ion induced current (IBC), proton induced x-ray emission (PIXE) for imaging of heavy element contamination, Rutherford back scattering (RBS), elastic recoil detection analysis (ERDA) and ion beam induced luminescence (IBIL) for imaging of radiative recombination.

IV Implantation Induced Carbon- and Oxygen- Related Defects in Silicon.

V Radiation effects on material and development of radiation hard semiconductor devices.

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

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Energy Dependence of Turbulent Transport Parameters Using A Ginzburg-Landau Treatment

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The arc driven shock tube produces turbulent plasmas in noble gases at fusion relevant densities and temperatures. Using a Ginzburg-Landau treatment for second order phase transitions, phase coherence velocimetry, and correlation analyses, measurements are made of the local turbulent parameters under circumstances of varying total local turbulent energy. A critical turbulent energy is found which distinguishes complexity regimes in the behavior of the turbulent system.