Executive Summary of Physics Department Annual Report 1995-1996

Dave Aspnes was awarded the 1996 Frank Isakson Prize for Optical Effects in Solids by the American Physical Society, **Harald Ade** was awarded the 1995 NCSU Chapter Sigma Xi Research Award, **John Blondin** was named a Cottrell Scholar by The Research Corporation, and was awarded the 1996 NCSU Chapter Sigma Xi Research Award, **Jerry Bernholc** was awarded an NSF Creativity Extension Grant for FY96 and FY 97, and **Dale Sayers** was awarded the NCSU Alumni Association Outstanding Research Award.

Richard Patty received the 1995 Alexander Quarles Holladay Medal for Excellence, and **Gary Mitchell** continues as Alumni Graduate Distinguished Professor.

Karen Johnston served as President of the American Association of Physics Teachers, and **Robert Nemanich** began serving as Second Vice President of the Materials Research Society. **Gerald Lucovsky** was elected a Fellow of the Materials Research Society, and **Jan Schetzina** a Fellow of the American Physical Society.

The 1995 NC State Undergraduate Research Symposium gave a special recognition to the **PY 228 Students** for their class project under the supervision of John Blondin. **Ho-Meoyng Choi,** a graduate student working with Chueng Ji, was selected to receive a SURA/CEBAF graduate fellowship for the 1996-1997 academic year. **Ginger Edwards** and **LucyMarie Mantese**, graduate students working with Dave Aspnes, received separate Awards from the Materials Research Society and the American Vacuum Society

Anita Smith was elected to the very first Staff Senate at NCSU. **Mike Smith** was awarded an NCSU Outstanding Extension Service Award for 1995.

The Department published 186 articles in refereed journals, 30 publications in conference proceedings, and presented 158 papers at professional meetings. Total **research funding** was approximately **$5.5M**.

The Department conferred **13 BS**, **8 MS**, and **8 PhD** Degrees. Six graduating seniors scored in the 93% on the 1995 major fields achievement test in Physics.

Approximately 8500 students visited The Physics Tutorial Center, which continues to be rated highly by students in the introductory classes.

Twenty high school **physics teachers from Korea** spent 5 weeks at Science House learning new laboratory and computer techniques.

The **First Annual Spring Meeting** of the newly formed North Carolina Section of the American Association of Physics Teachers was held at NCSU March 29-30.

A national committee of women physicists from the American Physical Society was invited to assess the **climate for women in the Department**. The report, sponsored by NSF, found women students here to be positive about their experiences, but encouraged us to redouble our efforts to hire more women faculty.

The speaker for the 1995 **L.H. Thomas lecture** on October 23 was Professor Jerome Friedman, chair of the MIT Physics Department, and co-winner of the 1990 Nobel prize. The visit of Dr. Friedman to Hillside High School in Durham was the subject of a highly positive editorial in the Raleigh News and Observer.

Concerns: The major concerns for the Department continue to be fragmentation of our faculty and the poor quality of much of our physical space. We occupy seven different buildings, most of which are totally

inadequate for mounting the kinds of nationally competitive research programs that our faculty are capable of sustaining, and to which North Carolina State University should aspire. Fragmentation and poor space have a negative impact on our ability to attract and retain undergraduate and graduate students. In addition, the poor quality of much of the instructional space inhibits our ability to deliver introductory physics teaching using state of the art technologies and methods.

We continue to track potential African American faculty candidates. We have identified two of our former undergraduates as likely interested in returning to NCSU after they complete their PhD's and after they gain appropriate post doctoral experience. Salary and start up offers, as for women faculty, will need to be highly competitive if we are to attract them to NCSU.

The Department continues to be recognized for the excellence of its faculty, staff and students, the high quality of its research, and its commitment to the instructional goals of the University. Physics is one of a handful of Departments poised to make a significant jump in national rankings over the next ten years. We need the support of the University in making the instructional laboratory building a reality, and in creating a permanent home for physics in a physical sciences research complex on Centennial Campus.

Honors and Recognitions

Harald Ade was selected to participate in the Proctor and Gamble Presidential Faculty Fellow Program, and was awarded the 1995 NCSU Chapter Sigma Xi Research Award.

Dave Aspnes was elected Divisional Councillor of the Division of Condensed Matter Physics of the American Physical Society, and was awarded the 1996 Frank Isakson Prize for Optical Effects in Solids by the American Physical Society.

John Blondin was named a Cottrell Scholar by The Research Corporation, and was awarded the 1996 NCSU Chapter Sigma Xi Research Award.

Jerry Bernholc was awarded an NSF Creativity Extension Grant for FY96 and FY 97.

Chris Gould was elected to a 2 year term as Zone VI Councilor for National Society of Physics Students.

David Haase was elected a Foundation Member of the NCSU Phi Beta Kappa Chapter.

Chueng-Ryong Ji was elected a Fellow of the Korean-American Science and Engineering Association.

Karen Johnston served as the President of the American Association of Physics Teachers.

Gerald Lucovsky was elected a Fellow of the Materials Research Society.

Gary Mitchell was named as an Alumni Graduate Distinguished Professor.

Robert Nemanich was elected Second Vice President of the Materials Research Society.

Richard Patty received the 1995 Alexander Quarles Holladay Medal for Excellence.

Dale Sayers was awarded the NCSU Alumni Association Outstanding Research Award, and the Seventh Annual NCSU Libraries Faculty Award.

Jan Schetzina was elected a Fellow of the American Physical Society, and was honored at the NCSU Inventors Banquet for receiving three Patents.

Publications and Other Professional Activities.

Publications Summary (Jan - Dec. 1995)

Refereed Publications: 186

Undergraduate Publications: 3

Other publications: 30

Papers presented at professional meetings: 158

Service on major university committees:

D. Aspnes - NCSU Hazardous Materials Management Committee

R. Beichner - University Teaching Effectiveness & Evaluation Committee

J. Bernholc - University Research Committee

Chair, NC Committee on Partnerships for Advanced Computational Infrastructure

Graduate Fellowship Committee in Computational Sciences

S. Cotanch - Steering Committee, NCSU Computational Engineering and Sciences Program

R. Egler - University Integrated Database Planning Committee

C. Gould - Faculty Trustee Committee of Honorary Degrees

Chair, Radiation Safety Advisory Committee

Ad Hoc Committee on PAMS Senate Representation

D. Haase - Chair of Executive Committee, NCSU Academy of Outstanding Teachers

University Honors Council

University Teaching Evaluation and Effectiveness Committee

Chair, University Teaching Effectiveness Workshop

K. Johnston - University Government Committee

Faculty Senate Committee on Undergraduate Student Success

G. Lucovsky - Council of University Professors (Chair)

N C State University IGEEM Committee

G. Mitchell - Committee on Interdisciplinary Graduate Education in Electronic Materials

Awards and Credentials Committee

Committee to Select Alumni Distinguished Professor

Graduate Academic Affairs Committee

R. Mowat - Radiation Protection Council

University Strategic Planning Committee

Nuclear Reactor Program Strategic Plan Advisory Committee

Master Classroom Subcommittee of the Classroom Improvement Committee

M. Paesler - Scholarly Communications Subcommittee of the University Library Committee

J. Park - Department Coordinator, NCSU State Employees Combined Campaign

G. Parker - University Open House Committee

R. Patty - Watauga Medal Selection Committee

University Honors Council

S. Reynolds - University Arts Studies Advisory Committee

E. Rieg - Advisory Council for the NCSU Undergraduate Studies Tutorial Center.

J. Risley - University Intellectual Property Committee

D. Sayers - University Research Committee

NC Star Executive Committee

NC State Alumni Association Outstanding

Research Awards Committee

Offices held; national committees:

• **Harald Ade** is a member of the User Executive Committee at the Advanced Light Source and the Program Study Panel at the National Synchrotron Light Source, and served as a member of the User Advisory Committee for the Duke Free Electron Laser, the session Chair for the Advanced Light Source Users Meeting, and a Member of the local organizing Committee for the Third International Conference on Atomically Controlled Surfaces and Interfaces.

• **David Aspnes** served as a member of the International Program Committee, International Conference on the Physics of Semiconductors, and as a member of the Governing Board, National Nanofabrication Users Network. He is also serving a Councilor of the American Physical Society from the Division of Condensed Matter, and serves as a Member of the Editorial Board for Thin Solid Films, Member of the Advisory Board for Applied Surface Science, Editor of the Proceedings of the Conference on the Physics and Chemistry of Semiconductor Surfaces, Member of the Editorial Board for Physical Review B, and Member of the Program Committee for the 1995 NIST Workshop on Semiconductor Material Characterization.

• **Robert Beichner** is a member of the American Association of Physics Teachers Committee on Research in Physics Education. He also serves as Contributing Editor for Educational Technology Review, and as a member of the Editorial Board for the Journal of Educational Multimedia and Hypermedia.

• **Jerzy Bernholc** served as the NCSU Representative to the Academic Affiliates of the Pittsburgh Supercomputing Center, as a session chair at the APS March Meeting, as a panel member on Massively Parallel Computing at the Fifth Conference on Computational Research on Materials, as a member of the organizing committee for the 6th Annual Workshop on Recent Developments in Electronic Structure Algorithms, a member of the program committee for the 3rd International Symposium on Atomically Controlled Surfaces and Interfaces, and as Co-organizer of the Symposium on recent Progress in Computational Materials Science

• **Steven Cotanch** continues to serve as a consultant to the Svedberg Laboratory in Uppsala, Sweden. He also serves on the CEBAF steering committee for end station design and is the theory spokesman for the CEBAF Kaon/hypernuclear program.

• **Robert Egler** continued as Associate Editor for Safety for the Physics Instructional Resource Association Newsletter.

• **Chris Gould** continues to serve on the International Advisory Committee, Dubna, Russia for the I.M. Frank Prize. He serves on the Neutron Program Advisory Committee for the Los Alamos Neutron Scattering Center.

• **D. G. Haase** continues as Director of The Science House, and was a Member of the Executive Committee and the Program Committee for the SESAPS Meeting.

• **Hans Hallen** was the session Chair for "Scanning Probe Microscopies III" and for "Near Field Optics" at Photonics West, and served as a Member of the local organizing Committee for the Third International Conference on Atomically Controlled Surfaces and Interfaces.

• **John Hubisz** spearheaded the drive to create the North Carolina Section of the American Association of Physics Teachers, and chaired the first NCS-AAPT section meeting in Raleigh at NCSU.

• **Chueng-Ryong Ji** was a member of the Honor Societies of Phi Kappa Phi and Sigma Xi. He also served as the Editor in Chief of the AKPA Newsletter, and as a Council Member of the North Carolina Chapter of the Korean-American Scientists.

• **Karen Johnston** was the President of the American Association of Physics Teachers, where she also was a Member of the Awards Committee, the Review Board, and Chair of the Executive Board, and the Personnel and Finance Committee. She also served on the American Institute of Physics Governing Board, Education Advisory Committee, and Program Policy Committee.

• **Gerald Lucovsky** served as Editor-in-Chief of the Journal of Vacuum Science and Technology, as editor of the Journal of Vacuum Science and Technology A, as member of the Editorial Board for the Journal of Physics C, as a member of the International Advisory Committee for the 16th International Conference on Amorphous Semiconductors, and as a member of the PCSI Conference Committee.

• **G.E. Mitchell** served as Associate Director of the Triangle Universities Nuclear laboratory, and as a member of the University Graduate Council and the Graduate Administrative Board.

• **Robert Nemanich** served on the International Advisory Committee: Thin Films Conference Series, the National Science Foundation's EPSCoR Merit Review Panel, as Chair of the MRS Continuing Education Committee, as Co-organizer of the Diamond and Related Materials focus session of the American Physical Society Meeting, and as Co-organizer of the MRS Symposium on "III-Nitride, SiC and diamond Materials for Electronic Devices.

• **Michael Paesler** served as Publications Chairman for the Third International Conference on Near Field Optics, as Chairman of the Symposium on Sub-wavelength Near Field Optics of the Optical Society of America, as Chairman of the Symposium on Near-field Optics for the International Society of Optical Engineers, as a Member of the International Advisory Committee for the Third International Conference on Near Field Optics, and as a member of the Program Committee for the Third International Symposium on Atomically Controlled Surfaces and Interfaces.

• **Jae Park** was elected as President of the CICC International Cultural Council, and to Sigma Iota Rho, the international studies honor society. He was re-elected to the Board of Examiners of the University of Madras, India. He also is a member of the Korea Academy of Science and Technology, the Presidential Advisory Committee on Peaceful and Democratic Unification of Korea, and is a Faculty Fellow of the North Carolina Japan Center.

• **Elizabeth Rieg** served on the Programs Committee of the National Tutoring Association, and as a member of the Electronic Services Task Force for the American Association of Physics Teachers.

• **Dale Sayers** served on the Sigma Xi Nominations Committee, the International Advisory Committee for the XAFS VIII Conference, and on the NSLS Proposal Study Panel.

• **Jan Schetzina** served as a Member of the Program Committee for the International Conference on II-VI Semiconductors, as a Member of the Program Committee for the US Workshop on Molecular Beam Epitaxy, as a Member of the Program selection Panel for ONR, and as a Member of the Program Committee for the International Conference on MBE.

Minority Representation and Recruitment Efforts.

The Department continues to be concerned with the under representation of women faculty and African American faculty. A national visiting committee of women physicists from the American Physical Society was invited in the Spring to assess the climate for women faculty and students in the Department. Their report found the women graduate and undergraduate students to be positive about their experiences in the department, but nevertheless encouraged us to redouble our efforts to hire more women faculty. With the help of the Provost we made an assistant professor offer to a highly regarded synchrotron radiation physicist, but failed to attract her to NCSU because we could not make a offer to her husband, and also because we had no start up

funds to offer.

We continue to track potential African American faculty candidates. We have identified two of our former undergraduates as likely interested in returning to NCSU after they complete their PhD's and after they gain appropriate post doctoral experience. Salary and start up offers in both these cases, as for women faculty, will need to be highly competitive if we are to attract them to NCSU.

Students

Honors and Awards:

1995 NC State Undergraduate Research Symposium Special Recognition: PY 228 Students-Randal J. Adams II, Michael K. Brame, Peter J. Dickson, Jason L. Elliott, Chris L. Grove, Jonas C. Gunter, Kevin C. Jaget, Peter B. Kessler, Henry Kopp, Jeffrey T. Layton, John H. Martin, Beth N. Moll, Anadi S. Srivastava, Sean T. Tarlton and Christopher M. Ward, under the supervision of John Blondin

Department of Physics Senior Award for Research:

Rebecca S. Hoffenberg, under the supervision of Chris Gould and David Haase.

College of Physical and Mathematical Sciences Award for Research: Rebecca S. Hoffenberg, under the supervision of Chris Gould and David Haase.

Ho-Meoyng Choi, a graduate student working with Chueng Ji, was selected to receive a SURA/CEBAF graduate fellowship for the 1996-1997 academic year.

Ginger Edwards, a graduate student working with Dave Aspnes, received a Graduate Student Award from the Materials Research Society.

Eric Ayars, Asena Caner, Duane Deardorff, Paula Engelhardt, Hugh Harrington, Lance McLean, and **Joe Walston** were selected as outstanding Graduate Student Teaching Assistants.

Mike Malinowski and **Jay Sullivan** were selected as Outstanding Undergraduate Laboratory Instructors.

LucyMarie Mantese, a graduate student working with Dave Aspnes, was a winner of a 1995 American Vacuum Society Graduate Student Award.

Undergraduate Program Outcomes Effectiveness Assessment. Each year a group of graduating seniors in physics volunteers to take the ETS major fields achievement test. Six students took the test in 1995, and made an average score of 167.8, placing them in the 93% of the sixty institutions nationally who participated in the test. This score surpassed last year's already strong showing in the 88%.

Student Activities

Bachelor Of Science Degrees Conferred:

Michael Robert Brainard

Troy Alan Carter

Howard Allen Foster, Jr.

Rebecca Sue Hoffenberg

David Lawrence Jaeger

Andrew Richardson Lankford

Michael Louis Malinowski

Brian Stuart Marks

John Douglas McCorquodale

Thomas Hackney Parker, Jr.

John Phillip Sharpe

Grant Morey Stevens

James Moye Sullivan

Master of Science Degrees Conferred:

Daniel Burdett Cartin

Timothy Morgan Crowder

Matthew Alyn LaBonye

Terri Lynn McCormick

Michael John Powers

Shawn Leigh Wagoner

Eric James Watco

Hanyang Yang

Doctor of Philosophy Degrees Conferred:

David Brian Aldrich

Emil Larsen Briggs

Charles Randall Bybee

Bin Chen

Seon Mee Cho

Yuan Dao

Chiu-Yen Pang

Eric Clyde Tucker

Instructional Programs

Curriculum Development

Microcomputer based laboratories were developed and implemented for the introductory Physics Labs. Currently about half of the experiments performed in these labs make use of innovations in computer interface technology.

A proposal to integrate the lab portion of the PY 205 and PY 208 classes into the lecture was developed and is being pursued.

A joint BS program with Materials Science and Engineering is under development: BS in Physics - Materials Sciences Concentration

In calendar year 1995, 5780 students were enrolled in 100 and 200 level physics courses.

Approximately 8500 students visited The Physics Tutorial Center, which continues to develop innovative tutoring methods rated highly by students in the introductory classes.

Research

Volume of Activity

Research funding for 95-96 is about $ 5.5M.

Specific Achievements

The Department was rated 51/144 in "Quality of Faculty" in the National Research Council Rankings of Graduate Programs. In "Citations/Faculty" the Department was in the top quarter: 32/144.
The Department showed the tenth largest jump in the category "how has the program changed in the last five years."

Extension and Public Service

Volume of Activities

Each year Mike Smith, working with The Science House, makes about 70 presentations of "Physics on the Road" to over 15,000 students.

Physics faculty members reported making approximately 25 visits to elementary and high schools, as well as a range of extension activities from answering more than 100 questions over the year on astronomical topics to consulting with local jewelers on the possible use of physics in their profession.

Faculty members reporting extension activities:

J. Blondin, R. Beichner, J. Bernholc, D. Brown, R. Egler, D. Haase,

H. Hallen, C-R. Ji, K. Johnston, G. Lucovsky, R. Nemanich, M. Paesler,

S. Reynolds, E. Rieg, and J. Risley.

Specific Achievements

Twenty trainees from Korea spent 5 weeks at Science House with lectures from Richard Patty, David Haase, Jae Park, Chris Gould, and Chueng Ji, and laboratory experience with Hugh Harrington.

Organized by John Hubisz, The First Annual Spring Meeting of the newly formed North Carolina Section of the American Association of Physics Teachers was held at NCSU March 29-30. Invited Speakers were Albert Bartlett (former AAPT President) Clifford E. Swartz (Editor, The Physics Teacher), Karen Johnston (Immediate Past President of AAPT), Thomas L. O'Kuma (Vice President of AAPT) and Len Pietrafesa (MEAS). Meeting was well attended, with over 150 registrants from high schools, two and four year colleges, and universities, and fourteen industrial and corporate sponsors.

1995 Thomas Lecture: The speaker for the 1995 L.H. Thomas lecture on October 23 was Professor Jerome Friedman, chair of the MIT Physics Department, and co-winner of the 1990 Nobel prize "for demonstrating that protons and neutrons consist of quarks". The Thomas lectures are among the most prestigious general audience presentations in the Triangle. Since 1980, twelve different Nobel prize winners have spoken in the series. The visit of Dr. Friedman to Hillside High School in Durham was covered by the news media, and was the subject of a highly positive editorial in the Raleigh News and Observer.

The John B. Derieux lecture, the second of the Department's named lecture presentations, was February 12. Dr. Morrell Cohen of EXXON Research and Engineering, a world renowned theorist, known for his past work in statistical mechanics, amorphous materials and superconductivity, spoke on "Finessing Chemical Complexity via Chemical Reactivity Theory".

In conjunction with Science house, the Department presented "Isaac and Albert's Excellent Adventure", a Physics Demonstration program on two successive nights in March.

Administration and Staff

Anita Smith was elected to the very first Staff Senate at NCSU. She serves on Committee studying the issue of Benefits to Domestic Partners.

Mike Smith was awarded an NCSU Outstanding Extension Service Award for 1995.

Brenda Johnson served on the ad-hoc University Signage Project Committee.

Recommendations and Concerns for the Future

The major concerns for the Department continue to be fragmentation of our faculty and the poor quality of much of our physical space. We occupy seven different buildings, most of which are totally inadequate for mounting the kinds of nationally competitive research programs that our faculty are capable of sustaining, and to which North Carolina State University should aspire. Fragmentation and poor space have a negative impact on our ability to attract and retain undergraduate and graduate students. In addition, the poor quality of much of the instructional space inhibits our ability to deliver introductory physics teaching using state of the art technologies and methods. Physics is one of the most dynamic Departments on campus and is one of a handful of Departments poised to make a significant jump in national rankings over the next ten years. We need the support of the University in making the instructional laboratory building a reality, and in creating a physical sciences research complex for all our faculty on Centennial campus.