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I. FOREWARD

This has been an unusually busy year, and in many ways a trying one. The year began with a campus-wide self-study, and wrapped up amidst a budget scare that evoked questions concerning the very future of the physics degree program. In between, we successfully recruited one new faculty member and somehow managed to keep pace with our normal everyday activities (classes, seminars, research).

The Fall 2000 semester marked the beginning of an institutional self-study, a process required to reaffirm University accreditation with the Southern Association of Colleges and Schools. For its part, the Department engaged in a thorough examination and analysis of its mission, goals, policies, planning procedures, and assessment mechanisms. The process forced us to reflect upon where we are, where we want to go, and how we will get there. My personal thanks to everyone for pitching in and doing their part to make this a rewarding and worthwhile exercise.

Recruiting of physics majors continues to be a top priority. The number of majors has declined in recent years, dipping below twenty for 2000-2001. While UNCW remains one of the most productive programs statewide, the trend toward decreasing enrollments is worrisome and reflects similar experiences at universities across the nation. Specific steps undertaken to combat this trend so far include creation of an Honors Laboratory for the introductory calculus-based physics class, and continued efforts to involve undergraduates in faculty-directed research. Still, more must be done, and making the physics major a more attractive option is a challenge that we must meet head-on in the coming months.

Efforts begun last year to improve the physical appearance of our classrooms, laboratories, and hallways continued. A mobile unit with computer, data projector, and network connectivity has been dedicated to instruction in DL 213, our primary teaching classroom. Another project resulted in the resurfacing of laboratory tables in DL 205, contributing to a more pleasant learning environment in our introductory teaching laboratory. This laboratory also is slated to receive a ceiling-mounted data projector in time for the start of the Fall 2001 term.

The Department was fortunate to recruit Dr. Liping Gan to fill the position vacated by the retirement of Professor Irwin Clator in 1999. Dr. Gan, a postdoctoral research associate with Hampstead University and Jefferson Lab, is an experimental high-energy nuclear physicist with impressive research credentials. She brings much needed experimental balance to the staff, and will begin teaching at UNCW in the Fall 2001 term.

The hiring of Dr. Gan also means the departure of Visiting Professor Emile Bernard. Dr. Bernard has been an invaluable asset since joining the staff in 1999 as a lecturer and laboratory instructor in algebra-based introductory physics. Our warm thanks and best wishes for the years ahead go with Dr. Bernard as he leaves UNCW.

Curt A. Moyer
July 28, 2005
II. ORGANIZATION

1. Staff

Frances C. Brown, Department Secretary

Professors
Moorad Alexanian
Ph.D. Indiana University, 1964
Brian F. Davis
Ph.D. North Carolina State University, 1982
Marvin K. Moss
Ph.D. North Carolina State University, 1961
Curt A. Moyer
Ph.D. State University of New York at Stony Brook, 1971
Edward A. Olszewski, Jr.
Ph.D. University of North Carolina at Chapel Hill, 1976

Associate Professors
Frederick M. Bingham
Ph.D. University of California, San Diego, 1990

Assistant Professors
Timothy C. Black
Ph.D. University of North Carolina at Chapel Hill, 1995

Visiting Professor
Emile A. Bernard
Ph.D. University of Florida, Gainesville, 1968

2. Departmental Committees for 2000-2001

Lab Development Committee
T. Black, chairperson
B. Davis
C. Moyer
R. Herman, consultant

Curriculum Committee
C. Moyer, chairperson
M. Alexanian
B. Davis
E. Olszewski

Faculty Search Committee
All tenure-track faculty
C. Moyer, chairperson
R. Herman, external member

SACS Review Committee
All tenure-track faculty
C. Moyer, chairperson

Colloquium Coordinator
M. Alexanian

Computing Resources Coordinator
E. Olszewski

SPS | Sigma Pi Sigma Advisor
T. Black

Academic Advising
M. Alexanian
B. Davis

Faculty Senate Representative
M. Alexanian

Library Representative
B. Davis
III. FACULTY

1. Areas of Specialization

   ▪ Atomic Physics
     Charge exchange in atomic collisions; response of atoms to intense electromagnetic fields; atomic structure studies; autoionization.
     Professors Alexanian, Davis, Moyer

   ▪ Marine Sciences
     Large-scale physical oceanography; observational oceanography; physics of the oceans.
     Professors Bingham, Moss

   ▪ Nuclear and Particle Physics
     Low energy few-nucleon systems. String theory.
     Professors Black, Olszewski

   ▪ Physics Education
     Professors Black, Moyer

2. Honors and Awards

   Dr. Fred Bingham
   Recipient of a Faculty Reassignment Award for 2000-2001. Dr. Bingham is spending the 2000-2001 academic year continuing work begun earlier with funding from NOAA for the project “Coastal Ocean Monitoring in the South Atlantic Bight”.

   Dr. Timothy Black
   Summer research appointment at Duke University from May 14 to June 23, 2001 to conduct experimental research in low energy few-nucleon physics and to develop sophisticated new detection instruments.


   Dr. Marvin Moss
   Elected to the Board of Directors of the North Carolina Biotechnology Center in the Research Triangle Park, a prestigious and first-ever appointment for a UNCW affiliated person. Dr. Moss will serve as an At-Large Board member for the period October 17, 2000 to October 17, 2004.

<table>
<thead>
<tr>
<th>Agency and Investigators</th>
<th>Title</th>
<th>Subject</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glaxo-Wellcome Foundation Marvin Moss (co-PI with D. Baden)</td>
<td>“Human Health and the Oceans”</td>
<td>$648,000</td>
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</tr>
<tr>
<td>Friends of UNCW Timothy Black</td>
<td>Purchase of YAG laser</td>
<td>$512</td>
<td></td>
</tr>
<tr>
<td>TUNL/Duke University Timothy Black</td>
<td>Summer research support</td>
<td>$6923</td>
<td></td>
</tr>
<tr>
<td>TUNL/Duke University Timothy Black</td>
<td>Laboratory equipment: turbo-molecular pumps (2); roughing pumps (3); helium leak chaser</td>
<td>$7200 (estimate)</td>
<td></td>
</tr>
<tr>
<td>NCSU Department of Nuclear Engineering Timothy Black</td>
<td>Geiger counters (2)</td>
<td>$200 (estimate)</td>
<td></td>
</tr>
</tbody>
</table>

Proposal Submissions (2000-2001)

2. **Bingham, F.** (with 3 other PI’s), “Cross-shelf Movement of Fish and Blue Crab Larvae by Tidal Transport”, to ONR; amount requested: $372,739 (declined).
3. **Moss, M.** (with 10 project co-PI’s, including Bingham, F.), “Southeast Atlantic Marine Monitoring and Prediction Center: 2001 Coastal Ocean Research and Monitoring Program (CORMP)”, to National Oceanic and Atmospheric Association; amount requested: $925,000 (pending).
4. **Moss, M.** “Establishment of a New Marine Science Center, St. Croix, U.S. Virgin Islands”, to Royal Caribbean International; amount requested: $3,000,000 (pending).
4. Publications


5. Talks Presented and Meetings Attended

**Contributed Talks**

1. **Bernard, E.** “Retire Into Teaching???” paper delivered to the October 2000 joint meeting of the North Carolina and Southern Atlantic Coast Sections of the American Association of Physics Teachers held at the University of South Carolina at Spartanburg, South Carolina.


Invited Presentations


6. Community Service
Especially noteworthy examples of community service for the 2000-2001 academic year include:

1. Professor Moorad Alexanian has contributed several letters to popular APS publications as follows: “The Last Word on Science, Religion and Creationists” (May APS News); APS News Readers Respond to “Creationism Versus Physical Science” (January APS News), and a response to “Teaching, Propaganda, and the Middle Ground” Physics Today 53 (11), 80 (2000).


3. Professor Timothy Black volunteers weekly at Vintage Values thrift shop on College Road. Proceeds from the store benefit the Domestic Violence Shelter.

4. Professors Timothy Black and Edward Olszewski made public presentations at the Cape Fear Museum’s Annual Science Spectacular on April 28, 2001. Department participation was organized by Professor Black, who also arranged for the production of promotional
materials, including diffraction glasses with the Department label that were distributed to more than 250 attendees.

5. Professor **Brian Davis** served as Event Leader for the *Wilmington Regional Science Olympiad*, February 2001.

6. Professor **Marvin Moss** served on the *Executive Advisory Panel* of Rear Admiral R.D. West, Oceanographer of the Navy, Washington, D.C. (two-day retreat in November, 2000)
### IV. ACADEMIC ENRICHMENT & SUPPORT PROGRAMS

#### 1. Course Offerings and Enrollments

<table>
<thead>
<tr>
<th>Summer 2000</th>
<th>Instructor</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 101 Elementary College Physics</td>
<td>Herman</td>
<td>50</td>
</tr>
<tr>
<td>PHY 102 Elementary College Physics</td>
<td>Black</td>
<td>35</td>
</tr>
<tr>
<td>PHY 201 General Physics</td>
<td>Olszewski</td>
<td>51</td>
</tr>
<tr>
<td>PHY 202 General Physics</td>
<td>Olszewski</td>
<td>45</td>
</tr>
<tr>
<td>Fall 2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHY 101 Elementary College Physics</td>
<td>Bernard</td>
<td>77</td>
</tr>
<tr>
<td>PHY 101 Elementary College Physics</td>
<td>Bernard</td>
<td>66</td>
</tr>
<tr>
<td>PHY 101 Elementary College Physics</td>
<td>Moyer</td>
<td>76</td>
</tr>
<tr>
<td>PHY 103 Great Ideas in Physics</td>
<td>Alexanian</td>
<td>31</td>
</tr>
<tr>
<td>PHY 105 Introductory Physics</td>
<td>Olszewski</td>
<td>26</td>
</tr>
<tr>
<td>PHY 201 General Physics</td>
<td>Black</td>
<td>23</td>
</tr>
<tr>
<td>PHY 201 General Physics</td>
<td>Alexanian</td>
<td>28</td>
</tr>
<tr>
<td>PHY 260 Introduction to Astronomy</td>
<td>Davis</td>
<td>76</td>
</tr>
<tr>
<td>PHY 321 Mechanics</td>
<td>Davis</td>
<td>4</td>
</tr>
<tr>
<td>PHY 335 Modern Physics</td>
<td>Olszewski</td>
<td>8</td>
</tr>
<tr>
<td>PHY 400 Advanced Laboratory</td>
<td>Black</td>
<td>3</td>
</tr>
<tr>
<td>PHY 411 Electricity &amp; Magnetism</td>
<td>Herman</td>
<td>2</td>
</tr>
<tr>
<td>PHY 415 Solid State Physics</td>
<td>Moyer</td>
<td>3</td>
</tr>
<tr>
<td>PHY 444 Quantum Theory</td>
<td>Herman</td>
<td>3</td>
</tr>
<tr>
<td>PHY 495 Physics Seminar</td>
<td>Alexanian</td>
<td>1</td>
</tr>
<tr>
<td>PHY 499 Honors Work in Physics</td>
<td>Moyer</td>
<td>1</td>
</tr>
<tr>
<td>Spring 2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHY 102 Elementary College Physics</td>
<td>Bernard</td>
<td>42</td>
</tr>
<tr>
<td>PHY 102 Elementary College Physics</td>
<td>Bernard</td>
<td>83</td>
</tr>
<tr>
<td>PHY 102 Elementary College Physics</td>
<td>Moyer</td>
<td>38</td>
</tr>
<tr>
<td>PHY 105 Introductory Physics</td>
<td>Olszewski</td>
<td>31</td>
</tr>
<tr>
<td>PHY 111 Archaeoastronomy</td>
<td>Davis</td>
<td>51</td>
</tr>
<tr>
<td>PHY 201 General Physics</td>
<td>Herman</td>
<td>31</td>
</tr>
<tr>
<td>PHY 202 General Physics</td>
<td>Alexanian</td>
<td>24</td>
</tr>
<tr>
<td>PHY 260 Introduction to Astronomy</td>
<td>Davis</td>
<td>76</td>
</tr>
<tr>
<td>PHY 311 Mathematical Physics</td>
<td>Alexanian</td>
<td>3</td>
</tr>
<tr>
<td>PHY 322 Mechanics</td>
<td>Moss</td>
<td>3</td>
</tr>
<tr>
<td>PHY 400 Advanced Laboratory</td>
<td>Black</td>
<td>6</td>
</tr>
<tr>
<td>PHY 412 Electricity &amp; Magnetism</td>
<td>Herman</td>
<td>2</td>
</tr>
<tr>
<td>PHY 435 Nuclear Physics</td>
<td>Black</td>
<td>6</td>
</tr>
<tr>
<td>PHY 455 Thermal Physics</td>
<td>Moyer</td>
<td>6</td>
</tr>
<tr>
<td>PHY 491 Directed Individual Study</td>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>PHY 495 Physics Seminar</td>
<td>Black/Davis/Moyer</td>
<td>3</td>
</tr>
<tr>
<td>PHY 499 Honors Work in Physics</td>
<td>Moyer</td>
<td>1</td>
</tr>
<tr>
<td>PHY 591 Directed Individual Study</td>
<td>Herman</td>
<td>1</td>
</tr>
</tbody>
</table>
2. **Innovative Teaching Initiatives**
Consistent with its commitment to offer a quality physics degree program, the Department recognizes the following enrichment initiatives for 2000-2001:

Professor **Timothy Black** initiated a new approach to teaching PHY 201, the first course of the calculus-based introductory physics sequence. The initiative implemented recommendations of the AAPT task force on physics education including limited topical coverage, a focus on conservation principles and symmetry, and an emphasis on 20th century physics. Professor Black also created two entirely new labs to accompany PHY 202, the second semester of the sequence.

Professor **Black** designed and taught an Honors section of physics laboratory for the introductory calculus-based sequence PHY 201-202. This first-ever physics Honors lab attracted a full complement of students and will be continued as a regular offering.

A mobile unit with computer, data projector, and network connectivity has been dedicated to instruction in DL 213, our primary teaching classroom.

3. **Research Opportunities for Undergraduates**
The following research projects were active during the 2000-2001 academic year:

1. The “**Syros Project**” is a parasitic, distributed parallel processing network for carrying out complex and time consuming physics calculations utilizing unused CPU time on host machines included in the network. The ongoing effort is supervised by Professor **Timothy Black**, and again this year involved several undergraduate Physics majors.

2. The “**QMTools Project**”, supported by a National Science Foundation grant, will develop multimedia-based materials for teaching quantum physics. Programming for the project is being carried out by several undergraduate majors in computer science working under the direction of Professor **Curt Moyer**.

3. “**RF Plasma Deposition System**”, an experimental investigation involving one physics student under the supervision of Professor **Timothy Black**.

4. “**Quantum Transitions in Two-State Models**”, a theoretical study involving one physics student under the direction of Professor **Curt Moyer**. This project was the basis for an honors thesis submitted by William Hodge.

5. “**Coastal Ocean Research and Monitoring Program**”, an observational study of the dynamics of the North Carolina continental shelf. A mathematics honors student examined the characteristics of tidal flows at a mid-shelf location under the direction of Professor **Frederick Bingham**.
## Physics Department Colloquia

<table>
<thead>
<tr>
<th>Date</th>
<th>Speaker/Affiliation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 29, 2000</td>
<td>Dr. William Thompson, University of North Carolina at Chapel Hill</td>
<td>Computing the Special Functions of Mathematical Physics</td>
</tr>
<tr>
<td>October 13, 2000</td>
<td>Dr. Michael Paesler, North Carolina State University</td>
<td>Breaking the Diffraction Limit</td>
</tr>
<tr>
<td>October 20, 2000</td>
<td>Dr. Carl R. Brune, University of North Carolina at Chapel Hill</td>
<td>Stellar Helium Burning</td>
</tr>
<tr>
<td>October 27, 2000</td>
<td>Dr. John S. Risley, North Carolina State University</td>
<td>Teaching Physics (and other subjects) with WebAssign: an Online Homework System</td>
</tr>
<tr>
<td>February 2, 2001</td>
<td>Dr. Frederick Bingham, University of North Carolina at Wilmington</td>
<td>Coastal Ocean Monitoring in Onslow Bay, North Carolina: Preliminary Results from the Physical Observations</td>
</tr>
<tr>
<td>March 15, 2001</td>
<td>Dr. Joseph Dolan, NASA Goddard Space Flight Center</td>
<td>What Do Black Holes Look Like</td>
</tr>
<tr>
<td>March 16, 2001</td>
<td>Dr. Joseph Dolan, NASA Goddard Space Flight Center</td>
<td>Possible Evidence for an Event Horizon in CYGXR-1</td>
</tr>
<tr>
<td>March 23, 2001</td>
<td>Dr. Edward Olszewski, University of North Carolina at Wilmington</td>
<td>A System for Trading S&amp;P 500 Futures Contracts</td>
</tr>
<tr>
<td>March 30, 2001</td>
<td>Dr. Paul H. Frampton, University of North Carolina at Chapel Hill</td>
<td>Recent Progress in Cosmology</td>
</tr>
<tr>
<td>April 6, 2001</td>
<td>Dr. Moorad Alexanian, University of North Carolina at Wilmington</td>
<td>Generation of Phase States by Two-Photon Absorption</td>
</tr>
<tr>
<td>April 9, 2001</td>
<td>Scott Watson, Brown University</td>
<td>Five Easy Pieces: A Guide to the New Precision Cosmology</td>
</tr>
<tr>
<td>April 20, 2001</td>
<td>Dr. Wolfgang Christian, Physics Department, Davidson College, Davidson, NC</td>
<td>Phsylets: A New Approach to Authoring Interactive Curricular Material</td>
</tr>
<tr>
<td>June 21, 2001</td>
<td>Dr. Laurence W. Fredrick, Hamilton Professor of Astronomy, University of Virginia, Charlottesville, VA</td>
<td>The Great Impactor</td>
</tr>
</tbody>
</table>

A special highlight of this year’s series was a two-day campus visit by Dr. Joseph Dolan, an astrophysicist with NASA’s Goddard Space Flight Center. In addition to addressing the Physics Colloquium, Dr. Dolan presented a public lecture titled “What Do Black Holes Look Like?”. Dr. Dolan’s visit was sponsored in part by the American Astronomical Society through the Harlow Shapley Visiting Lectureships in Astronomy.
5. **SPS/ΣΠΣ Activities**

On January 15, 2001 Douglas King was elected president of the UNCW chapter of the Society of Physics Students.

V. **STUDENTS**

1. **Enrollment Statistics**

**Undergraduate Physics Majors**

<table>
<thead>
<tr>
<th>Year</th>
<th>Freshman (Fall)</th>
<th>Sophomores (Fall)</th>
<th>Juniors (Fall)</th>
<th>Seniors (Fall)</th>
<th>Total</th>
<th>Annual Graduates</th>
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</thead>
<tbody>
<tr>
<td>1994-1995</td>
<td>0</td>
<td>4</td>
<td>9</td>
<td>12</td>
<td>25</td>
<td>1</td>
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<tr>
<td>1995-1996</td>
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<td>4</td>
<td>7</td>
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<td>20</td>
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<tr>
<td>1996-1997</td>
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<td>12</td>
<td>5</td>
<td>10</td>
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<tr>
<td>1997-1998</td>
<td>0</td>
<td>7</td>
<td>11</td>
<td>11</td>
<td>29</td>
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<tr>
<td>1998-1999</td>
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<td>3</td>
<td>5</td>
<td>15</td>
<td>23</td>
<td>6</td>
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<tr>
<td>1999-2000</td>
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<td>4</td>
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<td>12</td>
<td>17</td>
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<td>2000-2001</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>13</td>
<td>3</td>
</tr>
</tbody>
</table>

2. **Degrees Awarded** (May, 2001)

**Bachelor of Arts:**
- Eric David Fales (double major with Mathematics)
- Edward Daniel Pavia

**Bachelor of Science:**
- David Andrew Bednarczyk (*summa cum laude*)
- Douglas Kevin Bonessi (cum laude)
- William Benjamin Hodge (*cum laude*)
3. Honors, Awards, and Scholarships

Walter Schmid Award recipient: William Benjamin Hodge.
Will graduated cum laude with an overall GPA of 3.63. He also successfully completed the Honors Scholars Program, enabling him to graduate with University Honors and Departmental Honors. His honors thesis titled “Quantum Transitions in Two-State Systems” was completed under the supervision of Professor Curt Moyer.

REU Fellowship: Douglas Scott King.
Doug received an REU fellowship at TUNL (Triangle Universities Nuclear Laboratory) to study few-nucleon physics for the 10-week period May 30 – August 4, 2001. Sponsored in part by the National Science Foundation, the Research Experience for Undergraduates (REU) program is designed to provide students with a valuable exposure to research in the sciences and mathematics. During his appointment at TUNL, Doug will work under the supervision of Professor Timothy Black (UNCW) and Professor Hugon Karwowski (UNC-CH).

Bookstore Scholarship Award Winners: Laura Anne Abernathy and Douglas Scott King