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**Department
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TABLE OF CONTENTS

I.	FOREWARD	2
II.	ORGANIZATION	
	1. Staff	3
	2. Departmental Committees for 2000-2001	3
III.	FACULTY	
	1. Areas of Specialization	4
	2. Honors and Awards	4
	3. Grants and Gifts	5
	4. Publications	6
	5. Talks Presented and Meetings Attended	6
	6. Community Service	7
IV.	ACADEMIC ENRICHMENT & SUPPORT PROGRAMS	
	1. Course Offerings and Enrollments	9
	2. Innovative Teaching Initiatives	10
	3. Research Opportunities for Undergraduates	10
	4. Colloquium Series	11
	5. SPS / ΣΠΣ Activities	12
V.	STUDENTS	
	1. Enrollment Statistics	12
	2. Degrees Awarded	12
	3. Honors, Awards, and Scholarships	13

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*

Faculty Search Committee

All tenure-track faculty
C. Moyer, *chairperson*
R. Herman, *external member*

Colloquium Coordinator

M. Alexanian

SPS | Sigma Pi Sigma Advisor

T. Black

Faculty Senate Representative

M. Alexanian

Library Representative

B. Davis

Curriculum Committee

C. Moyer, *chairperson*
M. Alexanian
B. Davis
E. Olszewski

SACS Review Committee

All tenure-track faculty
C. Moyer, *chairperson*

Computing Resources Coordinator

E. Olszewski

Academic Advising

M. Alexanian
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**
Multimedia-based techniques for teaching introductory physics. General physics pedagogy.
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.

Commendation from the Center for Teaching Excellence for pursuing innovations and improvements in teaching in 2000-2001.

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.

3. Grants and Gifts (awarded 2000-2001)

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

Proposal Submissions (2000-2001)

1. **Bingham, F.** (with 2 other PI’s), “*Sea Surface Salinity Remote Sensing: Mission Background Studies*”, to NASA Oceanography; amount requested: \$77,365 (declined).
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

1. **Bingham, F.** (with R. Lukas, F. Santiago-Mandujano, and A. Mantyla), “*Cold Bottom Water Events Observed in the Hawaii Ocean Time-series: Implications for Vertical Mixing*”, Deep Sea Research I, 48(4), 995 (2000).
2. **Black, T.** (with W. Xu et. al.), “*Transverse Asymmetry A_T from the Quasielastic $^3\text{He}(e,e')$ process and the Neutron Magnetic Form Factor*”, Phys. Rev. Lett. 85(14), 2900 (2000).
3. **Black, T.** (with W.J. Thompson), “*Bayesian Data Analysis*”, Computers in Science and Engineering 3(4), 86 (2000)
4. **Moss, M.** was one of thirteen U.S. university scientists authoring a book published by the National Academy Press in Washington, D.C. “*Meeting Research and Education Needs in Coastal Engineering*”, ISBN 0-309-06381-7 (1999)
5. **Moyer, C.**, “*Quantum Transitions at a Level Crossing of Decaying States*”, accepted for publication in The Physical Review A (May 2001).
6. **Olszewski, E.A.** , “*A Strategy for Trading the S&P 500 Futures Market*”, accepted for publication in the Journal of Economics and Finance (February 2001).

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.
2. **Bingham, F.** (with D. Lindquist and R. Gamble), “*Do Western Boundary Currents Significantly Affect Recruitment to Downstream Shelf Habitats? A Comparison of Larval Fish Catches in Gulf Stream and Shelf waters in Onslow Bay, NC*”, poster presented to the American Society of Ichthyology and Herpetology, June 2000.
3. **Bingham, F.** (with S. Howden and C. Koblinsky), “*Characteristics of Open Ocean Sea Surface Salinity Variability*”, poster presented to the Oceans from Space meeting in Venice, Italy, October 9-13, 2000.
4. **Bingham, F.** (with T. Suga and K. Hanawa), “*The Origin of Waters Observed along 137°E*”, poster presented to the CLIVAR Subduction Workshop in Venice, Italy, October 9-13, 2000.
5. **Black, T.** (with K. Schoen, W.M. Snow, P. Huffman, M. Arif, H. Kaiser, D. Jacobson, and S. Werner), “*A Precision Measurement of the N-D Coherent Scattering Lengths*”, paper delivered to the April Meeting of the American Physical Society in Washington, D.C. April 28-May 1, 2001.

6. **Moyer, C.**, “*QMTools: Fulfilling the Multimedia Promise*” paper delivered to the 122nd meeting of the American Association of Physics Teachers (joint with the American Astronomical Society) in San Diego, CA January 6-11, 2001.

Invited Presentations

7. **Alexanian, M.**, “*Generation of Phase States by Two-Photon Absorption*”, Department of Physics and Physical Oceanography colloquium, UNC Wilmington, April 6, 2000.
8. **Bingham, F.**, “*Sea Surface Salinity Measurements in the Historical Database*”, Tohoku University Department of Geophysics seminar, November 6, 2000.
9. **Bingham, F.**, “*Coastal Ocean Monitoring in Onslow Bay, North Carolina: Preliminary Results from the Physical Observations*”, UNCW Center for Marine Sciences seminar, February 2, 2001.
10. **Bingham, F.**, “*Coastal Ocean Monitoring in Onslow Bay, North Carolina: Preliminary Results from the Physical Observations*”, UNC Chapel Hill Department of Marine Science seminar, February 21, 2001.
11. **Moss, M.**, “*Establishment of a New Marine Science Center, St. Croix, U.S. Virgin Islands*”, presentation to Royal Caribbean International, Miami FL, December 13, 2000.
12. **Olszewski, E.** “*A System for Trading S&P 500 Futures Contracts*”, Department of Physics and Physical Oceanography colloquium, UNC Wilmington, March 23, 2000.

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).
2. “*Warming’s real*”, letter to the editor by Professor **Fred Bingham** citing the scientific evidence for greenhouse warming of the atmosphere, published in the May 1, 2001 edition of the Wilmington Star News.
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

Summer 2000	Instructor	Enrollment
PHY 101 Elementary College Physics	Herman	50
PHY 102 Elementary College Physics	Black	35
PHY 201 General Physics	Olszewski	51
PHY 202 General Physics	Olszewski	45
Fall 2000		
PHY 101 Elementary College Physics	Bernard	77
PHY 101 Elementary College Physics	Bernard	66
PHY 101 Elementary College Physics	Moyer	76
PHY 103 Great Ideas in Physics	Alexanian	31
PHY 105 Introductory Physics	Olszewski	26
PHY 201 General Physics	Black	23
PHY 201 General Physics	Alexanian	28
PHY 260 Introduction to Astronomy	Davis	76
PHY 321 Mechanics	Davis	4
PHY 335 Modern Physics	Olszewski	8
PHY 400 Advanced Laboratory	Black	3
PHY 411 Electricity & Magnetism	Herman	2
PHY 415 Solid State Physics	Moyer	3
PHY 444 Quantum Theory	Herman	3
PHY 495 Physics Seminar	Alexanian	1
PHY 499 Honors Work in Physics	Moyer	1
Spring 2001		
PHY 102 Elementary College Physics	Bernard	42
PHY 102 Elementary College Physics	Bernard	83
PHY 102 Elementary College Physics	Moyer	38
PHY 105 Introductory Physics	Olszewski	31
PHY 111 Archaeoastronomy	Davis	51
PHY 201 General Physics	Herman	31
PHY 202 General Physics	Alexanian	24
PHY 260 Introduction to Astronomy	Davis	76
PHY 311 Mathematical Physics	Alexanian	3
PHY 322 Mechanics	Moss	3
PHY 400 Advanced Laboratory	Black	6
PHY 412 Electricity & Magnetism	Herman	2
PHY 435 Nuclear Physics	Black	6
PHY 455 Thermal Physics	Moyer	6
PHY 491 Directed Individual Study	Black	1
PHY 495 Physics Seminar	Black/Davis/Moyer	3
PHY 499 Honors Work in Physics	Moyer	1
PHY 591 Directed Individual Study	Herman	1

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**.

4. Physics Department Colloquia

Date	Speaker/Affiliation	Title
September 29, 2000	Dr. William Thompson, University of North Carolina at Chapel Hill	<i>Computing the Special Functions of Mathematical Physics</i>
October 13, 2000	Dr. Michael Paesler, North Carolina State University	<i>Breaking the Diffraction Limit</i>
October 20, 2000	Dr. Carl R. Brune, University of North Carolina at Chapel Hill	<i>Stellar Helium Burning</i>
October 27, 2000	Dr. John S. Risley, North Carolina State University	<i>Teaching Physics (and other subjects) with WebAssign: an Online Homework System</i>
February 2, 2001	Dr. Frederick Bingham, University of North Carolina at Wilmington	<i>Coastal Ocean Monitoring in Onslow Bay, North Carolina: Preliminary Results from the Physical Observations</i>
March 15, 2001	Dr. Joseph Dolan, NASA Goddard Space Flight Center	<i>What Do Black Holes Look Like</i>
March 16, 2001	Dr. Joseph Dolan, NASA Goddard Space Flight Center	<i>Possible Evidence for an Event Horizon in CYGXR-1</i>
March 23, 2001	Dr. Edward Olszewski, University of North Carolina at Wilmington	<i>A System for Trading S&P 500 Futures Contracts</i>
March 30, 2001	Dr. Paul H. Frampton, University of North Carolina at Chapel Hill	<i>Recent Progress in Cosmology</i>
April 6, 2001	Dr. Moorad Alexanian, University of North Carolina at Wilmington	<i>Generation of Phase States by Two-Photon Absorption</i>
April 9, 2001	Scott Watson, Brown University	<i>Five Easy Pieces: A Guide to the New Precision Cosmology</i>
April 10, 2001	Dr. Balram Prasad, Defense Threat Reduction Agency, US Department of Defense, Alexandria, VA	<i>Microwave Amplification and Stimulation of Emitted Radiation from Electron Beam-Plasma Systems</i>
April 20, 2001	Dr. Wolfgang Christian, Physics Department, Davidson College, Davidson, NC	<i>Physlets: A New Approach to Authoring Interactive Curricular Material</i>
June 21, 2001	Dr. Laurence W. Fredrick, Hamilton Professor of Astronomy, University of Virginia, Charlottesville, VA	<i>The Great Impactor</i>

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

Year	Freshman (Fall)	Sophomores (Fall)	Juniors (Fall)	Seniors (Fall)	Total	Annual Graduates	
						B.A. Degrees	B.S. Degrees
1994-1995	0	4	9	12	25	1	4
1995-1996	1	4	7	8	20	3	3
1996-1997	0	12	5	10	27	5	6
1997-1998	0	7	11	11	29	5	3
1998-1999	0	3	5	15	23	6	3
1999-2000	0	4	1	12	17	3	5
2000-2001	0	4	3	6	13	3	2

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*