

Interactions



Hurricane Warning

by Dr. Frederick Bingham

The next time the hurricane warnings get posted you might want to think about this: Hurricanes spend most of their lives out at sea, yet we really do not know all that much about how the ocean interacts with a hurricane. The ocean and atmosphere are a strongly coupled system, and when a hurricane blows over the ocean, the water column and the marine life within it feel the effects as much as we do on land. Mountainous waves and ripping currents over shallow bottoms can scour the ocean floor as effectively as if it were run over by a giant bulldozer.



It costs approximately \$1 million per mile of evacuated coastline to protect a population from hurricanes. Yet as anyone who lives in the Cape Fear region knows, predicting hurricane landfalls is a very tricky and inexact business. The government has devoted vast resources to tracking and predicting hurricanes-spotter planes, satellites, supercomputers and labs full of very intelligent people.

Many people who live near Wilmington may not realize this, but when Hurricane Fran hit our area in 1996, the damage could have been much worse than it ended up being. In the last 12 hours or so before the storm hit, its power diminished significantly, a completely unpredicted turn of events. Why? Well, when Fran crossed the Gulf Stream, which is about 60 miles off of our shore, it should normally have picked up strength from the current's

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Dr. Liping Gan Joins UNCW Faculty

Effective August 2001, **Dr. Liping Gan** joined the faculty of the Department of Physics and Physical Oceanography as Assistant Professor of Physics, bringing to eight the total number of full-time faculty in the department. Dr. Gan fills the position vacated by the retirement of (the late) Professor Irvin Clator.

The acquisition of Dr. Gan culminated a nationwide search that spanned two years and saw more than 100 applicants. An



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Greetings from Physics & Physical Oceanography

For those of you who were eagerly awaiting this next edition of the Newsletter, the delay in publication reflects a decision to scale back our efforts from a twice-yearly production to a single issue that will appear every spring. We continue to solicit your contributions to the Alumni Notes section, and again have included a special plea for information on page 7. So please – let us hear from you often and at length.



Dr. Curt Moyer, Chair

This has been another busy year, and a trying one too. The year saw a successful conclusion to the campus-wide self-study, and the return of the department to full strength with the hiring of Dr. Liping Gan (see article p. 1). At the same time the department continues to struggle with low numbers of majors and an increasingly tight operating budget.

We are very excited with the addition of Dr. Gan to the physics faculty, and look forward with great anticipation to collaborations on and off campus that will provide unique educational opportunities for our students. Together, Drs. Black (hired in 1999) and Gan represent an expertise and vitality in nuclear physics that is remarkably strong for a department this size, and positions UNC Wilmington as an up-and-coming leader in this field. Obvious benefits include enhanced program visibility within the southeast region [and beyond], and heretofore-unmatched research opportunities for UNCW undergraduates at nationally recognized laboratories. Already, their presence has begun to pay dividends: one physics major, Douglas King, received an REU fellowship at TUNL for the summer of 2001 to pursue nuclear physics research under the tutelage of Dr. Black, and at least one other, Michael Hollister, is slated to assist Dr. Gan with her research at Jefferson Lab in the summer of 2002.

On another bright note, the evaluation team representing the Southern Association of Colleges and Schools (SACS) accrediting agency wrapped up its four-day visit to UNCW on Feb. 28 with an exit report that featured a rare and extraordinary commendation. The campus visit culminated two years of self-study and assessment by the university as part of the re-accreditation process that takes place every 10 years. The visiting team consisted of 14 evaluators from colleges and universities across the South and a staff representative from SACS. Based on their review, the team reported preliminary findings during the exit report offering six recommendations and two suggestions for improvement. Donna Wilkinson, SACS staff representative, noted that in her five years with the agency only one other institution that she helped review had fewer recommendations. Thanks go to all physics faculty who participated in the self-study for a job well done.

The decade-long, 25 percent decline in the number of baccalaureate physics degrees awarded in the U.S. has been well documented, and UNCW has not been immune to this unfortunate trend. Last year the number of majors in the department dipped to 12, but vigorous efforts to combat the decline – especially those aimed at recruiting more double majors – have been effective. As of this writing, the number of majors stands at about 20, reason for optimism but still leaving plenty of room for improvement. The recent growth in nuclear physics research opportunities for our undergraduates promises to be one strong “selling point”, but more must be done. With its oceanography emphasis, the department is in a unique position (for a physics department) to add to the growing body of knowledge surrounding the important issues of global warming, coastal erosion, and storm (hurricane) development and tracking. In the coming year we will be looking for ways to exploit this resident faculty expertise in oceanography and the environment, and to repackage our curricula to attract students interested in those areas.

Unfortunately, all foreseeable efforts will have to be undertaken in an atmosphere of dwindling budgets and an increasing pressure to be cost effective. Due to cutbacks in state support, the University is being asked to do more with less. At the department level, this translates into fewer resources and increased teaching loads. I will resist here the temptation to lapse into a diatribe of woes, but the bottom line is that the coming year promises to be another lean one that is not conducive to program expansion or new initiatives. Somehow we must find a way to “ride out” these bad times and keep our eye on what will surely be a bright future. I am confident we can and will do just that.



Meteorite Exhibit -Cape Fear Fair and Expo

The 2001 Cape Fear Fair and Expo held in Wilmington on October 18-27, 2001 featured a meteorite collection on loan from the UNCW Physics Department. According to Fair Manager Skip Watkins, the fair was attended by close to 46,000, down from about 60,000 in 2000.

Meteorites are material left over from the formation of the solar system about 4.6 billion years ago, and as such contain important clues to the origins and early history of our planetary neighborhood. The UNCW collection of more than 15 meteorites was assembled by Dr. Brian Davis, and includes a rare piece of Mars. Dr. Davis was on hand for several hours during all but one of the ten fair days to

safeguard the collection and take questions from the public. He also spent countless hours developing and mounting explanatory material to go with each meteorite in the exhibit, and is now hoping to display the collection permanently in DeLoach Hall.



Hold an image of the life you want, and that image will become fact.

...Dr. Norman Vincent Peale

...Dr. Liping Gan continued

experimentalist specializing in high-energy nuclear and particle physics, Dr. Gan brings some much needed experimental balance to the staff. She studied at Beijing University in China, receiving a B.S. degree in physics in 1985 and the M.S. degree three years later. Dr. Gan earned her Ph.D. from the University of Manitoba in 1998, and subsequently served as a Postdoctoral Research Scholar at Hampton University, resident at Jefferson Lab. While at Jefferson Lab, she was an active member of the PrimEx collaboration, an experiment to measure the π^0 lifetime supported by a \$1,000,000 Major Research Instrumentation grant from the National Science Foundation. With her strong credentials and extensive professional ties, we expect that Dr. Gan will develop a vigorous externally-funded research program that can provide unique and exciting educational opportunities for our undergraduate majors.

The hiring of Dr. Gan also spells 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.



.....*Hurricane continued*

warm waters. Instead, the Gulf Stream was meandering. Tucked inside one of the meanders was a body of water that had been upwelled from deep under the Stream. The storm's passage over this cold water was enough to sap its strength. Hurricanes feed on warm water and are starved by cool water. The simultaneous meeting of this major hurricane and the upwelling current meander was completely by chance. Such meanders do pass by our area every 4-10 days. The presence of one just as Fran crossed over was an extremely fortunate coincidence unpredicted by any forecasting model. Forecasting models do not have active oceans embedded in them, only passive ones without moving Gulf Stream meanders.

This brings us to the research of Dr. Frederick Bingham, an associate professor in the Department of Physics and Physical Oceanography. Dr. Bingham, along with his graduate student, Amanda Smith, and colleagues Leonard Pietrafesa and Lian Xie at North Carolina State have embarked on a multi-pronged investigation of the interaction between hurricanes and the coastal ocean. Not just hurricanes actually, but strong storms like nor'easters which can cause just as much damage.

Ever since early 1999, Dr. Bingham and colleagues have maintained instrumentation on the continental shelf. The deployed instrumentation measures currents, and temperature and salinity as a function of time. In 1999, there were two instrumented sites in mid-Onslow Bay. (Onslow Bay is the area of ocean between approxi-

mately Cape Fear, and Cape Lookout near Beaufort) In 2000, two sites were maintained in southern Onslow Bay. One is at mid-shelf, about 27 miles from shore and another at the shelf break, about 63 miles off. In 2001 we have been maintaining just one moored site in mid-shelf. (The instrumentation at the shelf break site was lost in late 2000 due to equipment failure.) In 2002, there are plans to deploy 7 additional moorings, covering Onslow Bay and extending the array into Long Bay, south of Cape Fear. There are also plans for the following year to extend the array still further into coastal South Carolina.

The purpose of this array of instruments is, for one, to study the effects of storms on the coastal ocean. In addition, there are basic questions about the coastal ocean that these instruments have been put in to answer.

How is "stuff", pollutants, fish larvae, nutrients, tracers, etc., transported across the continental shelf? We know for example, that the life cycle of some fish species includes spawning in the Gulf Stream and transport during the larval stage to inshore estuarine nurseries. Fish larvae are too small to swim any great distance under their own power, so some naturally-occurring physical process, possibly accompanied by a specific behavior, must be responsible for this cross-shelf transport. What is the nature of the currents that might effect this transport? Are they tidal? Long-period tides? Synoptic-scale (4-7 day) flows?

What sets the "residence time" of Onslow Bay? The residence time is the typical time that a piece of water spends in the bay before being

transported elsewhere. Onslow Bay is somewhat confined, being bordered on one side by land, on two sides by relatively shallow shoals and on the offshore side by the Gulf Stream front. The residence time has been estimated to be approximately 60 days. Is this time relatively constant, or does it vary seasonally or episodically? What physical process is responsible for the flushing of the Bay? Tides are by far the most energetic process in mid-shelf, but tides by themselves are linear, and cannot transport anything by themselves. This is analogous to a pulse traveling down a stretched rope. The pulse does not carry any "stuff", only energy. Lower frequency synoptic flows are also a good possibility, but are far less energetic than tides in mid-shelf.

The research instrumentation deployed off of our shores is part of a national effort to increase the research presence off of the US coast. This strengthening of coastal research promises enormous benefits, improved weather prediction, better fisheries management, enhanced recreational opportunities, safe navigation, environmental protection and increased national security. Dr. Bingham's research is playing but a small role in this important new initiative.

Further details of Dr. Bingham's research can be found at <http://rover.phy.uncwil.edu/home/research.html>

Information on the coastal Ocean Research and Monitoring Program can be found at <http://www.uncwil.edu/cmsr/comp>

Information on some of the coastal monitoring programs around the southeastern US can be found at <http://comps.marine.usf.edu/SCOOP/>



Colloquium RoundUp

The Physics Colloquium Series continues this year with talks scheduled on average about twice monthly. Presentations slated for the 2002 academic year are (in chronological order):

Dr. Ashot Gasparian, Hampton University
Symmetry Breaking Phenomena in Physics and the Neutral Pion Lifetime, October 19

Dr. Curt Moyer, University of North Carolina at Wilmington
Teaching Quantum Physics With QMTools, November 2

Dr. Gabriela Gonzalez, Louisiana State University
Gravitational Waves: a new window to the Universe, November 9

Dr. Anna L. Lin, Duke University
Frequency locking of reaction-diffusion patterns, November 16

Dr. Tim Black, University of North Carolina at Wilmington
Notes from the teaching underground: The ugly truth and how to begin to win the science education war, November 30

Dr. Shelly A. Page, University of Manitoba
A Status Report on the Weak Nuclear Force
December 7

Dr. Gurudas Ganguli, The Naval Research Laboratory
Plasma Dynamics in the Earth's Auroral Region, January 31

Dr. David Haase, North Carolina State University
Manipulating Spins, Making Nuclei
February 22

Dr. John Hubisz, North Carolina State University
Science and Religion: A University Course
February 28

Dr. Raffi Nazikian, Princeton Plasma Physics Laboratory
Recent Developments and Future Directions in Fusion Energy Science, March 1

Dr. Christian Iliadis, University of North Carolina, Chapel Hill
New quests in nuclear astrophysics
March 15

Michael Shaffer and Shane Oakley,
University of North Carolina at Wilmington
Superseding Darwin: The Future of Biophysics
March 22

P.K. Kabir, University of Virginia, Charlottesville
Creators of the Quantum Theory and Triumphs and Challenges of Quantum Theory, April 11 & 12

Dr. Dmitri Khveshchenko, University of North Carolina, Chapel Hill
Dirac fermions in layered graphite and elsewhere, April 19

Dr. Daniel Gauthier, Duke University
"Fast" and "Slow" Light, April 26

Scott Watson, Brown University
Stabilization of Extra Dimensions: A Brane Gas Approach, May 20

All Colloquia are free and open to the public. You are cordially invited to attend.

Note: The very latest Colloquium information is always available from the Department web page at <http://www.uncwil.edu/phy>.



Faculty Update

Faculty 2001-2002

*Moorad Alexanian, Professor
Ph.D. Indiana University*

*Frederick M. Bingham
Associate Professor
Ph.D. University of California,
San Diego*

*Timothy C. Black
Assistant Professor
Ph.D. UNC Chapel Hill*

*Brian F. Davis, Professor
Ph.D. NC State University*

*Liping Gan, Assistant
Professor
Ph.D. University of Manitoba*

*Marvin K. Moss, Professor
Ph.D. NC State University*

*Curt A. Moyer, Professor
Ph.D. SUNY, Stony Brook*

*Edward A. Olszewski Jr.
Professor
Ph.D. UNC Chapel Hill*

Dr. Moorad Alexanian presented the paper "Generation of Photonic Superposition States by Two-photon Absorption" at the 13th International Conference on Dynamical processes in Excited States of Solids in Lyon, France. He also delivered the paper "Macroscopic Quantum Superpositions: Atom-field Entangled and Steady States by Two-photon Processes" to the 68th annual southeastern section meeting of the American Physical society in Charlottesville, VA.

Dr. Fred Bingham presented three seminars at the Ocean Sciences 2002 Meeting in Honolulu: "The Origin of Waters Observed Along 137E", "Sea Surface Salinity in the Historical Database", and "Kinematics of the Middle and Outer Shelf of the South Atlantic Bight: A Comparison of Moored Observations". He also presented the poster "Coastal Ocean research and Monitoring Program at the University of North Carolina at Wilmington", in collaboration with co-authors from the Departments of Biology, Chemistry and Earth Sciences.

Dr. Timothy Black was selected as one of 65 individuals nationwide to participate in the New Faculty Workshop November 8-11, 2001, at the American Center for Physics in College Park, Maryland. This annual event brings together resourceful new faculty and exposes them to the latest methodology in physics education. Subsequently, he reported on his experiences in the forum of a department colloquium aptly titled "Notes from the teaching underground: The ugly truth and how to begin to win the science education war".

Dr. Marvin Moss was 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.

Dr. Irvin Clator died September 19, 2001 at Duke University Medical Center following a brief illness. Dr. Clator retired from UNCW in 1999 after 36 years of service, including a stint as Physics Department chair.



Student Update

William Benjamin Hodge was named the Walter Schmid Award winner at the Spring 2001 Commencement ceremonies. The Schmid Award is given annually to the graduating senior who shows the greatest potential for contributing to the field of theoretical or applied physics. 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**.

Senior Physics major **Douglas King** 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 worked under the supervision of **Professors Timothy Black** (UNCW) and **Hugon Karwowski** (UNC-CH).

UNCW Bookstore Scholarships for the 2001-2002 academic year were awarded to seniors **Laura Anne Abernathy** and **Douglas Scott King**. The \$125 scholarships must be used toward the purchase of textbooks/supplies in the University Bookstore.

Alumni Notes



Gary (Scott) Watson '00, now at Brown University, spent a week of the 2001-2002 academic year visiting CERN in Geneva, Switzerland under a NASA research travel grant. The CERN theory committee awarded Scott a one week visit to finalize

research on "Isotropization in String Cosmology", which he expects to be published in the late spring of 2002. Currently, Scott is investigating the role of inhomogeneities in the early universe, along with his advisor at Brown, Robert Brandenberger, and jointly with Brian Greene and Richard Easter of Columbia and Saul Teukolsky of Cornell.

Eric Fales ('01) and Amy Upchurch were married June 30, 2001.

Attention Alumni!

We want to hear from you!

Send your news to: alumnews@uncw.edu or complete our form on the web at www.uncw.edu/alumni.

Full Name _____

Address: _____

Phone: () _____ Email _____

Grad. Date: _____

Your news: _____

I would like to support The Department of Physics and Physical Oceanography with my donation of \$_____.

It is your help and generosity that allows us to provide a meaningful education for UNCW physics students.

Thank you for your support!

Make checks payable to UNCW.

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The University of North Carolina at Wilmington

601 South College Road

Wilmington, NC 28403-5905



Hints to Home!?!.....

Dear Dad,

School i\$ really great. I am making lot\$ of friend\$ and \$tudying very hard. With all my \$tuff, I \$imply can't think of anything I need, \$o if you would like, you can ju\$t \$end me a card, a\$ I would love to hear from you.

Love,
Your \$on.

Dear Son,

I kNOw that astroNOmy, ecoNOMics, and oceaNOgraphy are eNOugh to keep even an hoNOr student busy. Do NOt forget that the pursuit of kNOwledge is a NOble task, and you can never study eNOugh.

Love—Dad

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