THE UNIVERSITY OF NORTH CAROLINA AT WILMINGTON

UNCW

Interactions

Department of Physics and Physical Oceanography Newsletter December 2000

Department Honors Spring 2000 Graduates

Five members of the graduating class of 2000 received their diplomas in a small department ceremony following University Commencement Exercises on May 13, 2000. Jeff Hernandez received the Bachelor of Arts degree, while Bachelor of Science degrees were conferred upon Michael Muglia, Patrick Murphy, William (Michael) Naylor, and Gary (Scott) Watson. (Three other students, Marnie Leick, Christopher Van der Stokker, and Corbin Hardy received their degrees in mid-year ceremonies conducted in December, 1999.)

Retired Professor Emeritus Hildelisa Hernandez was on hand to present Michael Muglia with a popular three-volume work *The Feynman Lectures on Physics*. The award was given to recognize Michael's outstanding academic record and dedication to physics. Gary (Scott) Watson was this year's Walter Schmid Award recipient (see page 3). Scott graduated cum laude with a double major in Physics and Mathematics, and completed the physics program with departmental honors for his project *Inflationary Cosmology and Anomalies in the Standard Cosmological Model*. For his accomplishments, Scott received an engraved plaque and a $150 cash prize.

Three of this year's graduates plan to pursue higher degrees starting in the Fall 2000 semester. Michael Muglia will enter the Physics Graduate Program at UNC Chapel Hill, Patrick Murphy will attend San Francisco State University to study astronomy, and Scott Watson will continue his cosmology studies in the Physics Department at Brown University. Jeff Hernandez and Michael Naylor have secured employment locally with the Nuclear Division of Carolina Power and Light. Our best wishes to all the graduates for their continued success in the future.

The Syros Project: A Distributed Parallel Processing Network

by Professor Timothy C. Black

Ninety percent of what we own is idle ninety percent of the time. The stove, the stereo, the table lamp, the washing machine: all of these do absolutely nothing most of the time. Appliances like these are inherently wasteful. There is no good, unobtrusive way to harness their excess capacity. No one really wants to open their home as the community laundromat or kitchen. Furthermore, ten or one hundred washing machines cannot wash bigger clothes, only more of them. Technologies like these pose a typically modern dilemma—privacy and convenience are acquired only at the cost of massive waste. Perhaps it is because we are so accustomed to this paradigm that it was only very recently that people realized that computers—connected by the internet or through an internal network—are different. I cannot listen to your stereo or cook on your stove without coming into your home, using your electricity, and generally disrupting your life. But I can, with your permission, use your computer's excess processing power without costing you anything, without diminishing your privacy and security, and without interrupting or affecting your own use of the computer in any way. Furthermore, computing power, unlike cooking, lighting or washing power, is synergistic: the whole can vastly exceed the sum of the parts.

Dr. Tim Black

A collection of computers whose excess processing resources are at the disposal of some

(continued on page 4...)

Greetings from Physics & Physical Oceanography


Dr. Curt Moyer, Chair

Our Newsletter has a different look this time, as we continue to experiment with new layouts and cover page designs. Still, regular sections like Faculty/Student Updates, Colloquium RoundUp, and Alumni Notes are intended to be permanent fixtures that maintain continuity with previous editions. The Notes section relies on your contributions; on the back page of this edition we have included a special plea for your input with examples of information that would be of interest to our readers. So don't be shy – let us hear from you!

With the start of another academic year come new challenges and fresh expectations. Despite attracting more than 65 applicants, last year's nationwide search for a new experimental assistant professor failed to produce a new hire. That task officially resumed with the Fall 2000 semester and we are determined to see it to a successful conclusion this time around.

Efforts begun last year to improve the physical appearance of our classrooms, laboratories, and hallways will continue. Those of you who haven't visited recently will be delighted to find the corridors adjoining the Department Office adorned with the *Century of Physics Timeline Series*, a collection of 11 beautifully framed posters chronicling the important developments in physics throughout the twentieth century. They are a gift of the American Physical Society, in honor of its 1999 Centennial Celebration. Technological improvements also are very much in evidence. Supporting the teaching function in Lecture Hall DL 212 is a new multimedia installation, including ceiling-mounted LCD projector, high-output receiver with 6-way Dolby surround sound, 400 MHz Pentium computer, Super VHS recorder, and DVD video player. Additionally, a mobile unit with computer, data projector, and network connectivity has been dedicated to instruction in DL 213, our primary teaching classroom. Another project – slated for completion by the time you read this – will resurface laboratory tables in DL 205 and should contribute to a more pleasant learning environment in our introductory teaching laboratory.

Recruiting physics majors continues to be a top priority. The number of majors has declined in recent years, dipping below twenty for 1999-2000. The trend is worrisome, but reflects similar experiences at universities nationwide. Specific steps undertaken to combat this trend include creation of an Honors Laboratory for the introductory calculus-based physics class, and renewed efforts to involve undergraduates in faculty research. Currently, two seniors are pursuing departmental honors doing genuine research under faculty supervision. **Douglas Bonessi** is engaged in an experimental project titled "*Construction of an RF Plasma Deposition System*" under the direction of Professor Timothy Black, while **William Hodge** is examining "*Two-State Models with Decay*" under the guidance of Professor Curt Moyer. Such unique educational opportunities expose undergraduates to the excitement that comes with doing real research, and should attract more students to the program.

The Fall 2000 semester has also 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 will undertake a thorough examination and analysis of its mission, goals, policies, planning procedures, and assessment mechanisms. The process, which forces us to reflect on where we are, where we want to go, and how we will get there, is tedious but rewarding, and necessary to the long-term growth and health of the Department and the University. Renewed efforts to provide research opportunities for undergraduates, to revive a regular series of seminars and colloquia, and to improve pedagogy in our teaching laboratories, all represent issues being addressed in tandem with the self-study. Clearly each is a *good thing*.

Lastly, I would like to call attention to our Department Web at http://www.uncwil.edu/phy. Our web increasingly is becoming the repository for Department announcements, activities, and resources. The Colloquium schedule can be found there, as can previous Newsletters in case you missed them. Check it out!

The Schmid Award – A Slice of History

The Walter Schmid Award is presented each year to the graduating senior who, in the opinion of the physics faculty, shows great potential for contributing to the field of theoretical or applied physics.

His family established the award in 1985 to honor the memory of Walter Schmid, an engineer and inventor best known for his invention of the bazooka fuse that was credited with stopping the Russian T-34 tank in the Korean War. Born the son of a silversmith in 1903 Germany, Schmid studied mechanical engineering before immigrating to the United States in 1926. He worked over 35 years for the Stewart-Warner Corporation in Chicago and assumed the role of unofficial corporate "fireman" for technical problems in Stewart-Warner plants in the United States and Europe. A 1951 issue of *The Saturday Evening Post* featured him as a "production wizard" in an article on the defense industry.

Schmid died in 1985. His son, Dr. Walter (Tom) Schmid, a professor in UNCW's Department of Philosophy and Religion, chose to establish the award with the UNCW Physics Department in remembrance of his father , who often spoke of physical laws as the "logic" of nature.

A Decade of Schmid Awards

2000 - Gary Scott Watson
1999 - Marshall Alan Goff
1998 - Ted Edwin Cook
1997 - Alexander Rowland Phillips, III
1996 - Jarrad Michael Taunt
1995 - Clair D.Weber
1994 - Lance Kent McLean
1993 - Edward Nance Hill
1992 - Brandon Lee Ward
1990 - Kevin Michael Killian

Colloquium RoundUp

The Physics Colloquium Series continues this year with talks scheduled on average about twice monthly. Presentations given during the Fall 2000 semester are (in chronological order):

Computing the Special Functions of Mathematical Physics **Dr. William Thompson**, University of North Carolina at Chapel Hill

Breaking the Diffraction Limit
Dr. Michael Paesler, North Carolina State University

Stellar Helium Burning
Dr. Carl R. Brune, University of North Carolina at Chapel Hill

Teaching Physics (and other subjects) with WebAssign: an Online Homework System
Dr. John S. Risley, North Carolina State University

Slated for Spring 2001 are two special presentations by **Dr. Joseph Dolan**, an astrophysicist with the NASA Goddard Space Flight Center. Dr. Dolan will give a public lecture on March 15 titled *What Do Black Holes Look Like?* followed the next day by a more specialized address to the Physics Colloquium on the topic *Possible Evidence for an Event Horizon in CYGXR-1***.** The Harlow Shapley Visiting Lectureship in Astronomy, a program of the American Astronomical Society, is sponsoring Dr. Dolan's visit.

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

(....Syros continued from page 1)

central server is known as a distributed parallel processing network. The word "distributed" refers to the fact that the computers in the network are not physically connected, nor are they primarily dedicated to working on the problems posed by the central server. In fact, the individual identity or even existence of a particular computer in the network is immaterial; the network is a society of interchangeable, anonymous processing proles. In a large, dispersed network such as this, one in which individual computers are unknown to one another, it is critical that each processor can perform its tasks independently of the others. Computers in the distributed network must work in parallel, requiring interaction only with the central server and not with each other. The operation of a parallel network is similar to the operation of a large manufacturing concern: The sales force sells as much of the product as possible, without worrying about how much of the product the manufacturing group is creating. The manufacturing group creates as much of the product as it can; it doesn't wait to hear from sales that a purchase has been made. The administrative group does not concern itself with the activities of sales or manufacturing. It focuses solely on its own task, which is...well, no one really knows what administrative groups do. All of these different actors in the operation perform their tasks simultaneously and independently of the others. Their activities are coordinated by senior management, whose role in a processing network is taken by the central server. The central server parcels out tasks and collects and organizes results in a form that is accessible to the user.

There are a number of distinctly different ways to organize and implement a distributed parallel processing network. Each has its own particular strengths and weaknesses. The techniques used to implement the network depend most strongly on the manner in which the individual processors are interconnected and on the nature of the programming task the network is attempting to solve. Whatever implementation scheme is employed, however, the criteria for organizing the network are the same: The network should have virtually no impact on the host computers and the amount of "communications overhead" required between the host computers and the central server should be minimized. These two criteria are somewhat at odds with one another, but the former takes precedence. Donors of processing power must be assured that the operation of the network will not affect their own activities.

The Syros project is a distributed parallel processing network being implemented by the UNCW Physics department. The project was undertaken last year under the direction of **Doug Canning** ('00), and Professor Timothy Black. Doug, who is now attending graduate school at UNC-Charlotte, continues to consult on the project. Dr. Black continues in his role as faculty advisor, while student leadership on Syros has passed to sophomore **Doug King**. Our aim is to develop sufficient computing power to attack certain theoretical and phenomenological problems in nuclear physics via powerful but computationally intensive evolutionary algorithms developed by Dr. Black. The class of algorithms being employed are extraordinarily versatile and can, in principle, be used to solve otherwise insoluble problems across a wide spectrum of disciplines. For them to do so in a reasonable period of time, however, requires massive computing power which, given the local financial realities, can only be obtained from a distributed parallel processing network.

It is only within the past year or so that the computing community at large has become alive to the possibilities afforded by distributed parallel processing networks. A number of commercial concerns have sprung up recently that operate something like banks. Processing "depositors" are induced to put their spare computing power at the disposal of the network in return for some quasi-commercial consideration; small presents, gift certificates, reduced-price internet access, etc. The computing "capital" thus accumulated is then "loaned" out to customers for a fee. The customers use this computing

(continued on next page...)

Dr. Alexanian assists PHY 201 lab students.

Dr. John Risley - Colloquium 10/27/00

Dr. Davis works with students in lab help session.

Physics Happenings

Dr. Black speeds up wheel in physics experiment.

Dr. Lugo crushes cinder block over Dr. Olszewski in "Bed-of-Nails" experiment.

PHY 105 class observes "Bed of Nails" experiment.

power to implement programs that otherwise might require them to purchase, at great cost, dedicated computers. There are significant flaws in this scheme, mainly related to the reluctance most customers have about putting sensitive internal data out in the public regime.

Another paradigm, which seems more promising, is for a user to set up an internal network that uses its own spare processing power to undertake computationally intensive tasks. Any large concern has vast excess computing power. In the main, secretaries, managers, "knowledge workers", writers, designers, and accountants—all the varieties of office people—do not work in shifts. All of these workers' computers, which are owned by the concern, are idle about half the time. Businesses that recycle this excess computing power have a significant advantage over those that do not. In recent years, for example, Sun Computers has saved tens of millions of dollars by employing company computers in off-hours to work on their computer design problems. Universities, like large businesses, have the excess computing resources to make this kind of network valuable and University researchers need to solve the kinds of problems that require massive computing power. It's a perfect fit.

Students participating in Syros benefit in many ways. They are engaged in developing an emerging technology that will likely be a prominent and permanent feature of the operation of any organization of significant size. They learn about algorithmic development in general and the development of genetic and evolutionary algorithms in particular. This class of algorithms is being used not only to address frontier problems in the sciences, but has also been used successfully in product and technology design and economic analysis. As we gain the confidence to investigate ever more complex systems, whatever their nature, genetic algorithms will more and more be the method of choice, perhaps the only possible method, of conducting these investigations. Finally, students working on Syros learn about cutting edge problems in nuclear physics. At present we are actively seeking more students who wish to become involved in the project. We are also attempting to expand the network beyond the few dozen computers we have already obtained permission to access. We feel confident that once University administrators and our colleagues in other departments understand the impressive pedagogical and research value of helping us to implement this network, we can construct a "virtual machine" that will be unrivaled in the Southeast.

Faculty/Student Update

Faculty 2000-2001

Moorad Alexanian, Professor
Ph.D. Indiana University

Emile A. Bernard
Visiting Professor
Ph.D. University of Florida

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

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 had the article *Comment on 'Generation of Phase States by Two-Photon Absorption'* published in the July 31 issue of Physical Review Letters. The work is important in quantum cryptography and communication, and was done in collaboration with Subir Bose of the University of Central Florida.

Dr. Emile Bernard presented the paper *Retire Into Teaching???* at the October 13-14 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. The presentation highlighted the author's transition from a research and development laboratory to academia and his post-retirement experiences, challenges and reflections while teaching at the community college and university levels.

Dr. Fred Bingham, on research reassignment for 2000-2001, journeyed to Italy to present the poster *The Origin of Waters Observed Along 137E* at the CLIVAR subduction workshop in Venice, and another poster, *Characteristics of Open Ocean Sea Surface Salinity Variability* at the Oceans from Space meeting, also in Venice. The latter was named Best of Session.

Dr. Timothy Black was one of seven panelists drawn from various departments at UNCW who participated in a public discussion on *Examining the Stereotypes – What do people think scientists do…and what do they really do?* The November 7 event was co-sponsored by the Math and Computer Science Club and the Center for Teaching Excellence.

Alumni Notes

Jeff Hernandez '00 and **Michael Naylor '00** began training to become Auxiliary Operators in Carolina Power and Light's Brunswick Nuclear Facility.

Seniors **Douglas Bonessi** and **William Hodge** were presented with UNCW Bookstore Scholarships for the 2000-2001 academic year. The scholarships in the amount of $125 may be used toward the purchase of textbooks/supplies in the University Bookstore.

Gary Scott Watson was named the Walter Schmid Award recipient at the Spring 2000 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. Scott graduated with a B.S. in Physics and Mathematics, and an overall GPA of 3.80.

Yes, I Want To Support

The UNCW Physics and Physical Oceanography Department!

Your gift will help supply equipment for classrooms, support student services and extracurricular activities, as well as help provide needed scholarship support for our students. It is your help and generosity that allows us to provide a meaningful education for UNCW physics students.

Full
Name_____
Dr./Mr./Mrs./Ms. First Middle Maiden Last Suffix
Home Address:_____
Street/PO Box City State Zip
Phone: Home ( ) _____ Work ( ) _____

E-mail_____

Employer: _____Position _____

_____
Address City, State Zip code

Grad. Date: _____Degree/Major_____

Let us know how you would like your gift designated (please check below):

_____Department Trust Fund _____Sheehan Loan Fund _____Schmid Award

Does your company have a matching gift program? If so, please provide a matching gift form with your gift to make an even greater difference to the future of physics at UNCW!

Donation: $_____

Make checks payable to UNCW.

Please Mail To:

Advancement Services
The University of North Carolina at Wilmington
601 South College Road
Wilmington, NC 28403-5905

Credit Card Information

__Visa __M/C exp. date___/___

Card No.:_____
Name on Card_____
Signature _____

Thank you for your support!

Bulk Mail

Department of Physics & Physical Oceanograpy
University of North Carolina at Wilmington
601 South College Road
Wilmington, NC 28403

Address Service Requested

500 copies of this public document were printed at a cost of $0000 or $.00 per copy. (G.S. 143-170)

Attention Alumni!

We want to hear fromYOU!

Please send any information about yourself, such as graduation, marriage and birth announcements, what you are doing in school or in your career, news about your family, where you are living, special recognition you have received, anything you would like to share with the rest of the UNCW Physics Family. Any information, no matter how mundane it is to you, is of interest to someone else. If you have contact with any of your classmates, please share where they are now and what they are doing. Parents of alumni are also encouraged to submit news about their children. Photographs of you, your family, and classmates are welcomed and will be returned to you.

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

We look forward to hearing from you soon!