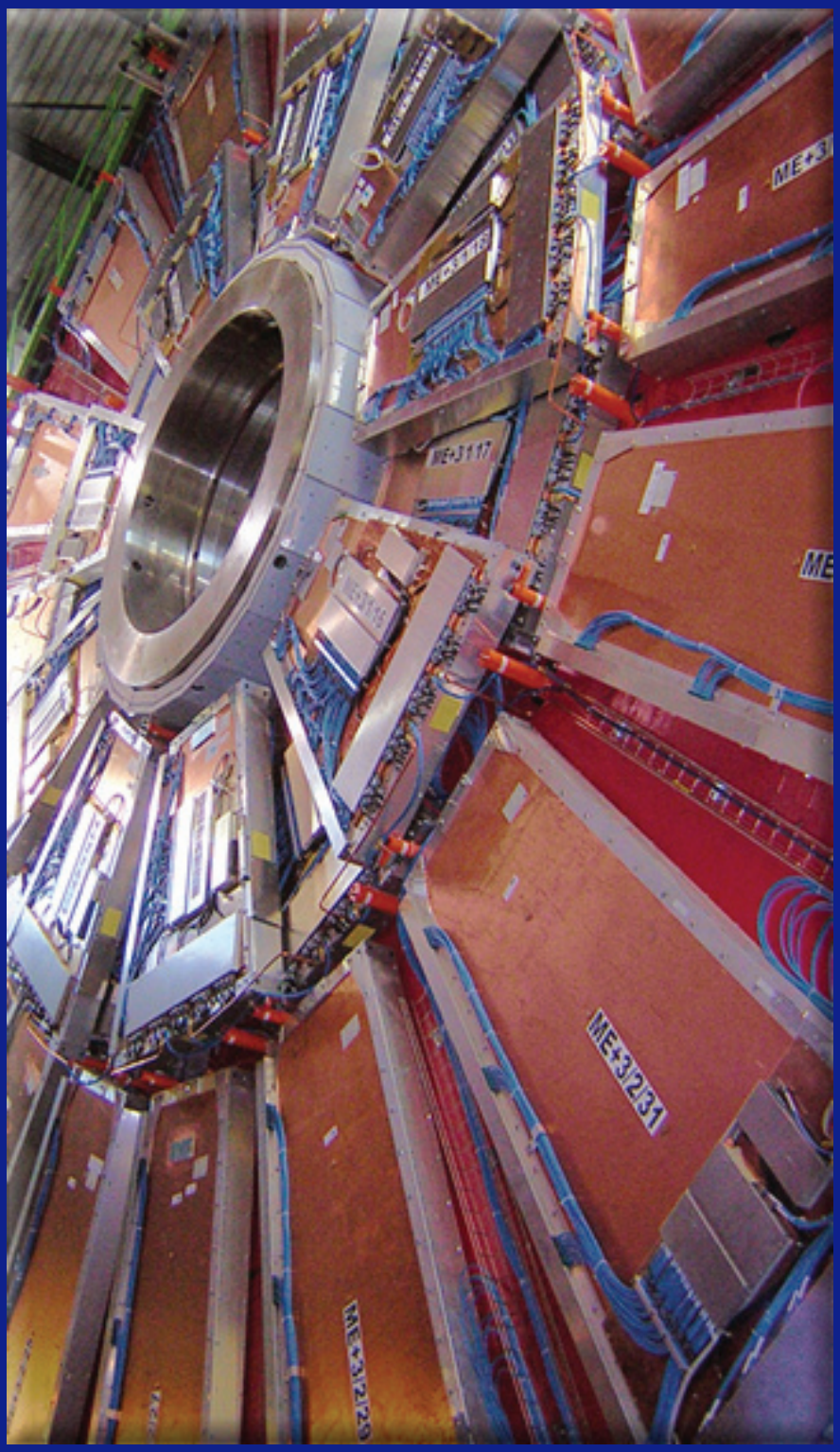
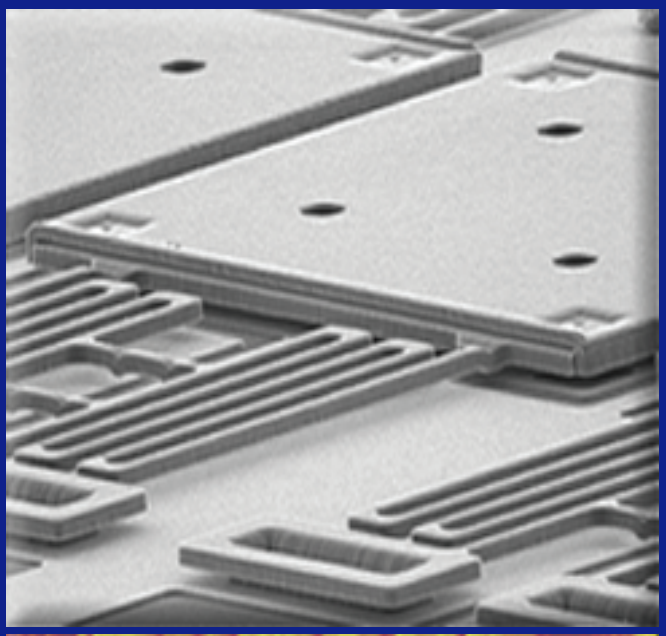
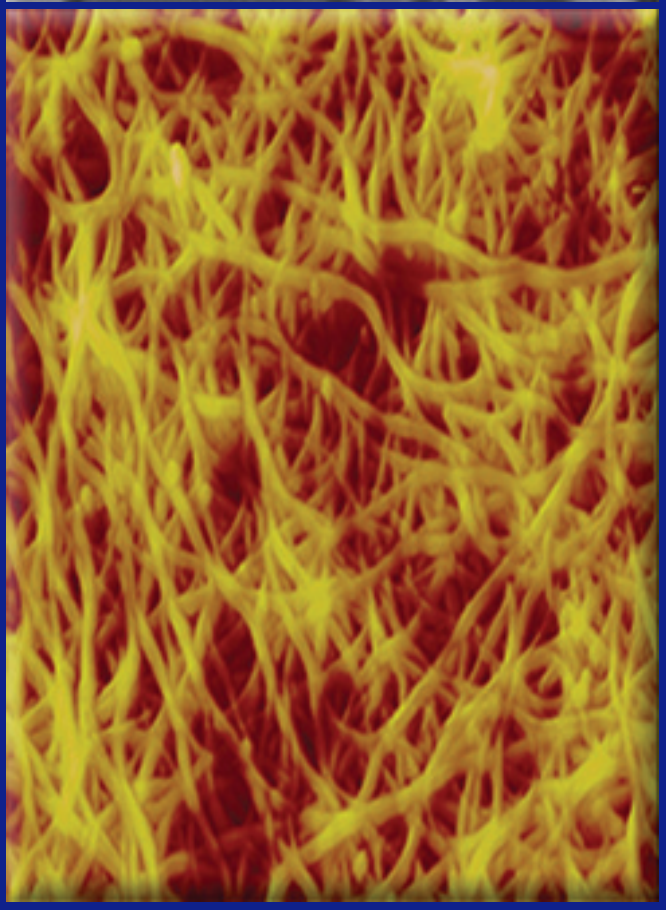
UNIVERSITY OF FLORIDA

Department of Physics Alumni Newsletter

Florida Physics News







The Physics Department Alumni Newsletter
Florida Physics News
Fall 2004

http://www.phys.ufl.edu/alumni

Chair
Alan Dorsey

Associate Chair
John Yelton

Editor/Layout
Leilanie Merrill

Contributors

Department & Faculty News
Professors A. Dorsey, G. Ihas, S. Trickey, CLAS News and Publications, PROTON Newsletter

Research News
Professors D. Acosta, P. Avery, L. Baudis, H. B. Chan, S. Hill, and A. Rinzler

Student News
Catherine Yeh

We would like to hear from you please visit the Alumni Registry: *http://www.phys.ufl.edu/alumni*

or send a note or photos to:

Florida Physics News
P.O. Box 118440
Gainesville, FL 32611-8440
(352) 392-0521
(352) 392-0524
physicsnews@phys.ufl.edu

Cover images from the following research articles:
"Marking Time at the LHC" p. 13
"Investigating Physics with Micromachines" p. 11
"Nanotube Films as Transparent Conducting Materials" p. 16

(top) UF Bookstore and Welcome Center opened in 2003. (left) The new addition to Ben Hill Griffin Stadium, including new press boxes, and box seating was completed in 2003. (right) The new Emerson Alumni Hall across from Ben Hill Griffin Stadium.

Letter from the Chair

This second issue of Florida Physics News follows on the heels of a gratifying response to last year's inaugural issue. Inside you'll find information about the faculty, staff, students, and alumni, as well as highlight articles on research, teaching, and outreach. I would like to take this opportunity to touch upon some of the news and issues that face our department, university, and profession.

We have had a successful year of faculty recruiting. As mentioned in last year's letter, experimental particle astrophysics is one of our new research directions, and in this area we have hired Assistant Professors Guido Mueller, formerly a research scientist with the UF LIGO group working on gravitational wave searches, and Laura Baudis, who joined us from Stanford University where she worked on an experiment searching for dark matter. We have strengthened our effort in nanoscience with the addition of Assistant Professor Ho Bun Chan, formerly a member of the technical staff at Lucent Technologies/Bell Labs, who uses micromechanics/microelectromechanical systems (MEMS) to study fundamental physics such as the Casimir forces. We also welcome Assistant Professor Katia Matcheva, who will join us from Cornell University where she is involved in the theoretical modeling of planetary atmospheres and in the interpretation of data from space missions, including the Cassini mission to Saturn. Professor Henri Van Rinsvelt retired in June 2004 after 37 years of distinguished service and teaching at the university, and he will be sorely missed. We do expect to see him around the department regularly and will continue to count on his advice and wisdom. Finally, this has been a good year for faculty awards and recognitions; they have been so numerous that I will refer you to the articles inside for details. I am especially proud of the awards garnered by our young faculty, including an NSF CAREER Award to Steve Hagen, a Department of Energy Outstanding Junior Investigator Award to Konstantin Matchev, and an Alfred P. Sloan Research Fellowship to Yoon Lee.

There have been changes in the university and its administration. UF's 11th President, Dr. J. Bernard "Bernie" Machen, assumed office on January 5th, 2004. He has been very visible on campus (including a visit to the physics department), and has made widely known his positions on increasing the diversity of the faculty and student body and rewarding faculty performance. The university's budget outlook is better this year than it has been for the past three years, with the result that the faculty will receive a long-overdue merit raise, and several campus-wide initiatives, including a nanoscience and technology building, are moving forward.

These are interesting times for our profession as well. Next year is special indeed—the year 2005 marks the 100th anniversary

continued on page 4

Physics Connection to the 2003 Nobel Prizes

NOBEL PRIZE IN MEDICINE

On October 6, 2003, the Nobel Prize for Medicine was awarded to Dr. Paul Lauterbur of the University of Illinois at Urbana and Sir Peter Mansfield of the University of Nottingham in England, developers of magnetic resonance imaging (MRI).

MRI technology is based on the research of Nuclear Magnetic Resonance spectroscopy, in which molecules are entrained in a strong magnetic field and zapped with radio waves. When the technology was beginning its use in Medicine, the nuclear (N) term was dropped to avoid the public misunderstanding that the word nuclear may mean radioactive, when in fact it refers to the harmless behavior in the presence of a magnetic field.

One of the major contributors to NMR research was Prof. Raymond Andrew, a Graduate Research Professor of Physics at the University of Florida from 1983-1998, who also held joint appointments in the Departments of Radiology and Nuclear Engineering. Prof. Andrew's first work on NMR came shortly after its discovery at Harvard University, where he was a Commonwealth Fellow from 1948-49. In 1974 when he was a member of the Physics Department at the University of Nottingham, Prof. Andrew began to focus his research in MRI technology after hearing Dr. Lauterbur speak at a conference in Bombay, whereupon he and Dr. Waldo Hinshaw, an American post-doc, started their research to improve on Dr. Lauterbur's imaging technique. One of their colleagues at the University of Nottingham was Sir Peter Mansfield, and his research group was studying NMR for the purposes of cancer detection.

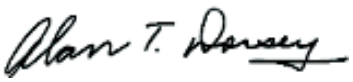
Prof. Andrew was a professor at the University of Wales and made one of his most significant discoveries there in the mid 1960s; the narrowing of NMR lines by magic angle spinning, which has been the foundation of modern high resolution NMR studies for chemical structures. He continued his research when he returned to the University of Nottingham, where he worked on using rapid rotation of samples for high-resolution studies and made another major contribution to the field of magnetic resonance with his pioneering studies on

continued on page 7

Chair continued from page 3

of Albert Einstein's "miraculous year" during which he published seminal papers on light quanta, Brownian motion and the special theory of relativity. To coincide with this anniversary, and to raise public awareness of the role of physics in society, the year 2005 is being celebrated as the World Year of Physics, and the UN General Assembly has declared 2005 to be the International Year of Physics. Our department will be planning some events as part of this celebration, and details will be forthcoming. Other good news is that nationwide the number of undergraduate physics majors is up, as is the number of US citizens or permanent residents entering graduate school in physics; both of these statistics are reflected in our own programs. The bad news is that funding for the physical sciences is in peril, due in large part to the ballooning federal budget deficit. In 2002 Congress passed the NSF Authorization Act of 2002 (signed by President Bush in December 2002), which authorized the doubling of the budget of the National Science Foundation over a five-year period. Unfortunately, this authorization has yet to translate into actual funding, with physical science funding slated to remain flat or decrease over the next several years. If you are as concerned about this as I am, please get in touch with me and I can tell you how you can help.

In these changing times we need our alumni more than ever. How can you help? With your experiences and expertise you can help us recruit the best physics majors and graduate students and you can offer career advice and assist in job placement for our students. Your contributions to the physics fund will improve the research and instructional infrastructure of the department, and will move us toward our goal of raising funds for graduate fellowships and for endowed professorships. Get in touch and get involved! Your involvement will be most appreciated by us and rewarding for you.



Alan Dorsey
Professor and Chairman

Professor Awarded Prestigious Commemorative Medal

The Commemorative Medal given by the Faculty of Mathematics and Physics of the Charles University in Prague was awarded to Professor Guenakh Mitselmakher of the University of Florida along with Professor Frank Wilczek of MIT and Professor Franco Bradamante of Trieste University.

Prof. Mitselmakher traveled to Prague to receive his medal on July 10, 2003. The ceremony was during the "Physics at LHC" conference which the University of Florida helped to organize along with CERN and Charles University. This award honors him for his work in experimental particle physics in particular his contributions to the experiments at particle colliders as well as his integrating role in the international scientific research, including contributions to the cooperation of the Charles University with major research centers.

Charles University was founded in the 14th Century by Charles IV, the Emperor of the Holy Roman Empire. The list of physicists who worked in Prague includes Johannes Kepler, who discovered two first Laws of Planetary Motion in Prague and Albert Einstein, who conceived his Theory of General Relativity while being a Professor in Prague.

Photo and Captions provided by Prof. Miroslav Finger

From Left: Professors Miroslav Finger of the Charles University, Guenakh Mitselmakher of the University of Florida (winner), Frank Wilczek of MIT (winner), and Ivan Netuka, Dean of the Faculty of Mathematics and Physics of the Charles University.

Photo and Captions provided by Prof. Miroslav Finger

The Commemorative Medal depicting Charles IV, Emperor of the Holy Roman Empire, founder of the Charles University.

Ramond Receives New Honor and Celebrates a Scientific Anniversary

Professor Pierre Ramond has been named the 2004 Oskar Klein Lecturer. This is a prestigious honor which includes past lectures by Nobel Laureates including C. N. Yang, Steven Weinberg, Hans A. Bethe, T. D. Lee, and Gerard 't Hooft. Oskar Klein, b. 1894 d. 1977, is known widely for his part in the Kaluza-Klein Theory (the existence of extra dimensions) and the Klein-Gordon equation (the first relativistic wave equation). The Oskar Klein Lectures are sponsored by the Royal Swedish Academy of Sciences through its Nobel Institute for Physics and by Stockholm University. Professor Pierre Ramond was invited to give his lecture at the 2004

continued on page 10

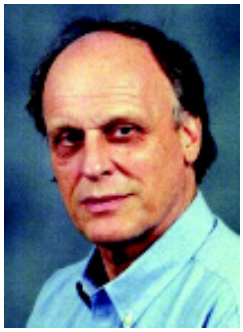
Ohrn Receives UF Teacher/Scholar Award

-CLAS News and Publications

Dr. N. Yngve Ohrn, a professor of chemistry and physics, received the 2003-04 University of Florida Teacher/Scholar Award. The award is the university's highest honor for faculty who demonstrate excellence in teaching and scholarly activity, and exhibit visibility within and beyond the university. The awardee serves as a very distinguished example of the teacher/scholar as represented at the UF.

For 38 years, Ohrn has demonstrated his commitment to UF through an exceptionally high level of scholarship, teaching and service. Ohrn is a world-recognized scholar for his fundamental and important contributions to quantum chemistry for which he has received many recognitions, including a gold medal awarded by the King of Sweden in 1980.

His research interests include the application of quantum mechanics and statistical physics to atomic and molecular processes, in particular the electronic structure and dynamics of molecular systems. He is a Fellow of the American Physical Society and a foreign member of the Finnish Academy of Sciences, the Royal Danish Academy of Sciences and the Swedish Royal Science Society.



During his tenure, Ohrn has supervised more than 20 doctoral students and more than 30 postdoctoral scientists, and he has maintained consistent extramural funding for more than 30 years. Generations of students at all levels have enjoyed Ohrn's lectures and mentorship, and student evaluations consistently note that he is a gifted teacher. He also has served as a judge at middle school and high school science competitions in Alachua County.

Gibson Professorship Awarded to Stewart

-CLAS News and Publications

Professor Greg Stewart has been selected as the 2003-2004 Gibson Term Professorship in the College of Liberal Arts & Sciences. These professorships are awarded to faculty who have demonstrated excellence in scholarship and teaching. The professorships also come with a one-time salary supplement and research allocation.

Professor Stewart specializes in experimental condensed matter physics. He received his PhD in applied physics from Stanford University in 1975 and has taught at UF since 1985. In 1990-1998, he held a joint appointment as a chaired professor at the University of Augsburg in Germany.

His research group focuses on advancing understanding of the unusual magnetic and superconducting properties of highly correlated f-electron metallic compounds, and he is internationally recognized as a leader in the measurement of new materials in high magnetic fields. Stewart is a fellow of the American Physical Society and is currently teaching a new general education course, "The Development of Modern Ideas in Physics".

Photo by Jane Dominguez, CLAS News and Publications

Hebard Named UFRF Research Professor

-CLAS News and Publications

The University of Florida Research Foundation named Physics Professor Arthur Hebard to its annual class of UF Research Foundation Professors. The three-year professorships were created in recognition of faculty who have established a distinguished record of research and scholarship that is expected to lead to continuing distinction in their field. This year, six CLAS faculty have been named UFRF professors, and each has been awarded a $5,000 annual salary supplement and a one-time $3,000 research grant.

Hebard specializes in condensed matter. His research focuses on the fabrication and characterization of thin-film structures and the unusual physical phenomena that occur within restricted dimensions. Much of his work is done through the facilities of the National High Magnetic Field Laboratory and consists of four key areas—transport in thin films, magneto-transport in semimetals, novel interfacial effects in thin-film capacitors and magnetic semiconductors. He has been issued six US patents for his work and has received numerous grants from the National Science Foundation. Hebard came to UF in 1996, after spending most of his professional career as a member of the technical staff at AT&T Laboratories.

Ihas Receives Research Opportunity Award

As one of six winners of the *Research Opportunity Award* from the Research Corporation, Professor Gary Ihas received the maximum allowed grant of $50,000.

"This award is for scientists of demonstrated productivity seeking to explore new experimental research." Selection is based on the scientific significance and originality of the research, potential for enhancement of the applicant's career, evidence of support from the department and institution, the candidate's past record and potential to mount and sustain a competitive research program, and evidence of the applicant's vigor and self-motivation.

For more information on the Research Corporation and the awards available please visit http://www.rescorp.org/.

Konigsberg Awarded Medal

Dr. Jacobo Konigsberg has been awarded the 2004 Medal of the Department of Particles and Fields of the Mexican Physical Society. The award is for Mexican scientists that have distinguished themselves internationally due to their contributions to the field and/or for contributing to the development of Particle Physics in Mexico. Dr. Konigsberg is currently working on the CDF Experiment at FermiLab and his main research focus has been on the discovery and further studies of the Top Quark. The medal was presented to Dr. Konigsberg in August 2004 at a ceremony at the Xi Mexican School of Particles and Fields, where he also gave several lectures on Experimental Top Quark Physics.

Outstanding Junior Investigator Award to Matchev

Professor Konstantin Matchev has been awarded a Department of Energy Outstanding Junior Investigator (OJI) Award. These competitive and prestigious awards are given to tenure track faculty and are meant to identify the best young researchers in high energy physics. This is the second OJI for the department; the first was awarded to Dr. Darin Acosta in 2001.

Lee Receives Fellowship Award

Professor Yoonseok Lee has been awarded with the 2004 Alfred P Sloan Research Fellowship. This fellowship is designed to "stimulate fundamental research by young scholars of outstanding promise." He will receive $40,000 over a two year period in support of his research which currently includes acoustic and magnetic properties of liquid and solid 3He and low temperature properties of low dimensional conductors.

Physics' Third NSF CAREER Award Recipient

-CLAS News and Publications

Professor Stephen Hagen received a National Science Foundation "CAREER" award. This will be the third CAREER Award in 2 years for the department. Professors Stephen Hill and Yoonseok Lee were recipients in 2003.

Professor Hagen will use his award to further his study of protein molecules and how they assemble themselves, or "fold", to carry out their biochemical function. Professor Hagen's research is interdisciplinary, and he collaborates with researchers in the Department of Chemistry, the College of Medicine and McKnight Brain Institute.

The CAREER program recognizes and supports the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century. CAREER awardees are selected on the basis of creative, career-development plans that effectively integrate research and education within the context of the mission of their institution. NSF encourages submission of CAREER proposals from new faculty at all CAREER eligible institutions. Such plans should build a firm foundation for a lifetime of integrated contributions to research and education. (http://www.nsf.gov/home/crssprgm/career/)

American Physical Society - *Division Elections*

Avery - SESAPS

Professor Paul Avery has been elected the new Vice Chair of the Southeastern Section of the American Physical Society (SESAPS). Professor Avery will be Vice Chair in 2004/2005, Chair-Elect in 2005/2006 and Chair in 2006/2007.

Tanner - DCMP

Professor David Tanner has been elected as the new Vice-Chair of the Division of Condensed Matter Physics (DCMP) of the American Physical Society (APS). Professor Tanner will take office at the 2004 March Meeting of the APS. In 2005, he will be the Chair-Elect, and then the Chair of DCMP in 2006.

Monkhorst Receives Two U.S. Patents

Professor Hendrik Monkhorst was recently issued two US Patents. Both are titled, "Controlled Fusion in a Field Reversed Configuration and Direct Energy Conversion".

The *direct energy conversion* that is described in the patents is a new method by which to obtain electric power from a possible fusion reactor. Unlike the previous technique where water is boiled to get steam to drive turbines which then drive generators of electricity, this new patent details the use of an Inverse Cyclotron Converter (ICC), which can be characterized as an inverse of a particle accelerator.

The direct use for this fusion reaction is for the development of the Colliding Beam Fusion Reactor (CBFR) which is currently underway in California.

"The Colliding Beam Fusion Reactor holds the promise to produce fusion power without nuclear waste, using abundant hydrogen and boron as fuel. The reactors can be built and placed anywhere and with various power outputs. It will make nuclear power safe, clean, and affordable," Prof. Monkhorst says.

When asked about the possible applications of this new power conversion, Prof. Monkhorst stated, "This power conversion was invented quite specifically for the aneutronic fusion reactor. However, it was pointed out to me that it could find application in recycling unused particle beam energy - from particles that did not undergo reactions."

Working along with a startup company called Tri Alpha Energy, Inc., and a plasma physics group at University of California at Irvine, headed by Prof. Monkhorst's co-inventor Norman Rostoker, this project is essentially an electrical engineering invention, which relies on existing technologies, in particular, solid-state power electronics.

The patents are: Patent No 6,628,740 (issued 9/30/03) and Patent No 6,611,106 (issued 8/26/03).

Nobel continued from page 3

MRI. Prof. Andrew was also highly involved with the establishment of the National High Magnetic Field Laboratory in Florida in 1990.

Sadly, Prof. Andrew died in 2001 at the age of 79. A physics fund has been established in his memory.

NOBEL PRIZE IN PHYSICS

Dr. Anthony J. Leggett of the University of Illinois at Urbana shared the 2003 Nobel Prize in Physics with Drs. Alexei A. Abrikosov, Argonne National Laboratory, and Vitaly L. Ginzburg, P.N. Lebedev Physical Institute Moscow, Russia. They received this award for their contributions to the theory of superconductors and superfluids.

Dr. Leggett's theoretical work was crucial for the correct interpretation of the experimental data obtained, at Cornell University, by Douglas D. Osheroff, Robert C. Richardson, and David M. Lee, who were studying the thermodynamic properties of solid and liquid 3He in coexistence at millikelvin temperatures. Initially, the unusual data were thought to be a signature of the magnetic ordering in the solid phase of 3He. At the suggestion of Dr. Leggett, additional NMR work was performed, and the observations were unambiguously linked to a superfluid state of liquid 3He. UF Professor Dwight Adams subsequently discovered the magnetic ordering in the solid phase of 3He at a lower temperature. In 1996, Drs. Osheroff, Richardson, and Lee shared the Nobel Prize for their discovery, and these researchers have visited UF on several occasions. In 1998, the University of Florida honored Dr. Dave Lee with an honorary doctorate degree, while Dr. Doug Osheroff, now at Stanford University, gave a speech at the dedication of the New Physics Building. Dr. Bob Richardson's most recent visit was earlier this semester as one of the finalists interviewed for the position of President of UF.

Dr. Leggett's association with UF dates back to the early 1970's when he was working on the theoretical description of superfluid 3He. His theoretical work has served as the basis of numerous experimental studies performed by UF Professors Dwight Adams, Gary Ihas, Yoon Lee, Mark Meisel, Neil Sullivan, and Yasu Takano. In May 1993, Dr. Leggett visited the Department of Physics and the Microkelvin Research Laboratory as a member of the external advisory committee for the Center for Ultralow Temperature Research (and today this organization is known as the Center for Condensed Matter Sciences).

Dr. Leggett served as Physics Chair Alan Dorsey's thesis advisor at the University of Illinois from 1983-1987. He also spent about six weeks visiting UF this past spring, from January 11-February 15, and gave 10 lectures on quantum fluids as a graduate level mini course, as well as a physics department colloquium, condensed matter physics seminar, and IFT colloquium.

Faculty in Retirement

Lennart R. Peterson

Professor Peterson arrived in Gainesville as a postdoc with Prof. Alex Green in 1966 and went on to become a faculty member in 1967. He has research interests in atmospheric physics and theoretical physics. He is recognized as an excellent instructor, and in 1996 was honored as an Anderson Scholar Faculty Honoree. He retired in June 2004 after having been in the phased retirement program. He plans to split his time between Gainesville and Georgia, and is working on a physics textbook.

L. Elizabeth Seiberling

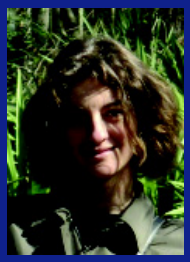
Professor Seiberling came to UF from a faculty position at the University of Pennsylvania and quickly established a research program in accelerator-based surface structure analysis and electron-tunneling microscopy. In addition to running a federally-funded research program for several years she was an outstanding citizen in the department, serving on a host of committees as well as being an excellent teacher. She also chaired the Building Committee, whose work resulted in the New Physics Building. For three years she acted tirelessly as the interface between the entire faculty and the architects and contractors; the impressive structure that resulted is in great part due to her efforts. She is in the phased retirement program through 2006.

Henri Van Rinsvelt

Professor Van Rinsvelt joined the UF physics department in 1967 after a postdoctoral appointment in the Nuclear Laboratory at FSU. After a few years' research here at UF in his specialty of nuclear spectroscopy he decided to enter the then-new field of Particle Induced X-ray Emission analysis. Henri successfully became a well-known expert in what is now called PIXE analysis, and applied PIXE to a wide range of problems such as forensic analysis, air pollution, and mammalian disorders. Henri has also been a stalwart departmental citizen, having served as Associate Chair of the department for 13 years. He has an ongoing interest in educational outreach activities, including his "Physics is Fun" shows, which he has put on at local schools and at the FL Museum of Natural History. After his retirement in June 2004 he plans to continue his involvement with physics education and outreach.

New Faculty

Laura Baudis



Professor Laura Baudis, a new Assistant Professor with the Experimental Astrophysics group joined the department in January 2004.

Professor Baudis received her PhD from The University of Heidelberg in 1999 and her research interests include cosmology and particle astrophysics, in particular the nature of the dark matter in the Universe and the absolute scale of the neutrino mass.

Ho-Bun Chan

Professor Ho-Bun Chan, a new Assistant Professor with the Condensed Matter Experiment group working in Nanoscale Science joined the department in January 2004.

Professor Chan received his PhD from The Massachusetts Institute of Technology in 1999 and his research interests include micromechanics/microelectro-mechanical systems (MEMS), Casimir forces, and surface plasmon devices.

Photo by: Jane Dominguez courtesy CLAS News and Publications

Katia Matcheva

Professor Katia Matcheva, a new Assistant Professor with the Theoretical Astrophysics group, will join the department in January 2005.

Professor Matcheva received her Ph.D. from Johns Hopkins University in 2000 and her research interests include the physics and chemistry of the atmospheres of Solar system planets, radiative transfer models of the atmosphere, dynamics of the upper atmosphere, and atmospheric gravity waves.

Department Conferences

24th International Conference on Low Temperature Physics (LT24)

contributed by Professor Gary Ihas

Every three years the international community of low temperature physicists gathers in conference to exchange information on their latest researches, and to plan for future directions in research. From August 10 to 17, 2005, the 24th International Conference on Low Temperature Physics (LT24) will be held in Orlando, Florida, hosted by the University of Florida under the auspices of the International Union of Pure and Applied Physics. Professor Gary Ihas is Chairman of the conference, and Professor Mark Meisel is Secretary.

The first conference in this series was held in Cambridge, England in 1946 and was chaired by Sir Lawrence Bragg. It had three hundred participants who presented 26 papers. The last conference, LT23, was in Hiroshima, Japan, and was attended by 1466 participants from 34 countries that presented 1412 talks and posters.

This is the most important conference in an area of science that has been the spawning ground for much of our technological economy and society. Because of the venue, Walt Disney World Resorts, and the timing, 12 years after the last US conference and during a rapidly growing period of low temperature research, this will probably be the largest LT conference ever. A major goal of this conference is to include scientists from as many countries as possible and at all stages of scientific development, and to encourage young scientists in the United States. A large outreach program in the state of Florida is also planned. The most prestigious prize in the field of low temperature research, the London Prize, will be presented at the meeting. For more information visit: http://www.phys.ufl.edu/~lt24/.

Department External Review

The department underwent a self-initiated external review on November 20&21, 2003. The External Advisory Committee consisted of five eminent physicists: Thomas Applequist (chair of the committee, Professor of Physics and former Dean, Yale University), Judy Franz (Executive Officer, American Physical Society), William Frazer (Emeritus Professor, UC Berkeley, and former Vice President of the UC system), Raymond Goldstein (Professor, University of Arizona), and Eric Mazur (Professor of Physics, Harvard University). Over the two days the committee had a frenetic schedule which included touring the building and facilities, listening to presentations on research and instructional activities in the department, meeting with groups of students, staff, and faculty, and meeting with university administrators including CLAS Dean Neil Sullivan, VP for Research Win Phillips, and Provost David Colburn. The committee was charged with reviewing the department's activities and assessing our strengths and weaknesses, and providing recommendations for improving our program and identifying new opportunities. The committee's report praised many of our programs, and strongly endorsed our plan of growing new research programs in experimental biological physics and particle astrophysics. Several concerns were raised, including the level of fellowship support for our graduate students and the lack of diversity within our faculty ranks; both issues are being actively discussed in the department. A formal response to the committee's report will be produced in the fall of 2004.

44th Sanibel Symposium

contributed by Professor Samuel Trickey

The 44th Sanibel Symposium continued two themes - scientific excellence and a location different from its name. The 2004 meeting was held at World Golf Village, north of St. Augustine Florida. The move occurred because the former site (Ponce de Leon Resort) was closed and torn down to make way for residential development. The meeting format also changed, to 6 days with 17 Invited Talk sessions and 6 Poster sessions. Invited Talk sessions included such topics as Molecular Electronics, Nanoscale Phenomena at Surfaces, Density Functional and Density Matrix Functional Theory, Multi-scale Chemistry, Quantum Dynamics in both finite and extended systems, Molecular Spectroscopy in Interstellar Regions, Thermodynamics of Small Systems, Quantum Mechanical - Molecular Mechanical Methods and Applications, Metals in Biomolecules, Ion Channels, and Large System Simulations.

Two tutorial sessions to introduce graduate students to the topics of the Invited Talk sessions were a popular new feature. For the third year, the participant survey showed high satisfaction with the scientific program and speaker selection (4.1 - 4.4 on a 1-5 scale with 5 best). First-time attendance by younger scientists was up and return attendance continued strong. The Army Research Office, Office of Naval Research, and IBM Corporation provided external funding.

The Symposium is on the move again. The 45th will take place March 5 - 11 at the King and Prince Resort Hotel on St. Simons Island Georgia. Go to http:www.qtp.ufl.edu and click on "Sanibel" in the menu on the left side.

New Magnet Lab Director Named

-CLAS News and Publications

A world-class leader in magnetic field research is the new director of the National High Magnetic Field Laboratory, which is operated by a consortium among the University of Florida, Florida State University and Los Alamos National Laboratory in New Mexico. Greg Boebinger, who has been the director of the pulsed magnet facility at Los Alamos since 1998, will head the lab whose central headquarters are in Tallahassee. He succeeds Jack Crow, the founding director of the NHMFL, whose vision has led the facility to break all records in the field of magnet technology and now supplies advanced magnets for other labs around the world. Sadly, Jack Crow died in September 2004 after an extended illness, and his presence at the NHMFL will be sorely missed.

In addition to his administrative duties, he also will hold faculty appointments in physics at UF and FSU. A distinguished experimental condensed matter scientist, Boebinger completed his Ph.D. at the Massachusetts Institute of Technology in 1986 after earning three bachelor's degrees in electrical engineering, philosophy and physics from Purdue University and completing postgraduate work at Cambridge University in England. Before joining Los Alamos, Boebinger worked as a staff physicist at Bell Laboratories in Murray Hill, New Jersey. Since 1995, one of Boebinger's major collaborators has been Neil Sullivan, a professor of physics and dean of UF's College of Liberal Arts and Sciences. Sullivan, along with Crow, is one of the original architects of the proposal to bring the NHMFL to Florida and still serves as the co-principal investigator representing UF.

In 1989, a consortium of scientists at UF, FSU, and Los Alamos National Lab out-competed a number of universities vying to be the national lab's new headquarters, then based at the Massachusetts Institute of Technology in Boston. The new lab opened in 1994 and operates through a grant from the National Science Foundation.

Photo: NHMFL

Launched at Innovation Park in Tallahassee, the NHMFL's central headquarters houses the most powerful magnets ever built. Scientists in various fields use the extraordinarily high fields as tools for probing the properties of materials ranging from superconducting compounds to living tissue. In Gainesville, the NHMFL operates two facilities, one that studies the physics of materials at ultra-low temperatures and high magnetic fields, and a second that uses magnetic resonance to study biological systems.

Ramond continued from page 4

Nobel Symposium entitled "Neutrino Physics", sponsored by the Nobel Foundation, held August 19-24, 2004.

Professor Ramond also attended two conferences commemorating the 25th anniversary of his work as one of the four collaborators who proposed the "see-saw mechanism" in 1979. The "see-saw mechanism" is the prediction that neutrinos have masses and that they are very small compared to that of their charged partners. The anniversary conferences held in France and Japan, were not only to commemorate the importance of this finding, but also assess its place now among the current research of neutrino masses.

UF Welcomes New President

After a long search with over 400 candidates contacted, 11 applicants interviewed and then narrowed to three, the University of Florida Board of Trustees elected Dr. James Bernard "Bernie" Machen as the 11th President of the University of Florida on October 8, 2003. Dr. Machen began his duties on January 5, 2004 and his inauguration ceremony was held September 9-10, 2004.

Prior to arriving at UF, Dr. Machen served as President of the University of Utah. His past experiences include provost and vice-president of academic affairs and dean of the School of Dentistry at the University of Michigan.

To get to know the campus and the people, Dr. Machen made visits to some of the colleges and departments. Arranged by Professor Dorsey, a forum with Dr. Machen was held on May 20, 2004. The forum was open to all members of the department. It was a relaxed, casual meeting where Dr. Machen began a discussion about his plans for the university in the coming years.

RESEARCH NEWS

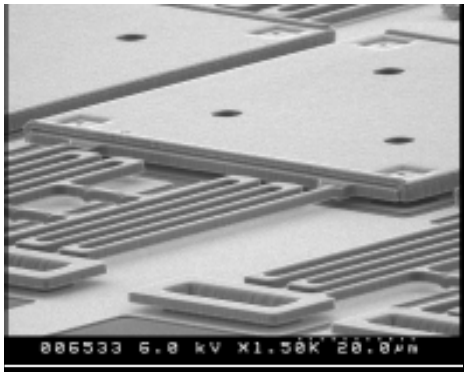
Investigating Physics with Micromachines

contributed by Professor Ho Bun Chan

Micromachines, or microelectromechanical systems (MEMS), are small, movable structures created using integrated circuit technology. Processes that fabricate microelectronic chips, such as lithography, etching and deposition, are used to create movable MEMS components in the um or nm scale on a semiconductor wafer. The small size, quick response time, high sensitivity and low cost of MEMS have made them a compelling choice for a variety of applications. For instance, micromachined sensors are nowadays widely used in automobiles for detecting acceleration and deploying airbags. Apart from the obvious commercial value of MEMS, their high sensitivity and functionality offer unique capabilities for carrying out fundamental physics experiments. Dr. Ho Bun Chan's research group makes use of MEMS to investigate fundamental interactions among surfaces in close proximity including Casimir forces and non-contact friction. Dr. Chan's group also studies the interaction of MEMS with light: controlling light using MEMS as well as actuating MEMS with light.

The Casimir force is the attraction between two neutral metallic surfaces arising from the changes in the zero point energy of the electromagnetic field. When the Casimir force is mentioned in physics courses, it is usually regarded as an interesting but technologically irrelevant corollary of quantum field theory. Dr. Chan and his collaborators demonstrated that motion of MEMS device can be created solely based on the Casimir force. So far, classical mechanics have done a good job in describing the operation of commercial MEMS devices. Dr. Chan's experiment establishes the importance of quantum mechanical effects between MEMS components when the trend of miniaturization of MEMS continues. Currently, Dr. Chan's group is investigating non-conservative effects between two bodies in relative motion at the nanoscale. Such dissipative effects will affect the damping and reduce the resonance linewidth of micro-mechanical oscillators.

In microelectronic devices, billions of transistors are packed into a single chip. The fabrication of MEMS involves similar, highly parallel processes, making it possible to create arrays of large number of elements. MEMS optical devices that contain hundreds or even millions of moving parts have become important components in telecommunication networks, adaptive optics and display devices such as projectors. In collaboration with Dr. Reitze, Dr. Chan's group has built a prototype MEMS micro-mirror array to be used in shaping ultrafast optical pulses (Figure). This group is also investigating the interaction between nanomechanical components and surface plasmons polaritons.



The width of the serpentine springs supporting each mirror is about 1/100 the diameter of a human hair.

Figure: Micron-sized movable artificial structures can be used to control light. This polysilicon micro-mirror is suspended by serpentine springs. The mirror is capable of motion perpendicular to the substrate when a voltage is applied to the underlying electrode. When actuated, each mirror in the array can be used to change the free space path length of an incident light beam and impart variable phase shifts in real time.

Physics and the University of Florida Campus Grid

contributed by Professor Paul Avery

Processing, analyzing, transporting and displaying terabytes of data present increasingly difficult challenges to forefront research in many domains of science and engineering. These problems are particularly acute in such computer-intensive Physics domains as High Energy Physics, nanostructures, stellar dynamics and gravitational wave detection, where University of Florida physicists have strong research programs.

To address these critical challenges, Physics faculty members, in partnership with colleagues across the University of Florida, have embarked on a campus-wide program (http://www.hcs.ufl.edu/hpc/) to develop high-end computing for data-intensive research across a broad spectrum of disciplines. The centerpiece of this strategy is the creation of a UF Campus Research Grid linking several powerful computing clusters to form a single, large computational resource that will be accessed by researchers across the entire campus. At the heart of the Campus Research Grid is a new high-performance computing facility intended to provide a powerful baseline of computation and storage infrastructure for the grid coupled with high-speed communications. This facility will loosely bind existing computing resources across campus and is being constructed in three phases, starting in 2004,

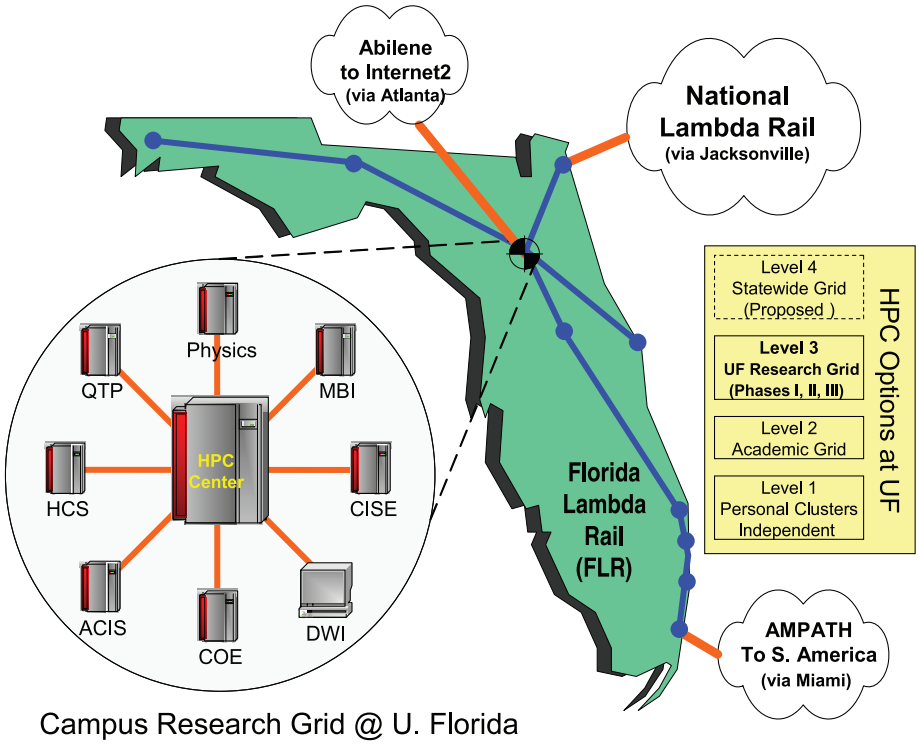
continued on page 12

Grid continued from page 11

with a focus on the physical sciences, engineering sciences, and health sciences, respectively.

The Department of Physics is playing a principal role in the creation of the Campus Research Grid. Phase I (see figure) is located in the Physics computer room and two recently hired computing engineers will work closely with Erik Deumens of the Quantum Theory Project and Jorge Rodriguez of High Energy Physics in integrating the hardware and software systems of the facility with the other major computing clusters on campus. The Grid software will take advantage of the University of Florida's leadership of two national Grid efforts, GriPhyN (http://www.griphyn.org/) and the International Virtual Data Grid Laboratory (http://www.ivdgl.org/), both led by Paul Avery.

The Campus Research Grid has tremendous synergy with other major activities at the local, state and national levels that will augment the University's role in high end computing. Paul Avery and Sam Trickey were co-principal investigators of a successful proposal to the NSF Major Research Initiative (MRI) program, which will bring $857K of resources to build a state of the art networking infrastructure linking the major computing centers on campus, including Physics. This campus network will be linked to the advance networking infrastructures Florida Lambda Rail (FLR) and National Lambda Rail (NLR), thanks to $800K in equipment and personnel provided by the successful UltraLight proposal to the NSF Information Technology Research program (http://ultralight.caltech.edu/), on which Paul Avery was the lead UF investigator. Taken together, these projects will not only extend UF national leadership in Grid computing, but they will help catapult UF into the front ranks of international ultra-high speed networking, providing our university for the first time with a state of the art networking infrastructure supporting advanced scientific applications.



Campus Research Grid @ U. Florida

Marking Time to the LHC

contributed by Professor Darin Acosta

Experimenters from the high-energy physics group are marking time until the start of the Large Hadron Collider (LHC) in 2007 at the CERN laboratory in Geneva, Switzerland. The LHC will collide protons at an unprecedented energy of 14 trillion electron-volts in order to unravel some basic mysteries of the universe, such as the mechanism by which particles acquire mass and the mechanism that unifies the known fundamental forces. Circumstantial evidence has been gradually accumulating that a high grand theory must exist that is able to explain physical phenomena with fewer ad-hoc parameters than used in current theories, and the LHC is our best bet for directly probing this theory. The LHC also may shed light on "dark matter", so-far invisible yet responsible for 90% of the mass in the universe according to cosmologists, and perhaps even reveal that we live in a universe with more than 3 spatial dimensions.

The UF researchers participate in an LHC experiment called the Compact Muon Solenoid, a misnomer given that the experiment will stand 15 m tall and weight over 12,000 tons when completed. It will also contain the largest superconducting magnet ever constructed in order to measure particle momenta: a 4 Tesla solenoid 12 m long and 6 meters in diameter. The CMS experiment will be installed 100 meters underground at one of the collision points of the LHC ring, which is 27 kilometers in circumference.

One of the ways UF researchers are marking time is in developing a precise and stable clock distribution system in order to synchronize the experiment electronics to the 40 MHz proton collision frequency. The research group of Professor Darin Acosta marked a mile-

stone in September 2003 by successfully testing a sophisticated electronic processor they developed at UF in an experiment using a muon beam at CERN. Dubbed the "Track-Finder," the processor collects data transmitted on high-speed fiber-optic links to reconstruct in real-time the trajectories of muons in the Endcap Muon system of the CMS. In earlier tests, the experiment failed because the clock distributed by the CERN particle accelerator had too much jitter to drive optical links operating at 1.6 GHz without error. The clock is the heartbeat of a collider experiment: data must be synchronized to the clock so that information from one proton collision is not mixed up with that from another. In the September tests, the UF group employed a very stable crystal oscillator and phase-locked it to the accelerator clock. This time the experiment succeeded, and data was successfully driven through the entire electronic system from the muon chambers to the Track-Finder at the measured machine frequency of 40.078893 MHz. The feat was repeated with even more detectors and electronics in June 2004 as an even larger slice of the CMS experiment was tested. The success of the beam test experiments depended on the efforts of UF physics graduate students Bobby Scurlock, Alexei Drozdetski and Khristian Kotov, as well as physics undergraduates Lindsay Gray and Nicholas Park. Post-doctoral research Holger Stoeck and engineer Alex Madorsky also were instrumental.

Another way to mark time until the start of the LHC is to measure the progress on the installation of the many detectors that will compose the CMS experiment. Professors Mitselmakher and Korytov lead the Endcap Muon project of CMS, which is a system consisting of over 400 large wire chambers devoted to detecting muons emanating from the LHC collision point. Approximately 75 of these chambers were tested in the High-Bay laboratory of the Physics Building, but all have now been shipped to CERN for installation. The CMS team recently celebrated the installation of 108 chambers onto the 5-story tall iron disks at CERN, which represents 27% of the final system. In fact, several of these chambers have seen the first muons at CMS after being powered up and detecting cosmic-ray muons originating from the upper atmosphere.

The construction of CMS and the LHC is a monumental task, but one which is well underway. The reward in 3 years hopefully will be deep insight into the nature of the universe.

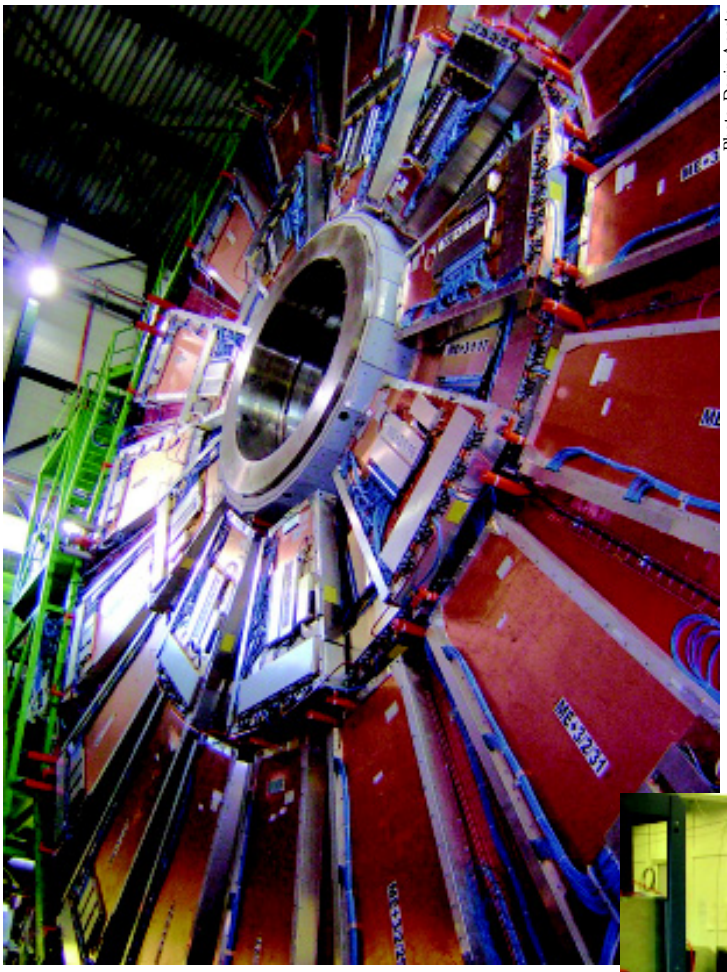


Photo: Darin Acosta

▲ *One of the disks of the CMS Endcap Muon system. The gaps seen in the picture will soon be filled with muon detectors to complete the installation.*

Photo courtesy of CMS

Eagerly awaiting beam test results. From left to right: ▶ *Associate Professor Darin Acosta, Graduate student Bobby Scurlock, Post Doc Holger Stoeck, and collaborating engineers Victor Golovtsov and Lev Uvarov (seated).*

A Quantum Leap

adapted with permission from Aaron Hoover, UF News and Publications, by Professor Stephen Hill

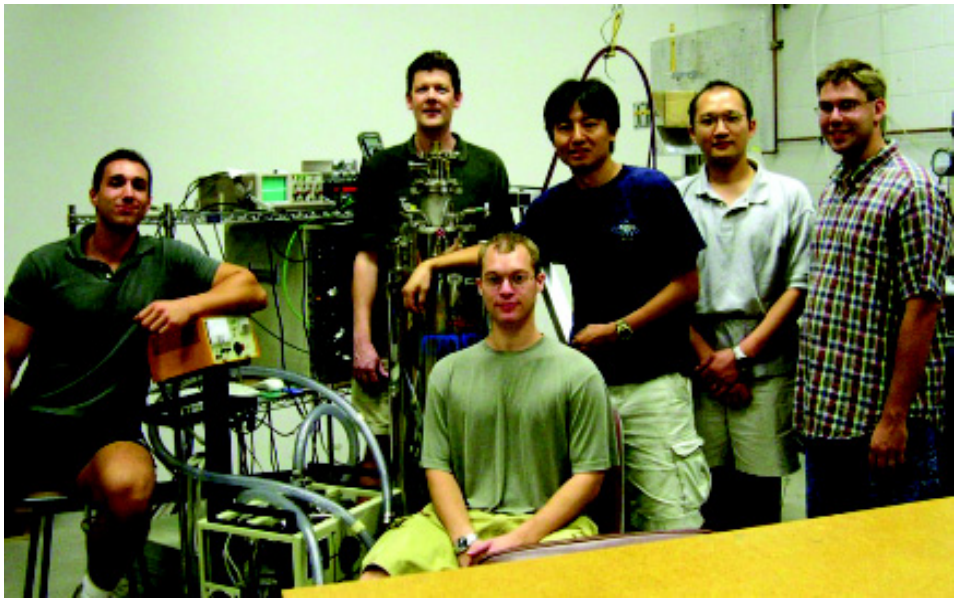
No one knows how to build a quantum computer. But futurists predict that whoever succeeds will be able to crack the U.S. military's hardiest codes in a few minutes, solve currently insurmountable problems in physics, meteorology and astronomy and possibly shrink computers to microscopic size. So, in a reprise of the effort to pioneer high temperature superconductors a decade ago, the race is on. Among the proven competitors at the world's universities and research institutions: two University of Florida scientists. Physics Associate Professor Stephen Hill and Drago Professor of Chemistry George Christou say up front they're nowhere near building what remains a device rooted partly in science and partly in science fiction. But, in a paper published last fall in the journal Science,[1] the two demonstrated a new possibility for the basic mechanism that could underlie a quantum machine. Supported by $2 million from the National Science Foundation, they're continuing to pursue that possibility - which they believe may have key advantages over a handful of other candidates for the quantum computer's mysterious innards.

Today's computers rely on bits of information stored as magnetic states on hard drives or in a compact disc's grooves. These states are represented as zeros or ones. The quantum computer would have a radically different foundation: the quantum bit, or qubit. It may sound bizarre, but the qubit would lead to vast increases in a computer's processing power. Here's why: Four bits in a conventional computer can store only one of 16 different patterns at a time – 0001 at one time, 0011 the next time, then 0111, and so on.. But four qubits, if achieved, could store *all* 16 patterns at the same time. So, while each additional bit gives a conventional computer just one more bit of power, each qubit increases the quantum computer's power exponentially.

Mathematicians have already demonstrated formulae or algorithms that would use quantum computers to do remarkable things, Hill says. For example, today's state-of-the-art military codes are immune to conventional computers, which would require centuries of processing to discover the patterns needed to crack them. "The joke is that the codes developed by the Pentagon are supposedly safe for hundreds of years, but if someone makes a quantum computer they may only be safe for a few minutes," Hill says.

Although everyone agrees no one will build a quantum computer next year, scientists have already made progress. In 2001, IBM researchers built the first "proof of concept" primitive version of a quantum computer, using it to break the number 15 into its factors of five and three. Most researchers since have concentrated their efforts on the problem of developing the physical system that will serve as the main computational ingredient – in other words, the quantum computer's processor. It is presently unknown what this system will consist of. Some teams are experimenting with photons, others with the spins of atomic nuclei. Still others hope to tweak the electron spin in a pursuit known as spintronics.

Hill and Christou are working on yet another candidate: molecular magnets. Until 1992, no one had observed magnetism on the molecular scale. That year, Christou, then at Indiana University in Bloomington, was among a group of scientists who synthesized the world's first magnet consisting only of a single molecule. With an inner core measuring just one half of a nanometer, or a half of a billionth of a meter, so-called "Manganese 12" was the smallest magnet then known to science. Each molecule is too small to probe by itself. But they form in crystals, each containing trillions of identical, ordered, similarly aligned magnets. By studying the behavior of manageably large crystals, scientists can



L to R: Jon Lawrence, Stephen Hill, Tony Wilson, Susumu Takahashi, Sheng-Chiang Lee, and Norman Anderson.

deduce the behavior of each molecule.

If Christou's specialty is making the crystals, Hill's expertise is studying them. Hill's lab has an elaborate and expensive setup that boasts some of modern physics' most powerful instruments, including a spectrometer, a cryostat and a powerful magnet. He uses the cryostat to cool the sample to a few degrees above absolute zero, a necessity to shelter the delicate quantum system against heat-related disturbances. He then powers up and manipulates the magnetic field to prompt the sample to enter a quantum state, firing microwaves at it and studying the return signal with the state-of-the-art spectrometer. "With just the right conditions of magnetic field strength and temperature and magnetic field orientation, we can coax the system into a so-called superposition of quantum states whereby pairs of molecules act in unison," Hill says. "The microwaves are our eyes looking into the system, while the magnetic field, if you like, represents our hands." The superposition state is stable for only a few nanoseconds-just enough time for Hill and Christou to show, as reported in the 2003 Science paper, that single-molecule magnets could one day be used in a quantum computer.

Success may be a long way off, but no one disputes the importance of this research. Already, as engineers tap the last of silicon's remaining potential, the rapid increases in computing speed that spurred the information revolution are slowing down. With modern scientific progress so closely tied to computing heft, it's important for acceleration to continue. "Once we figure out all these issues with quantum mechanics there might be another quantum leap," Hill says.

[1] S. Hill, R. S. Edwards, N. Aliaga-Alcalde, G. Christou, Science 302, 1015-1018 (Nov 7 2003).

Looking for Particles Left Over From the Big Bang with the Cryogenic Dark Matter Search (CDMS) Experiment

contributed by Professor Laura Baudis

We have strong evidence on all cosmic scales, from galaxies to the largest structures ever observed, that there is more matter in the universe than we can actually see. Galaxies and clusters would fly apart unless they would be held together by material which we call dark, because it does not emit electromagnetic radiation. As early as 1933 Fritz Zwicky had discovered that the masses of massive galaxy clusters are about ten times larger than the sum of the luminous mass of their individual galaxies. However, it was the pioneering work of Vera Rubin in the 1970s which provided dynamical evidence that individual galaxies are embedded in large, dark halos.

According to the Wilkinson Microwave Anisotropy Probe, or WMAP, a survey of the microwave background radiation left over from the big bang, ordinary ("baryonic") matter containing atoms makes up only 4% of the energy-matter contents in the Universe. "Dark energy" makes up 73%, and an unknown form of dark matter makes up the last 23%. Some of the properties of non-baryonic dark matter, such as its density, can be inferred from WMAP, with the Sloan Digital Sky Survey recently confirming these results. We know that neutrinos, very light particles left over from the big bang in massive quantities, make up a small amount. WIMPs, or Weakly Interacting Massive Particles, may make up the rest. WIMPs, which could have been produced in the very early universe, may have a mass 10 to 1000 times the mass of the proton and interact only via the weak force and gravity. Such particles are outside the realm of the Standard Model of particle physics and their discovery would bring a breakthrough for theories going beyond the Standard Model.

The CDMS experiment uses germanium and silicon crystals cooled down to mK temperatures to look for WIMPs scattering off Ge or Si nuclei. Since dark matter particles will interact less than once per day in 1 kilogram of target material, the detectors have to be care-

continued on page 16

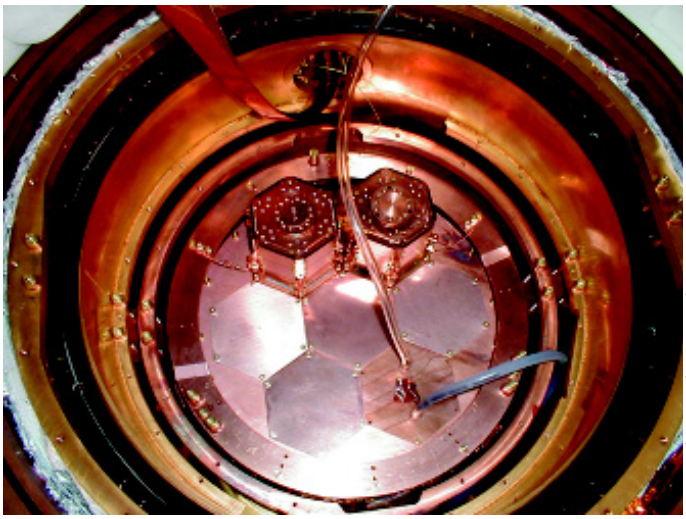


Image and text credit: FermiLab

A view of the inner layers of the cryostat with two towers installed. Detector towers are mounted in the holes covered by hexagonal plates. The coldest part of the cryostat stays at 10 mK (millikelvin, or thousandths of a degree above absolute zero) during operation. The surrounding layers are higher temperature stages of the cryostat. The cryostat is constructed using radiopure copper to provide a low-radioactivity environment for the extremely sensitive CDMS detectors.

CDMS continued from page 15

fully shielded from cosmic rays and any other interactions that would mimic a WIMP (so-called "background events"). The CDMS team thus practices 'underground astronomy', with the detectors being located nearly a half-mile below the earth's surface in a former iron mine in Soudan, in northern Minnesota.

The power of the detectors resides in the capability of simultaneously measuring the charge and vibration produced by particle interactions within the crystals. WIMPs will signal their presence by releasing less charge than other particles for the same amount of vibration.

The current experimental set-up for CDMS at Soudan contains two towers of detectors, each with a kilogram of germanium and 200 g of silicon. While germanium is heavier and has a higher probability of seeing a WIMP interaction, silicon is used to distinguish WIMPs from neutrons, which produce the same ratio of charge to vibration as a dark matter particle.

With the first data from the Soudan observatory, taken with only one tower from October 2003 to January 2004, the CDMS team has achieved the worldwide highest sensitivity on WIMPs.

The CDMS result, described in a paper accepted by *Physical Review Letters* (astro-ph/0405033), shows with 90 percent certainty that the interaction rate of a WIMP with mass 60 GeV must be less than 4×10^{-43} cm^2 or about one interaction every 25 days per kilogram of germanium.

These measurements are at least four times more sensitive than the best previous measurement offered by the EDELWEISS experiment, an underground European experiment near Grenoble, France.

The team is now analyzing the data from the two towers taken from February to August 2004, while at the same time they warmed up the experiment to include 3 additional towers. They expect to resume data taking by the end of the year and to take measurements during the entire year 2005 before the next scheduled upgrade.

CDMS includes 48 scientists from 13 institutions, and is supported by funds from NSF and DoE. The University of Florida is the youngest addition to the CDMS II collaborating institutions. The UF group, led by Professor Laura Baudis, is playing a major role in identifying and reducing the background sources of CDMS detectors, a precise detective work to chase down all types of interactions that may look like WIMPs, but in fact, are not. The group is also strongly involved in modeling these so-called background interactions with Monte Carlo methods, in the analysis of the WIMP search data and in operation of the experiment at the Soudan laboratory.

The discovery of Weakly Interacting Massive Particles would have deep implications for cosmology and particle physics, solving the double mystery of dark matter on cosmic scales and on new particle physics on subatomic scales.

Website of the UF group:
http://www.phys.ufl.edu/darkmatter/
Main CDMS website:
http://cdms.berkeley.edu/

Nanotube Films as Transparent Conducting Materials

contributed by Professor Andrew Rinzler

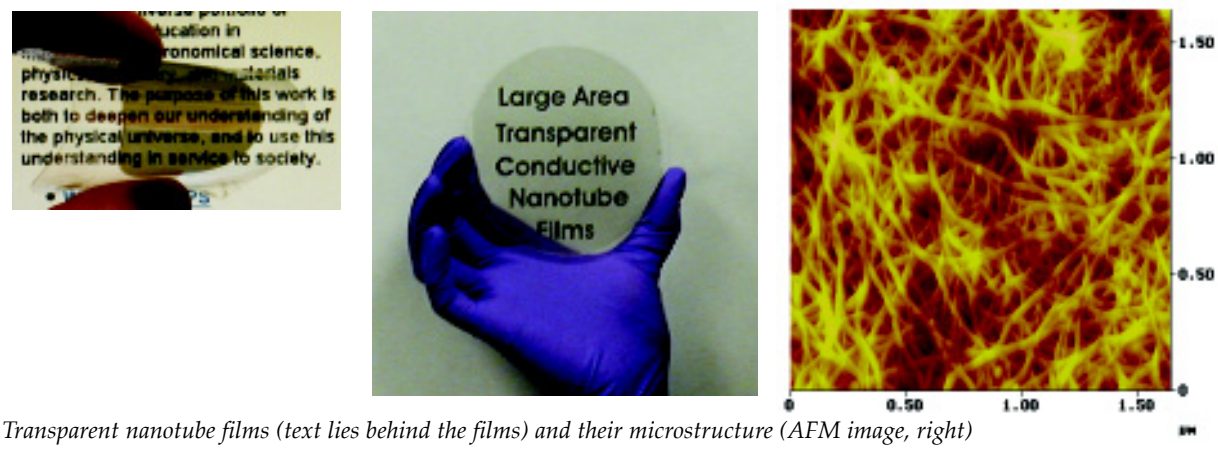
If not for a handful of materials, the properties of optical transparency and good electrical conductivity would be mutually exclusive. Glasses and plastics are nicely transparent, but they are generally electrically insulating. Metals, on the other hand, while being good electrical conductors, tend to be opaque. They can be made very thin and thereby transparent, but most metals oxidize the depth of the film making for poor conductors and the precious metals, which don't oxidize, don't like to form contiguous films, so their conductivity when thin enough to be transparent, is also poor. This leaves a handful of semiconductors: the transparent conducting oxides (TCOs), like indium tin oxide, to carry the burden. And a big burden it is because modern technology depends heavily on the use of transparent conducting films and the need keeps growing. Where? Well, in computer laptop displays, in infrared light emitting diodes (LEDs) like in TV remotes and their photodiode receivers, in the visible LEDs you see in traffic lights and commercial signs, in each of the Megapixels of digital cameras, in photocopiers, in solar cells, and in digital watch displays. The list goes on. Given this ubiquity the TCOs are obviously very successful. Nevertheless there remains considerable room for improvement. The conductivity of the TCOs depends critically on their oxygen doping, which is finicky to control, and limits their temperature tolerance during device fabrication. The TCOs are brittle, limiting their use to rigid devices. Finally, most TCOs are n-type conductors, which limits the range of materials to which they can electrically couple without the formation of significant contact barriers.

Now a group of researchers at UF

has demonstrated that thin films of pure single walled carbon nanotubes (SWNTs) can provide transparent conductors having properties complimentary to if not outright competitive with the TCOs. Fabrication of the films and application to GaN based light emitting diodes were first reported in the Journal Nano Letters.[1,2] Elaboration of the film fabrication process and optical and electronic characterization appeared in the August 27th issue of Science.[3] The nanotube films are distinguished by having higher electrical conductivity, for equal transparency in the mid-IR compared to other known materials; they are highly flexible, with no degradation in their opto-electronic properties after repeated flexing; and the semiconducting nanotubes in the mixture of ~1/3 metallic, 2/3 semiconducting, tend to be p-type conductors, although by simple chemical charge transfer doping (effected by exposure to vapors of the appropriate chemicals) their carrier concentration can be modulated all the way to n-type. This means that the nanotube films should permit the coupling of current into a broad range of materials.

How do the nanotubes achieve a simultaneous high transparency in the mid IR and good electrical conductivity? Part of the high transparency is explained the by the low nanotube carrier density, which limits their free carrier absorption. Low carrier density usually spells poor conductivity however the remarkably high mobility of the itinerant carriers in the nanotube atomic lattice makes for a good electrical conductivity, despite the low carrier density. One further feature contributes to the high transparency. Optical absorption is suppressed in the nanotubes for components of the incident radiation polarized perpendicular to the nanotube axis. This was first inferred several years ago by the UF researchers from polarized Raman spectroscopic data on fibers of aligned nanotubes[4] and subsequently confirmed by reflectance measurements on such fibers.[5]

High magnetic fields will soon be of relevance in this research. In 2001 Rick Smalley's group from Rice University used the high field facilities of the NHMFL to produce optically dense films of aligned nanotubes. This magnetic field induced alignment is consistent with the present method for forming the transparent films. Aligned, transparent nanotube films will be useful both for further scientific exploration of the one-dimensional character of the nanotubes themselves and for exploration of the technical limits of the film transparency to polarized light.



Transparent nanotube films (text lies behind the films) and their microstructure (AFM image, right)

1 Z. Chen, X. Du, M-H. Du, C. D. Rancken, H-P. Cheng, A. G. Rinzler, Nano Letters **3** 1245 (2003)

2 K. Lee, Z. Wu, Z. Chen, F. Ren, S. J. Pearton, A. G. Rinzler, Nano Lett. **4**, 911 (2004)

3 Z. Wu, Z. Chen, X. Du, J. M. Logan, J. Sippel, M. Nikolou, K. Kamaras, J. R. Reynolds, D. B. Tanner, A. F. Hebard, A. G. Rinzler, Science **305**, 1273 (2004)

4 H. H. Gommans, J. W. Alldredge, H. Tashiro, J. Park, J. Magnuson and A. G. Rinzler, J. Appl. Phys. **88**, 2509 (2000)

5 J. Hwang, H. H. Gommans, A. Ugawa, H. Tashiro R. Haggenmueller, K. I. Winey, J. E. Fischer, D. B. Tanner, and A. G. Rinzler, Phys. Rev. B **62**, R13310 (2000)

6 D. A. Walters, M. J. Casavant, X. C. Qin, C. B. Huffman, P. J. Boul, L. M. Ericson, E. H. Haroz, M. J. O'Connell, K. Smith, D. T. Colbert and R. E. Smalley. Chemical Physics Letters, **338**, 14-20 (2001)

The Society of Physics Students

Year in Review

- Catherine Yeh, SPS Vice President

The past 2003-2004 year was a productive one for the Society of Physics Students. Prof. Yoonseok Lee proved to be an involved, enthusiastic sponsor. Under his guidance and the leadership of SPS president Colin Shepherd, '04 graduate now headed for UC Santa Barbara, SPS initiated new activities and strengthened the club treasury.

The well-attended Research Opportunities for Undergraduates series of physics faculty lectures, dubbed "ROFU" by Prof. Lee, was instituted. UF physics professors from a variety of fields donated their evenings to present their research to an attentive audience of undergraduate physics majors. In addition to lectures, SPS scheduled occasional lab tours. Students gawked at complex apparatuses as professors blissfully described why they wish to levitate plants and smash particles. The growing number of undergraduate researchers is due partly to ROFU, which encouraged students to take advantage of the many research opportunities in the physics department.

SPS also established UP (Undergraduate Physics), a monthly undergraduate physics newsletter run entirely by students. UP helped to publicize SPS activities and increase student awareness of events around the department. Subject matter ranged from student interviews to undergraduate advisor profiles to coverage of the SPS verses Chemistry Club Paintball fight (it ended in a draw). The newsletter is distributed to classrooms at the beginning of each month and published online at http://www.phys.ufl.edu/~upnews.

Activities like a month-long rocket building project with the Girls Club of Alachua County expanded community outreach. SPS members arrived each week at the Girls Club with armfuls of rocket parts, bracing themselves for the little girls awaiting them at the door whose limitless supply of energy seemingly defied the laws of physics. Transformed from students to teachers, the SPS members were amused to observe the girls' reactions to failures and triumphs during the construction process. Despite a few hitches along the way, everyone was able to complete construction and experience the satisfaction of seeing her rocket soar high into the sky on the day of the launch.

Other SPS successes included the first meeting of the Female Physics Forum, at which both undergraduate and graduate female physics students convened over cookies and punch to hear new faculty-member Prof. Laura Baudis discuss her experiences in a field dominated by men. Fundraising efforts through the sale of solution manuals, a generous donation by Prof. Gregory Stewart, and a Marsh White Award from the National SPS organization approving a proposal to enhance current "Physics is Fun" shows reinforced the treasury. The availability of funds paves the way for 2004-2005 SPS officers, who will have a firm footing with which to start the fall semester.

Professor Arthur Hebard discusses research in his lab

Jim Davis, Amruta Deshpande, Tim Jones, and Jacob Tosado are ready to paintball

Jacob Tosado sets up the launch pad at the Girls Club

UNDERGRADUATE AND GRADUATE HONORS AND AWARDS

Apker Award - Finalist

Taylor Hughes (Class of 2003 valedictorian and recipient of an NSF Graduate Research Fellowship) was selected as a finalist for the 2003 Apker Award of the APS. The purpose of the award is to recognize outstanding achievements in physics by undergraduate students. He was a participant in the 2002 Summer REU program, which resulted in a coauthored publication [see T. L. Hughes et al., Phys. Rev. Lett. 90, 196802 (2003)]. Jason Alicea (Class of '01) was the winner of the 2002 Apker Award, Chris Schaffer (Class of 1995) won the Apker Award in 1996 and Chris Harrison (Class of 1993) was a finalist in 1994; we clearly have an undergraduate majors program of which we can be proud.

Outstanding International Student Award

Aparna Baskaran, a third year graduate student working with Professor Jim Dufty, was one of the 10 CLAS students chose to be recognized with a 2004 Outstanding International Student Academic Award. The awards are designed to recognize undergraduate and graduate students who not only meet exemplary academic achievement but also a wide range of accomplishments and contributions, including exceptional scholarly research, active participation in the department, and service to the university community.

Aparna has also received a $1000 travel grant from the National Science Foundation (NSF) for her presentation at the IUPAP Statistical Physics meeting in Bangalore, India this summer. She is one of 15 students to win this award.

Society of Physics Students Leadership Scholarship

Colin Shepherd has been named as one of the top three SPS Leadership Scholarship Awardees from the American Institute of Physics. Colin was senior Physics undergraduate student and has been the President of the UF Chapter of SPS from 2003-2004. Colin plans to continue on with his graduate work at the University of California at Santa Barbara.

National Awards garnered by the University of Florida Chapter of the Society of Physics Students:

Marsh W. White Award
(2003-2004)
Outstanding Chapter
(2002-2003 & 2001-2002)
SPS Leadership Scholarship
(Colin Shepherd top three finalist, 2003-2004)

2004-2005 National Science Foundation (NSF) Graduate Fellowships

Three students affiliated with the Department of Physics have recently been awarded with an NSF Graduate Fellowship and one graduate student has been given an honorary mention. "NSF Graduate Fellowships offer recognition and three years of support for advanced study to approximately 900 outstanding graduate students in the mathematical, physical, biological, engineering, and behavioral and social sciences, including the history of science and the philosophy of science, and to research-based PhD degrees in science education."

AWARDEES

Robert Abel received his bachelor's degree in Chemistry from UF and plans to use his fellowship at one of the schools that has accepted him. (Scripps, UCSD, Columbia or Minnesota)

Ryan Chancey received his bachelor's degree in Civil Engineering from UF and is currently attending graduate school at UF. He will be using his fellowship at Odense in Denmark.

Desika Narayanan received his bachelor's degree in Astronomy and Physics and is currently attending graduate school at the University of Arizona, Department of Astronomy.

Christopher McKenney received his bachelor's degree in Physics and Electrical Engineering and is currently attending graduate school at the University of California at Santa Barbara. *(Honorable Mention)*

American Physical Society Chemical Physics Travel Award

Brian Thorndyke received a "Graduate Travel Award" from the Division of Chemical Physics of the American Physical Society. Brian is a graduate research assistant working with Prof. David Micha of the Quantum Theory Project (QTP). Brian used his award to attend the 2004 March APS meeting in Montreal, Canada.

Aditi Mallik also received a "Graduate Travel Award" from the Division of Chemical Physics of the American Physical Society. Aditi is a graduate research assistant working with Prof. James Dufty. She presented a talk at the 2004 March APS meeting in Montreal, Canada.

DEPARTMENT OF PHYSICS ANNUAL AWARDS FOR 2003

At the 2003 Holiday Celebration on December 11, the Physics Department awarded the yearly honors to those individuals who have demonstrated and achieved excellence throughout 2003.

TEACHER OF THE YEAR

Professor Kevin Ingersent was awarded the Teacher of the Year. This award is voted on by the students and faculty. He was recognized for his outstanding teaching in the graduate core courses.

TOM SCOTT MEMORIAL AWARD

Dmitri Tsybychev is the awardee for The Tom Scott Memorial Award which is made annually to a senior graduate student in experimental physics who has shown distinction in research. The award honors the memory of Professor Tom Scott who made significant contributions to the Department both as a Chair and as a noted researcher. The award carries a cash prize of $400.

CHARLES F. HOOPER JR. MEMORIAL AWARD

Marc Soussa is the winner for The Charles F. Hooper Jr. Memorial Award which is made annually to senior graduate students in physics who have shown distinction in research and teaching. The Award honors the memory of Professor Charles (Chuck) Hooper who made seminal contributions to the Department as a Chair, as a distinguished researcher, and as a beloved mentor/teacher.

CLAS DISSERTATION AWARD

Each year the College of Liberal Arts & Sciences awards graduate students with the CLAS Dissertation Award. Two of these were awarded to **Luis Breva-Newell** and **Sersita Suzette Pabit**.

PHYSICS TEACHING ASSISTANT OF THE YEAR

The Physics department awards two graduate students, annually, with the Physics Teaching Assistant of the Year for Laboratory Sessions & Discussion Sessions.

Gregory Martin won for the Discussion Sessions & **Kyoungchul Kong** won for the Laboratory Sessions.

EMPLOYEE EXCELLENCE AWARD

This year, two Excellence awards were given, one honoring the secretarial staff, and the other for the engineering and technical staff.

Cindy Bright, Accountant, was the winner for the secretarial staff and **John Graham**, Sr. Engineer Tech, of Cryogenics Services was the winner for the engineering & technical staff.

Superior Accomplishment Award *Division Three*

One of the five (5) Division Three Superior Accomplishment Awards for 2003-2004 has been awarded to Yvonne Dixon. She is the Office Manager for the High Energy Theory Group. These awards serve to recognize individuals for meritorious service beyond their normally assigned duties.

Promotions

Effective August 16, 2004, President Machen has approved the following faculty promotions.

Faculty Name	New Promotion Title
Guenakh Mitselmakher	Distinguished Professor
Kevin Ingersent	Professor
Bernard Whiting	Professor
Stephen Hagen	Associate Professor with Tenure
Stephen Hill	Associate Professor with Tenure

Masters and PhD Theses Listing for 1990 - Spring 2004

1990

James K. Blackburn (Detweiler)
PhD: "The spiralling binary system of black holes"

Phillipe B. Chilson (Adams)
MS: "The use of fiber optics in an ultra-low temperature heater"

Meifang Chu (Thorn)
PhD: "Operator methods in the superstring theory"

Christian A. Hagmann (Sullivan)
PhD: "A search for cosmic axions"

Curtis R. Harkless (Nagler)
PhD: "An X-ray scattering study of ordering in block copolymers"

Erika G. Kisvarsanyi (Sullivan)
MS: "Quantum tunneling of isotopic impurities in solid H"

Thomas McCarty (Ramond)
PhD: "A collection of theoretical problems in high energy physics"

Howard C. Royce (Ihas)
MS: "Vibrational and structural analysis of a system for improved cryostat support and operation"

Robert F. Shannon (Nagler)
PhD: "A time-resolved x-ray scattering study of the ordering kinetics in Cu3Au"

Yuanshan Sun (Wolfle)
PhD: "Matrix method of solution for coupled Boltzmann equations and its applications to superfluid 3He and semiconductors"

Hyung-Suk Woo (Tanner)
PhD: "Optical properties of segmented and oriented polyacetylene"

Dawei Zhou (Sullivan)
PhD: "Quantum tunneling in solid hydrogen"

1991

Eric Q. Feng (Micha)
PhD: "A time-dependent molecular orbital approach to ion-solid surface collisions"

David P. Kilcrease (Hooper)
PhD: "Higher order microfield effects on spectral line broadening in dense plasmas"

Gary Kleppe (Ramond)
PhD: "Reparametrization invariant operators in string field theory"

Markus Rall (Sullivan)
PhD: "NMR studies of molecular hydrogen confined to the pores of zeolite"

Laddawan Ruamsuwan (Fry)
PhD: "Analytical and numerical investigation of nonlinear gravitational clustering"

1992

Keith D. Bartholomew (Brown)
MS: "Low and high frequency elastic measurements of quasi-one-dimensional conductors"

Agustin C. Diz (Ohrn)
PhD: "Electron-nuclear dynamics: a theoretical treatment using coherent states and the time-dependent variational principle"

Feng Gao (Tanner)
PhD: "Temperature dependence of infrared and optical properties of high temperature superconductors"

Jung Soo Kim (Stewart)
PhD: "Doping experiments in heavy fermion superconductors"

Linda K. Lars (Van Rinsvelt)
MS: "Depth profile of trace elements in Fish Lake of Indiana sediments by particle induced X-ray emission"

Dorte Sasse (Tanner)
MS: "Structural studies of Langmuir-Blodgett films via FT-IR spectroscopy"

Brian D. Watson (Ramond)
PhD: "Renormalization group analysis of the standard model and its minimal supersymmetric extension"

1993

Hauku Arason (Ramond)
PhD: "Renormalization group analysis of the standard model, the minimal supersymmetric extension of the standard model, and the effective action"

Steven L. Carbon (Thorn)
PhD: "Sister trajectories in string theory"

Diego J. Castano (Ramond)
PhD: "Renormalization group study of the minimal supersymmetric extension of the standard model with broken supersymmetry"

Monique R. Chacon (Zerner)
PhD: "The reduced-expended space method applied to electronic spectroscopy"

Bettina E. Keszthelyi (Ramond)
PhD: "Gravitational models in 2+1 dimensions with topological terms and thermo-field dynamics of black holes"

Eric J. Piard (Ramond)
PhD: "Minimal supersymmetry extension of the standard model of elementary particles: a renormalization group approach"

Keith Runge (Micha)
PhD: "A time-dependent many-electron approach to atomic and molecular interactions"

Junqing Zhang (Nagler)
PhD: "High resolution x-ray scattering study of the charge density waves in quasi-one-dimensional K0.3Mo03"

1994

Dario Beksic (Micha)
PhD: "Electronically diabatic photodesorption of molecules adsorbed on metal surfaces"

William W. Brey (Andrew)
PhD: "Novel techniques for pulsed gradient NMR measurements"

James C. Clark (Ihas)
MS: "Conduction and localization in polyaniline and polypyrrole"

George R. Duensing (Andrew)
PhD: "Signal-to-noise ratio improvement in NMR via receiver hardware optimization"

Morgan D. Evans (Sullivan)
PhD: "Orientational and translational properties of hydrogen films adsorbed onto boron nitride"

Mark D. Frederickson (Stanton)
MS: "Computer visualization of solid-state phenomena"

Mark W. Grant (Seiberling)
PhD: "Heteroepitaxial dimer structures on the silicon (100) surface"

James A.S. Lee (Klauder)
PhD: "The complex Langevin equation"

Wenhai Ni (Adams)
PhD: "Melting pressure thermometry and magnetically ordered solid 3He"

Manuel A. Quijada (Tanner)
PhD: "Anisotropy in the infrared, optical and transport properties of high temperature superconductors"

Jose A. Rubio (Woodard)
PhD: "Reduced Hamiltonians"

Ramchander R. Sastry (Klauder)
MS: "A study of discontinuous perturbations"

Qingbiao Shi (Cumming)
PhD: "The kinetics of surface-mediated phase separation in the quasi-binary mixture of guaiacol-glycerol-water"

Phillipe J.-C. Signore (Meisel)
PhD: "Inductive measurements of heavy Fermion superconductors"

David R. Stark (Tanner)
MS: "Fluctuation effects in the optical conductivity of thin film BiSrCaCuO"

Chengjun Zhu (Klauder)
PhD: "Singular dynamics in quantum mechanics and quantum field theory"

1995

Lech S. Borkowski (Hirschfeld)
PhD: "Impurities in unconventional superconductors"

Chad L. Davies (Hunter)
PhD: "Numerical modeling of large N galactic disk systems"

Anuradha Durbha (Sullivan)
MS: "Study of ohmic contacts on gallium nitride thin films"

Jaewan Kim (Sikivie)
PhD: "Small scale structure on relativistic strings"

Weonwoo Kim (Stewart)
PhD: "Doping experiments on magnetic heavy fermion superconductors"

Satoru Miyamoto (Takano)
PhD: "Torsion pendulum studies of 4He in nanopores"

Jorge L. Rodriguez (Avery)
PhD: "Exclusive two body decays of the bottom meson"

Wolfgang Tome (Klauder)
PhD: "Quantization and representation independent propagators"

Gajendra Tulsian (Klauder)
PhD: "Bicoherent states, path integrals, and systems with constraints"

David E. Willmes (Kandrup)
PhD: "The effect of noise in chaotic galactic potentials"

Young-Duck Yoon (Tanner)
PhD: "Optical properties of doped cuprates and related materials"

1996

Ejaz Ahmad (Ipser)
PhD: "The spacetime manifold of a rotating star"

Mark A. Boshart (Seiberling)
PhD: "A channeled ion energy loss study of the surfactant-mediated growth of Ge on Si(100)"

Matthias H. Hettler (Hirschfeld)
PhD: "Impurities in metals and superconductors"

Kiho Kim (Sullivan)
PhD: "NMR studies of orientational behavior of quantum solid hydrogen films adsorbed on boron nitride"

Tien Vu Lang (Adams)
PhD: "Direct nuclear demagnetization of high density body-centered-cubic (BCC) and hexagonal-close-packed (HCP) solid 3He"

Mirim Lee (Dufty)
PhD: "Uniform shear flow far from equilibrium"

Samuel Mikaelian (Thorn)
PhD: "Phenomenological aspects of the standard model: high energy QCD, renormalization, and a supersymmetric extension"

Ma'an N. Raja Al-Ani (Dunnam)
MS: "Effect of nicotinoid compound saturated ring size upon interaction with nicotinic receptors"

1997

Carsten Blecken (Muttalib)
PhD: "Disordered conductors in a random matrix formulation and the connection to complex systems"

Edgar B. Genio (Sullivan)
PhD: "Low-temperature nuclear quadrupole resonance studies of antimony and application of thermometry"

Kaundinya S. Gopinath (Kennedy)
MS: "Relavistic charged particle in dipole-sphere configuration"

Donald A. Haynes (Hooper)
PhD: "Analysis of hot dense plasmas and consideration of Stark broadening theory applied to transitions involving continuum radiator wave functions"

Michael A. Jones (Fry)
PhD: "Large-scale structure of the universe: simulations and statistics"

Namkyoung Lee (Obukhov)
PhD: "Conformational properties of polymers"

Hsiang-Lin Liu (Tanner)
PhD: "Effects of high magnetic field and substitutional doping on optical properties of cuprate superconductors"

Jianzhong Li (Stanton)
PhD: "Electronic, optical, and transport properties of widegap II-VI semiconductors"

Paul L. Moyland (Takano)
PhD: "Nuclear magnetism and negative temperatures in silver"

Wenhua X. Ni (Mareci)
PhD: "Design of novel RF coils for signal-to-noise ratio improvement in NMR"

Nacira Tache (Tanner)
PhD: "Infrared and optical studies of rare earth substitution in high temperature superconductors"

M. Reza Tayebnejad (Field)
PhD: "Applications of neural networks in high energy physics"

1998

Allison A. Bailes, III (Seiberling)
PhD: "Flat or lumpy: surface structure and growth modes in silicon-germanium epitaxy"

Garrett E. Granroth (Meisel)
PhD: "Experimental studies of integer spin antiferromagnetic chains"

Andrew W. Garrett (Nagler)
PhD: "Low dimensional magnetic exchange in vanadyl pyrosphosphate and vanadyl hydrogen phosphate hemihydrate"

Youli A. Kanev (Field)
PhD: "Application of neural networks and genetic algorithms in high energy physics"

Andrew E. Rubin (Klauder)
PhD: "The comparative roles of connected and disconnected trajectories in the evaluation of the semiclassical coherent-state propagator"

Timothy J. Schultz (Sharifi)
MS: Electron beam lithography methods for fabrication of magnetic nanostructures"

Stephen G. Thomas (Stewart)
PhD: "An investigation of some unusual single crystals of the heavy fermion superconductor UBE 13"

Zhigang Yi (Micha)
PhD: "Computational aspects of the quantum molecular dynamics of adsorbates"

1999

Elizabeth L. Bossart (Mareci)
PhD: "Magnetic resonance imaging and spectroscopy for the study of translation diffusion: applications to nervous tissue"

Nikolaos Irges (Ramond)
PhD: "Anomalous U(1) gauge symmetry in superstring inspired low energy effective theories"

Joseph D. LaVeigne (Tanner)
PhD: "Time resolved infrared spectroscopy at the NSLS U12IR beamline"

Kingshuk Majumdar (Hershfield)
PhD: "Study of transport properties in magnetic nanostructures"

Sean Moore (Graybeal)
PhD: "Optical properties of lamellar copper oxides with in-plane magnetic and charged impurities"

Subrahmanyam Pilla (Sullivan)
PhD: "Electric-field induced glass phase in molecular solids at low temperatures"

Thomas A. Waddington (Monkhorst)
MS: "A feasibility study on the nuclear spin polarization of 11B for the colliding beam fusion reactor(CBFR)"

Lei Yang (Andrew)
PhD: "Diffusion tensor imaging and the measurement of diffusion tensors in biological systems"

Jiu Zheng (Yelton)
PhD: "Studies of charmed baryons decaying in lambda_c (n pi)"

2000

Anatoly Efimov (Reitze)
PhD: "Adaptive control of lasers and their interactions with matter using femtosecond pulse shaping"

Heather D. Hudspeth (Sharifi)
PhD: "Electron tunneling measurements on ferromagnetically doped lanthanum manganite films"

Kirk Hunter (Reitze)
MS: "The physical basis for optical functional imaging: detecting intrinsic optical signals in vivo using optical coherent tomography"

Gwyneth C.A. Junkel-Vives (Hooper)
PhD: "Second-order, full Coloumb electron broadening calculations for multi-electron radiators in hot, dense plasmas: a focus on dense plasma line shifts"

Naoki Matsunaga (Adams)
PhD: "Magnetic susceptibility and pressure measurements in helium-three nano-clusters"

Eric O'Neill (Kandrup)
PhD: "Hamiltonian structure and stability of relativistic gravitational theories"

Bruce C. Paul (Ingersent)
PhD: "A study of a three-impurity kondo model"

Teparksorn Pengpan (Ramond)
PhD: "Equal rank embedding and its related construction to superconformal field theories"

Artan Qerushi (Monkhorst)
PhD: "Particles and energy transport in a field reversed configuration"

Antonio I. Rubiera (Yelton)
PhD: "Exclusive measurements in B --> D* N N X"

Brian C. Watson (Meisel)
PhD: "Quantum transitions in antiferromagnets and liquid helium-3"

2001

Anatol Blass (Ohrn)
PhD: "Quasiclassical and semiclassical methods in molecular scattering dynamics"

Vladimir Boychev (Tanner)
PhD: "Far-infrared studies of superconducting thin films and Fabry-Perot resonators made of such films"

Tat-Sang Choy (Hershfield)
PhD: "Electron transport theory in magnetic nanostructures"

Thomas Delker (Reitze)
PhD: "Demonstration of a prototype dual-recycled cavity-enhanced Michelson interferometer for gravitational wave detection"

Stephanie A. Getty (Hebard)
PhD: "Electron transport studies of the ferromagnetic semiconductor calcium hexaboride"

Mark A. Gunderson (Hooper)
PhD: "Strong collisions in the electron broadening of spectral lines from charged radiators in hot, dense plasmas"

Richard M. Haas (Field)
PhD: "The underlying event in hard scattering collisions of proton and antiproton at 1.8 TEV"

Quentin M. Hudspeth (Hebard)
PhD: "Characterization of two-carbon-sixty systems: electron-doped carbon-sixty monolayers on thin-film metal underlayers, and composite films of carbon-sixty and nickel."

Jungseek Hwang (Tanner)
PhD: "Electrochemical spectroscopy of conjugated polymers"

Kevin J. Kless (Adams)
MS: "Magnetic susceptibility and melting in helium-three nanoclusters"

Mark D. Moores (Reitze)
PhD: "Adaptive control of the propagation of ultrafast light through random and nonlinear media"

Steven E. Patamia (Kumar)
PhD: "Spectrum and properties of mesoscopic surface-coupled phonons in rectangular wires"

Richard Pietri (Andraka)
PhD: "Magnetism and the Kondo effect in cerium heavy-fermion compounds cerium-aluminum-3 and cerium-lead-3"

Ilya V. Pogorelov (Kandrup)
PhD: "Phase space transport and the continuum limit in nonlinear Hamiltonian systems"

Craig P. Prescott (Yelton)
PhD: "Search for mixing in the neutral D meson system with decays into CP even eigenstates"

Alexei N. Safonov (Korytov)
PhD: "Jet fragmentation and predictions of the resummed perturbative QCD"

2002

Rupal S. Amin (Tanner)
MS: "A technique for passively compensating thermally induced modal distortions in faraday isolators for gravitational wave detector input optics"

Brian D. Baker (Detweiler)
PhD: "Variational principles in general relativity"

Kevin T. McCarthy (Hebard)
PhD: "Magnetocapacitance: a probe of spin dependent potentials"

Nikoleta Theodoropoulou (Hebard)
PhD: "Experimental studies of spin dependent phenomena in Giant Magnetoresistance (GMR) and Dilute Magnetic Semiconductor (DMS) systems"

Xiaozhen Xiong (Ramond)
PhD: "Noncommutative scalar field theories, solitons and superalgebra"

2003

Zhihong Chen (Rinzler)
PhD: "Electron field induced transparency modulation in single wall carbon nanotube ultra-thin films and a method to separate metallic and semi-conducting nanotubes"

Mao-Hua Du (Cheng)
PhD: "Theoretical modeling and design of complex materials"

Alexios Klironomos (Dorsey)
PhD: "Structural transitions of the vortex lattice in anisotropic superconductors and fingering instability of electron droplets in an inhomogenous magnetic field"

Frank C. McDonald, Jr (Takano)
MS: "Specific heat measurements of copper benzoate"

Eirini Messaritaki (Detweiler)
PhD: "Radiation reaction on moving particles in general relativity"

Vakif K. Onemli (Sikivie)
PhD: "Gravitational lensing by dark matter caustics"

Linlin Qiu (Hagen)
PhD: "Laser induced temperature jump investigations of fast protein folding dynamics"

2004

Thomas Henderson (Bartlett)
PhD: "Short-range correlation in molecular physics: The basis set problem and the correlation hole"

Rongliang Liu (Stanton)
PhD: "Theoretical studies of coherent optic and acoustic phonons in GaN/InGaN heterostructures"

Corneliu Manescu (Krause)
PhD: "Controlling and probing atoms and molecules with ultrafast laser pulses"

Suzette A. Pabit (Hagen)
PhD: "Fast dynamics in protein folding: Time-resolved fluorescence and absorbance studies of polypeptide reconfigurations"

Bryan Thorndyke (Micha)
PhD: "Quantum dynamics of finite atomic and molecular systems through density matrix methods"

Dmitri Tsybychev (Acosta)
PhD: "Search for first-generation leptoquarks in the jets and missing transverse energy topology in proton-antiproton collisions at center-of-mass energy 1.96 TeV"

Linlin Wang (Cheng)
PhD: "Density functional study of adsorption of fullerenes on metal (111) surfaces"

Jeffrey M. Wrighton (Hooper/Dufty)
PhD: "Correlation and collective effects in dense plasma spectroscopy"

ALUMNI NEWS & UPDATES

Alumnus Pledge

Alumnus Dr. J. Michael Harris (Class of '82) has generously pledged $12,000 in support of graduate education in theoretical physics. Mike, a Sarasota internist in private practice, has a deep interest in particle physics and cosmology.

In August 2004 he attended a three day conference entitled "Einstein: A Celebration", at the Aspen Institute. The speaker list for the conference was diverse, from Nobel Laureate Murray Gell-Mann to novelist E. L. Doctor to our own Professor Pierre Ramond who was an invited panelist.

Mike reports that "my visit to Aspen has reassured me that an underlying non-random theory is possible (not everyone believes this, it seems). I am just glad to be a part of a group who is willing to pursue the answers. That is the purpose of my investment."

Physics Graduate Elected To Distinguished Academy

Photo courtesy of Prof. Daw

Professor Murray S. Daw received his Bachelors of Science degree in physics from the University of Florida in 1976 and his PhD from the California Institute of Technology in 1981. He is currently the R.A. Bowen Professor of Physics at Clemson University where he has been since 1994.

Professor Daw has recently been elected to the American Academy of National Arts and Sciences. Daw shares this distinction with some of the world's most influential minds, including Benjamin Franklin, Albert Einstein and Winston Churchill.

Founded in 1780, the academy brings together scholars and leaders in every field of arts and sciences. The goal is to stimulate progress in international security, social policy, education and the humanities. Professor Daw joins 150 Nobel laureates and 50 pulitzer prize winners who are among the 4500 academy members.

Professor Daw uses theoretical physics to understand what makes metals strong to help make them stronger. His work, funded by NASA the Department of Energy and the National Science Foundation, could lead to new metal alloys capable of enduring extreme stress and temperatures. Applications of his work include components of power-generating turbines and future generations of space vehicles.

- adapted with permission from Emily Keller, Clemson University News Service [http://clemsonews.clemson.edu]

What are they doing now?

This is a sample of some of our current entries on the UF Physics Alumni online survey!

1984

Penny Haskins - *PhD*
haskins@radiationtechnologies.com
President, Radiation Technologies, Inc.
Associate Director, Florida Space Grant Consortium

1985

Simon Phillpot - *PhD*
phillpot@mse.ufl.edu
Professor of Materials Science and Engineering, Univ. of Florida

ALUMNI SURVEY
What are you doing?

Keep in touch with Physics. Visit our online survey and we'll post your message on the web and in the next issue of the Florida Physics News. Send a note and/or pictures to:

Florida Physics News
Department of Physics
University of Florida
P.O. Box 118440
Gainesville, FL 32611

Email: physicsnews@phys.ufl.edu
Alumni Survey:
http://www.phys.ufl.edu/alumni/

1991

Elaine Hunter - *BS*
elaine.hunter10@verizon.net
Field Safety Specialist with Fred Meyer Stores

1992

Leon W Couch III - *BS*
musicman14@bigfoot.com
Assistant Professor of Music, Texas A&M University
Recently earned his Doctorate of Musical Arts (DMA) and PhD from the Conservatory of Music in Cincinnati.

1993

Dohn A. Arms - *BS*
dohnarms@anl.gov
Assistant Physicist, Adv. Photon Source at Argonne National Laboratory
"I had a great time working with Liz Seiberling and Yasu Takano as an undergraduate."

1995

Jorge Rodriguez - *PhD*
jorge@phys.ufl.edu
Assistant Scientist with GriPhyN, Physics, Univ. of Florida

1997

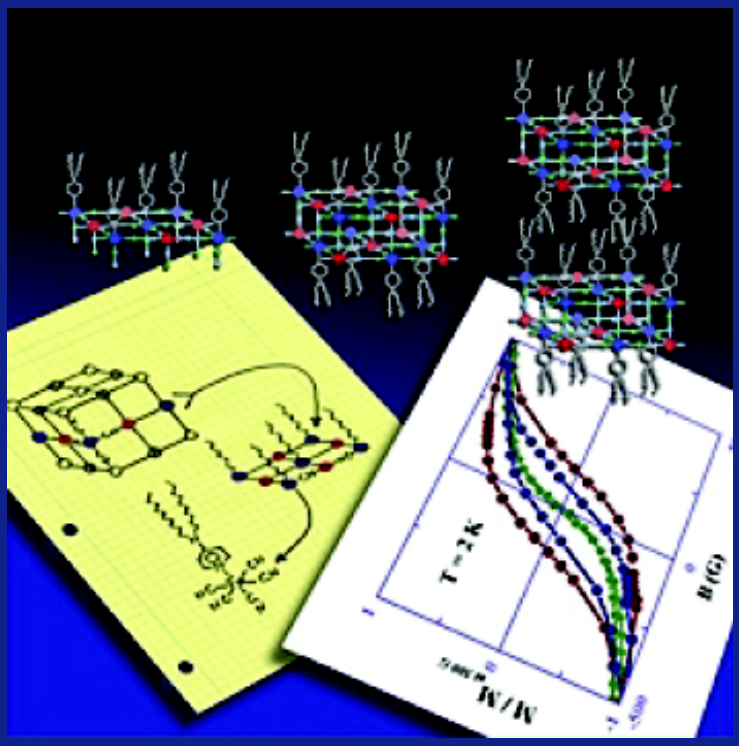
Benjamin Stillwell - *BS*
benstillwell@hotmail.com
Technician at the Advanced Photon Source/ Argonne National Lab and a graduate student at Northern Illinois University
"Thank you Dr. Adams and Dr. Ihas for being such great mentors."

1998

Chris Wickersham - *BS*
will592@yahoo.com
Software Engineer, CopperKey Technologies

2001

Jungseek Hwang - *PhD*
hwangjs@univmail.mcmaster.ca
Research Associate, Department of Physics and Astronomy, McMaster University



"Reproduced with permission from Inorg. Chem. ***2003***, 42(9) *cover art - Copyright 2003 American Chemical Society."*

The research work entitled, "Monolayer, Bilayer, Multilayers: Evolving Magnetic Behavior in Langmuir-Blodgett Films Containing a Two-Dimensional Iron-Nickel Cyanide Square Grid Network" was published in the May 5, 2003 *Inorganic Chemistry Journal* of the American Chemical Society and also became the basis for the cover art which appeared on the May 2003 cover. A collaborative effort between the Department of Chemistry, Physics and the Center for Condensed Matter Sciences, the research was funded by the National Science Foundation and by the American Chemical Society.

Earlier this year, the authors were notified that this artwork and research is featured on the *Inorganic Chemistry Journal's* 2004 Calendar for the month of September.

The authors of this work are Jeffrey Culp, a chemistry graduate student and Dr. Daniel Talham of the Department of Chemistry, and Ju-Hyun Park, a physics graduate student, and Dr. Mark Meisel of the Department of Physics and the Center for Condensed Matter Sciences. Isa Benitez a graduate student in the Department of Chemistry was also a contributor to the cover artwork.

Reference: "Monolayer, Bilayer, Multilayers: Evolving Magnetic Behavior in Langmuir-Blodgett Films Containing a Two-Dimensional Iron-Nickel Cyanide Square Grid Network" Jeffrey T. Culp, Ju-Hyun Park, Mark W. Meisel, and Daniel R. Talham. Inorg. Chem.; ***2003;*** *42(9) pp 2842 - 2848;* ***(Article)*** *DOI: 10.1021/ic026158x*

UNIVERSITY OF FLORIDA
COLLEGE OF LIBERAL ARTS & SCIENCES
DEPARTMENT OF PHYSICS
PO BOX 118440
GAINESVILLE, FL 32611-8440

NONPROFIT ORG
U.S. POSTAGE PAID
GAINESVILLE, FL
PERMIT NO. 94