

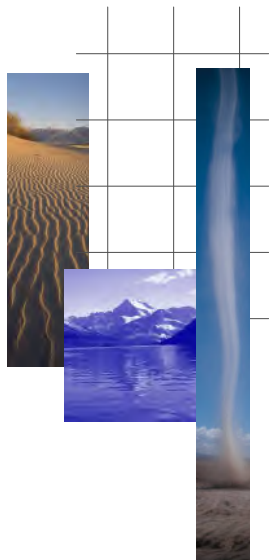
Schrödinger's Tiger

The Clemson University Physics and Astronomy Newsletter



Fall 2006

Volume 1, Issue 1



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The 24th International Conference on Thermoelectrics!

The 24th International Conference on Thermoelectrics (ICT-2005) was hosted by Clemson University in the summer of 2005. The Madren Conference Center and Inn welcomed over 260 participants from 31 countries to Clemson, South Carolina on June 19th-23rd, 2005. The attendees reported that they had both a scientifically and socially enjoyable experience for the five-day event. The conference chairman was Clemson professor, **Dr. Terry Tritt**. It was kicked off with a golf tournament on Sunday morning, followed by a reception that evening. Highlights included a BBQ and bluegrass event on Tuesday evening and a gala banquet the following day. A group of exciting speakers from industry, Dupont Corporation, government funding agencies, the Department of Energy (DOE) and the Defense Applied Research Projects Agency (DARPA) provided thought-provoking discussion and ideas on alternative energy sources and how they can and do impact specific areas of our lives. Tours of Dr. Tritt's laboratories were conducted on Thursday after the conference ended. Events were held all week for companions of conference participants. A post-conference tour to Biltmore House in Asheville, North Carolina was conducted on Friday for attendees and guests who chose to participate. Previous ICT conferences had been held in Beijing, China; Adelaide, Australia; Cardiff, Wales, and most recently in 2006 in Vienna, Austria.

Several organizations were instrumental in supporting and sponsoring the conference. The majority of this support went to providing financial assistance for more than 20 students to attend this event. These organizations were the Office of Naval Research, the South Carolina State Experimental Program to Stimulate Competitive Research (EPSCOR), General Motors Research and Development, the International Thermoelectrics Society and the IEEE Press. The conference proceedings were published by the IEEE Press and CDs and books are available.

This meeting gave great exposure, both nationally and internationally, to Clemson University, the City of Clemson, the College of Engineering and Science, and the Department of Physics and Astronomy. In addition, it also provided exposure to Dr. Tritt's internationally recognized program in thermoelectric materials research, which has nine graduate students and three postdoctoral researchers collaborating with him.



From left to right: Prof. Kuomoto (Nagoya University) rear Bo Zhang (Dr. Tritt's student), Mat Varma (DOE Program Manager) and Milfred Dresselhaus (MIT Professor, National Academy of Sciences member, and Science Advisor to President Clinton)



Dr. Peter Barnes, Chairman,
Physics & Astronomy



A Message From the Department Chair

We hope you find the information in this newsletter informative and entertaining, while bringing you up-to-date on the exciting programs and initiatives in the Department of Physics and Astronomy at Clemson University. As we progress through the 2006-07 academic year, I am pleased to see new faces of undergraduates, graduate students and faculty. We also mourn the loss of one of our esteemed colleagues, Phil Burt. Our department enrolled 32 freshmen this fall, more than most other research physics departments in the country. Two are National Merit Scholars and several are National Merit Finalists. Our new Dean of the Graduate School, Bruce Rafert, who is also a faculty member in the department, has initiated new university-wide policies to improve graduate student support and fee reduction. This will permit recruiting the very best graduate students into our expanding research program that is attracting national attention in several areas. We have also hired several excellent new faculty members to whom you are introduced in this letter.

I am excited about our future, and I hope that we move forward in achieving not only our individual, but collective goals for the University.

Peter A. Barnes, Professor and Chair
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Creating a Legacy... Giving to Clemson Physics & Astronomy

You can create a lasting legacy through your donation to the Clemson University Physics and Astronomy Department Foundation. The state of South Carolina can guarantee only that Clemson provides a basic level of education. Endowments to Clemson assure the best faculty, the brightest students and the most creative research projects. Substantial endowment can transform a good university into a great one.

The support of loyal Clemson friends has been instrumental in building a record of excellence in education, research and public service. Clemson's share of state funds supports less than 38 percent of the University's operating budget each year. Through gifts to the Clemson University Physics and Astronomy Department Foundation, donors share in a proud tradition of commitment that helps the department achieve greater distinction year by year.

As a nonprofit organization, the Foundation is exempt from federal income tax under Section 501(c)(3) of the 1986 Internal Revenue Code as amended. The Foundation has been classified by the IRS as a public charity operated for the benefit of a state university as defined in the Internal Revenue Code of 1986 Section 170(b)(1)(A)(iv). Contributions to the University through the Foundation by individuals, corporations, organizations and other foundations qualify as tax deductions. The Internal Revenue Service identification number assigned to the Clemson University Foundation is 57-0426335.

In addition to gifts of cash and property, which offer immediate benefits to Clemson, deferred gifts can be given to the Foundation. Deferred gifts are an excellent way to experience today the personal satisfaction of making a significant gift to Clemson that will benefit the University in the future, typically at the donor's or beneficiary's death. This also can be an excellent method for estate planning, obtaining investment diversification, increasing income, and reducing state and federal income and estate taxes.

Please be sure that all donations to the Department are clearly indicated as intended for the Clemson University Physics and Astronomy Department Foundation Account.

The 5th Astronomy with Radioactivities Conference

A small group of astrophysicists gathered in the Clemson on March 20-22, 1996 to discuss our "Radioactive Galaxy". Nearly ten years later in September 2005 a much larger group of about 90 astrophysicists from 13 countries reconvened in Clemson. However, in 2005 the meeting became a conference series of enlarged focus on "Astronomy with Radioactivities".

Combining the latest astronomical observations with new theories and models of the formation of cosmic nuclei was the theme of the "5th Astronomy with Radioactivities Conference". The meeting was held at Clemson University's Madren Conference Center, with its excellent facilities and beautiful setting. In addition to discussing recent advances of this field and debating its future directions, we had the pleasure of celebrating the 70th birthday and retirement of Donald D. Clayton, one of meeting's founders and now a Clemson Professor Emeritus.

The organizers of the conference, **Drs. Dieter Hartmann, Roland Diehl, Nikos Prantzos, and Ernst Zinner** (see photo right), are grateful to the Curry Foundation, the Joint Institute for Nucleic Astrophysics of the National Science Foundation and Clemson's Department of Physics and Astronomy, for financial support, and to the staff of the Madren Center for its outstanding hospitality. They are especially grateful to Ms. Ann Vaughn for assistance with the logistics of the meeting.

Clemson REU Program -Research Experiences for Undergraduates

The Physics Department has run a successful research experience for undergraduates program sponsored by the National Science Foundation (NSF) for the past three years. The program involves bringing students from around the country to Clemson to engage in research projects and study one-on-one with faculty. This year we had eight students from around the country. The level of research performed by some of these undergraduates is outstanding. It is so good that their sponsoring professors include them on publications to be submitted to referee journals, and/or invite them to attend a professional conference. There are funds available within the REU program to cover the cost of student attendance to conferences. This allows the students to showcase their summer's work. The program has become enormously popular, and the list of students applying to the program has grown quite large.



Conference participants gather at the Madren Center for a group photo with the Clemson Tiger.



From left to right: Dr. Nikos Prantzos, Inst. of Astrophysics, Paris; Dr. Dieter Hartmann of Clemson; the Clemson Tiger; Dr. Roland Diehl of the Max Planck Institute, Garching, Germany; and Dr. Ernst Zinner of Washington University, St. Louis, MO.



Eric Watson, REU student of Dr. Brad Meyer, gives a presentation during his summer program.

Clemson Joins Historic Telescope Partnership

Clemson University has reached an agreement with the National Science Foundation-funded National Optical Astronomy Observatories (NOAO) providing guaranteed access to 33 nights of time per year on the Kitt Peak National Observatory (KPNO) 4-m Mayall telescope. The Mayall 4-m has been a groundbreaking workhorse of the U.S. national observatory system since the mid-1970's. The three-year agreement, signed in June, also allows Clemson astronomers to exchange half of their time for nights on nearly every other telescope in the U.S. national system, including the new giant twin Gemini 8-m telescopes in Hawai'i and Chile.

The agreement was made possible by an extremely generous \$100,000 grant from the Seneca-based Charles Curry Foundation. Even as we drive the future by building a knowledge-based economy in South Carolina, this agreement demonstrates Clemson's continuing commitment to truly world-class pure inquiry, undergraduate and graduate education and training, and faculty resources. It is also tremendously humbling and gratifying to have the continuing generous support of the Curry Foundation in making great things happen with Clemson astrophysics.

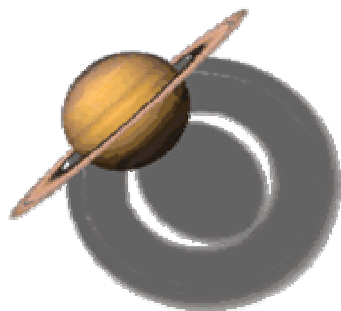
Access to NOAO telescopes will provide unprecedented opportunities for student participation in astrophysics research. "The Clemson-NOAO collaboration provides guaranteed access to a variety of telescopes in both the northern and southern hemispheres, with a suite of diverse instrumentation that is virtually unrivaled and unavailable to students at any other university in the world", says Dr. Jeremy King, Associate Professor of astrophysics. Clemson astronomers will use their new guaranteed telescope access to investigate the origin of hyper-energetic gamma-ray bursts, track the evolution of supernovae explosions, determine the composition of high red shift gas in the intergalactic medium, search for the formation of planets in circumstellar disks around other stars, and probe physics in the atmospheres and interiors of stars in the Milky Way.



An aerial view of the Kitt Peak National Observatory outside of Tucson, Arizona looking north. The KPNO 4-m Mayall is visible as the largest telescope.



The Gemini 8-m telescope on the 14,000 foot summit of Mauna Kea on the Big Island of Hawai'i.



Department of Energy Awards \$3 Million to Clemson

Clemson University, under the guidance of **Dr. Terry M. Tritt**, Professor in the Department of Physics and Astronomy, has received a major grant from the Department of Energy (DOE) to establish a Center of Excellence in Thermoelectric Materials Research.

The first phase of the grant (2004-2007) will total almost \$3M: \$1.32M from DOE and \$1.67M from the South Carolina EPSCoR/IDeA Program and Clemson University. The second phase of the grant (2007-2010) is expected to be of similar magnitude. The magnitude of the funds involved in this program will enable Clemson to build a nationally-recognized research center focused on the next generation thermoelectric (TE) materials for power conversion and/or refrigeration technologies.

Currently, Tritt is head of Clemson's Complex and Advanced Materials Laboratory (CAML), considered one of the premier laboratories for thermoelectric materials research in the world. He serves as a consultant to both international and national companies who have an interest in thermoelectric materials development. CAML is also a world-class center for the characterization of electrical and thermal transport (i.e. thermo-physical) properties of materials. This laboratory has been funded primarily by the Departments of Defense (DOD) and DOE. This grant will enable Clemson to enhance major infrastructure and faculty development in

TE power generation materials. With the new faculty hires and major equipment purchases, Tritt foresees Clemson's reputation in this field as being even more enhanced. Other faculty members that are involved in this project include **Dr. Joseph Kolis** (Chemistry), **Dr. Apparao Rao** (Physics & Astronomy), **Dr. Peter Barnes** (Chair, Physics & Astronomy) and **Dr. Murray Daw** (Physics and Astronomy). Dr. Daw will lead the computational and modeling efforts of new materials being investigated by the Clemson researchers.

The other faculty will be engaged in the synthesis and characterization of new and novel materials that show potential for use in a breadth of thermoelectric applications. Dr. Rao will lead the efforts in synthesis of nanoscale materials, as well as be responsible for spectroscopy characterization of the identified materials. Dr. Kolis will lead the synthesis and elemental characterization efforts of the bulk materials effort. Drs. Tritt and Kolis have worked together for over eight years, dating back to when Dr. Tritt first returned to Clemson in 1996. Theirs has been a real "team effort" that has focused on building this research effort step-by-step over that time period. They were just recently awarded a patent on new materials that they developed on a previous Department of Defense grant. Department of Energy funding will also allow interaction with Marlow Industries in Dallas, Texas, a major TE manufacturing company which sells devices based on these materials. Marlow Industries also houses an internal research and development department that will help develop TE devices that are made possible by the by the new materials being investigated by the Clemson researchers.

This grant will provide important government laboratory/university/industry interaction and collaboration, especially given the close geographic proximity of ORNL and the overlapping research interests of the groups involved.

This grant will support the hiring of new faculty, support two postdoctoral research associates, six graduate students and five undergraduates – all performing world class research at Clemson.



Dr. Terry Tritt

Clemson University Space Experiment Undergoes Final Testing

The Dosimetry Intercomparison and Miniaturization Experiment (DIME) has been designed and tested at Clemson in a collaborative effort of the departments of Physics and Astronomy and Electrical and Computer Engineering. It is scheduled to be delivered to NASA Goddard for final integration in October 2006. The purpose of the experiment is to compare six novel methods for characterizing the harsh radiation environments of space. The six techniques include two methods based on Clemson patents: the FGMOS transistor arrays for measuring total absorbed dose, the cumulative exposure that causes gradual degradation of circuits and radiation sickness in astronauts, and two versions of the LET Spectrometer that measure large energy-deposition events that are the cause of memory upsets, rocket misfires, and other isolated problems known to plague spacecraft. These patents are the result of research carried out in the Department of Physics and Astronomy by **Dr. Peter McNulty** and his students. One instrument, the Optically Simulated Luminescent (OSL) dosimeter, developed and built at the University of Montpellier in France, measures very small changes in the radiation environment. Six radiation dosimeters (RadFETs) are each under different layers of shielding to test radiation models used by NASA and ESA (European Space Agency) to estimate radiation exposure levels at different locations within a satellite. The University of Padova is collaborating with Clemson on using the FGMOS arrays to detect individual cosmic-ray particles as they penetrate the spacecraft. The six measurement systems on DIME served as the bases for M.S. theses for six Clemson ECE students, under the joint supervision of **Drs. Kelvin Poole and Peter McNulty**. Software for DIME was supervised by **Dr. Stan Birchfield** of ECE. Students had to build and test prototypes of the devices, write software to run them, and integrate them into one complete experiment. The final circuit boards were then built as prototypes and tested. Upon completion, the circuit layouts were sent to Space Micro Inc. for final fabrication for the spacecraft. Two copies of the DIME experiments are built, a flight version that goes straight to NASA and an engineering version that remains at Clemson for testing, calibration, and further experiments.

The DIME experiment was funded as part of NASA's "Living With a Star Program" and will fly on the first Space Environments Testbed Mission (SET-1) along with three others chosen by NASA. Launch is expected to be in 2010. Testing at different particle accelerator facilities and calibration of the instruments are currently being carried out by the Physics Department. A follow-up study funded by NASA is to develop one of these miniaturized dosimetry systems, the FGMOS array, into personnel monitors for NASA Astronauts on deep space missions. The FGMOS array approach is also being used to characterize micro-beams being developed at the French Synchrotron facility for cancer treatment at Grenoble France.



Fig. 1 Clemson team at NASA's interface tests for the DIME experiment with NASA. One of the DIME circuit board is seen at the lower left (green) attached to the NASA SET-1 simulator. Shown in the photo, from left to right, are Jason Reneau, Pete McNulty, and Kelvin Poole



Fig. 2 NASA's team from the Goddard SFC for DIME's interface tests.



Clemson Students Work at Elettra in Italy

In the summer of 2005, the chair of the department, Dr. **Peter Barnes**, initiated an international program of study in Italy. A trial run was begun with five Clemson physics majors that year, with a very successful outcome. This led to the adoption of the program for Clemson University credit. The program coincides with Clemson's Maymester term and is comprised of both a Surface Physics course for credit, followed by hands-on for-credit Surface Physics laboratory experience in Italy's synchrotron in Bosavizza, near Trieste. Ten students enrolled for the courses, and eight completed the rigorous four-week program. Professors **Murray Daw** and **Peter Barnes** taught the courses in May and June 2006. Three weeks were spent in Paderno del Grappe (just north of Venice) in the classroom, followed by the move to Bosavizza and the synchrotron.



Physics students and instructors pose on the campus at Paderno.



Matt Reaves (Univ. of Arkansas) and Tripp Collins (Clemson) prepare to insert a sample into the ultra-high vacuum chamber for analysis using XPS and LEED. This is one of the experimental stations at ELETTRA.



Clemson students unfurl the Clemson flag on a hilltop above beautiful Florence.

Students attended class four days per week and were encouraged to travel on the three-day weekends. Classes were conducted all day with frequent breaks and homework assignments. **Dr. Barnes** and **Dr. Daw** often accompanied the students to everyone's favorite coffee bar for further discussion and socializing. For readers with an interest in this course visit our web site at <http://hubcap.clemson.edu/~daw/>



Dr. Peter Barnes and Dr. Murray Daw enjoy a lively discussion with students at Elettra.

Larsen and Lehmacher Travel to Marshall Islands for Rocket Launches



Gerald Lehmacher (Clemson) and Erhan Kudeki (University of Illinois) in front of the ALTAIR radar during the EQUIS II Sounding Rocket Campaign.



Rockets on launchers on the Kwajalein atoll, in the Marshall Islands, during the EQUIS II Sounding Rocket Campaign.

In August 2004, **Dr. Miguel Larsen** and **Dr. Gerald Lehmacher** traveled to the island of Roi-Namur, Kwajalein Atoll, Marshall Islands (9 N, 168 E) to participate in two identical sounding rockets in the NASA EQUIS II Campaign. In total fourteen sounding rockets were launched during the campaign.

The rocket payloads were designed to study turbulence and plasma processes in the daytime equatorial mesosphere and lower thermosphere (70-120 km) and included instruments from Clemson, Penn State, Germany and Austria. Further radar and modeling support comes from scientists from Illinois and Boulder, Colorado.

The first rocket was launched on August 28, 2004. Unfortunately, the experiments delivered no data due to a failure in the experiment power bus. NASA decided to disassemble the second payload and to investigate the problem. Fortunately, at this time Dr. Lehmacher had just had found an unrelated problem in one of the experiments which had to be repaired. His stay had to be extended for three more weeks to monitor the experiments and supervise the actions taken to avoid another failure until the next launch opportunity.

The second rocket was launched on September 20, 2004. All experiments worked nominally and delivered good data. Detailed post-flight analysis will reveal the presence and strength of turbulence layers. Three small rockets with falling spheres were launched before and after the instrumented rocket to measure temperature and wind profiles. The ALTAIR radar on Roi-Namur supported Lehmacher's project with ionospheric measurements between 85 and 750 km.

In Memoriam

A Tribute to My Friend, Phil Burt

By *Will Graben, Physics Professor Emeritus*

I first met Phil when I entered the graduate program in physics at the University of Tennessee in Knoxville in the fall of 1957. For a while we shared an office in an old barracks building. I soon realized that Phil was the brightest and most eccentric person I had ever met. What a delightful genius to have as a friend!

Phil was a year ahead of me in the program. After he received his master's degree, I enjoyed calling him "Master Burt". His doctoral dissertation under his major professor Ed Harris contained a calculation in plasma physics which became known as the "Burt-Harris" instability. I told Phil it was a dubious, though suitable honor to have an instability named after him. Phil received his Ph. D. degree in 1961 and went off to the Jet Propulsion Laboratory in California. Meanwhile I continued my doctoral research in theoretical chemical physics under Dick Present. Phil left me a copy of his dissertation and inserted the comment "Exxon Hires chemist."

I came to Clemson University in the fall of 1963 after spending a year at the Oak Ridge National Laboratory. L. D. "Doc" Huff, who was head of the department, encouraged his young faculty to party often - and we did. At that time I was perhaps the only one who did not imbibe, but I could still be just as rowdy sober.

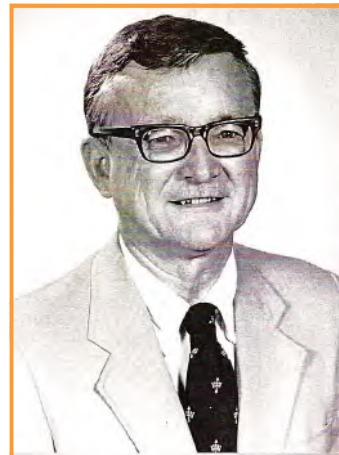
Phil wrote me to say he had had enough of California and would like to return to the southeast and join our faculty if there was a vacancy. I immediately engaged the taciturn Doc Huff with a monologue praising the abilities of Phil Burt. After my discourse wound down, Doc's only response was "Will, we do not want to hire any more teetotalers". After my jaw recovered, I left Doc's office, and Phil was hired.

Phil was not a good teacher in the classical sense of giving textbook style lectures. He had learned everything (and I do mean everything) on his own without the benefit of instruction. He thought others should do likewise. His graduate research students were introduced to nonlinear mathematical physics and then became mostly independent of Phil early on. He had good success with his graduate students.

Phil received the 1984 Sigma Xi Outstanding Research Scientist Award at Clemson. In 1992 he gave the commencement address, in German, at the Institute for Nuclear Theory, at the University of Hamburg. The Department of Physics and Astronomy of the University of Georgia honored him in 1994 with a Theoretical Symposium for his 60th birthday. This tribute is much too short to convey the true nature of my late friend - this man who flew his own airplane even though he was as myopic as Mr. MaGoo - this man who was sartorially challenged in the extreme. To glimpse into his profound intellect look at his 300 page research monograph titled "Quantum Mechanics and Nonlinear Waves." You won't understand much of it, but it will cure your insomnia. He gave me a copy of his book with the inscription: "Happy is the man with a friend."

Diane Hickey (1961-2006)

Clemson mourns the passing of Diane Hickey, wife of Dr. Michael Hickey, formerly of Clemson's Physics and Astronomy Department. Diane died Tuesday, Sept. 5, 2006, in Port Orange, Florida after a brief illness. Surviving are her husband, Michael; her son, Michael Hickey II, both of Port Orange; her daughter, Rachel; her parents, J.W. and Betty Clark; and her brother, Steven Clark, all of Guntersville, Ala. Dr. Hickey was previously a professor of atmospheric physics for several years at Clemson, before leaving to take a position at Embree Riddle University in Florida. Diane also worked for the Physics Department at Clemson as an Administrative Assistant.



Dr. Phil Burt

New Faces in Clemson's Physics Department.....

Assistant Professor Sean Brittain Expands Clemson's Astrophysics Group

The Department of Physics and Astronomy is pleased to welcome its newest faculty member in astrophysics, **Dr. Sean Brittain**. Sean arrived at Clemson in March 2006 from the National Science Foundation's National Optical Astronomy Observatory in Tucson, Arizona, where he held a prestigious Michelson Fellowship. His hire was the result of a national search conducted during the Spring of 2005.

"We received roughly 70 applications from several different countries as part of our astrophysics search," said Associate Professor Jeremy King. "While the vast majority of these were from outstanding astrophysicists, we were particularly excited by Sean's application because of the unique aspects of his research that both complement and broaden Clemson astrophysics, the fundamental nature and timeliness of his research program, his clear dedication to students and the educational responsibilities of a faculty member, and his demonstrable success and maturity as a young scientist. We are thrilled to have him join the Physics and Astronomy family."

Sean's research focuses on the use of high-resolution spectroscopy in the near-infrared to determine gaseous phase abundances in circumstellar disks, young stars, and the atmospheres of planets orbiting other stars. Sean uses these abundances to explore the formation and very early evolution of stars—including the formation and evolution of planetary disks and planets themselves. Sean has already initiated a vigorous program of research with Clemson Ph.D. students Brian Donehew and Matt Troutman, and looks forward to teaching the 2-semester introductory astrophysics sequence for undergraduates starting fall 2006.



Dr. Sean Brittain



Dr. Fivos Drymiotis

Fivos Drymiotis Joins Condensed Matter Group

The Department of Physics and Astronomy is also very pleased to welcome another new faculty member in Condensed Matter & Materials Physics, **Dr. Fivos Drymiotis**. Fivos arrived at Clemson in June of 2005 in time to attend the 24th International Conference on Thermoelectrics. Fivos was a Seaborg Postdoctoral Fellow at Los Alamos National Lab working with Albert Migliori before joining Clemson. Fivos is a Ph.D. graduate of Florida State University where he worked with Zachary Fisk, a world-renowned crystal growth and materials person.

His hire was the result of a national search conducted during the Winter of 2005. He was hired as part of the Department's DOE Implementation grant to promote capabilities and expertise in targeted areas. "We received over 50 applications and invited five excellent candidates to interview," said Professor Terry Tritt, who is the Principal Investigator on the DOE grant that enabled Clemson to hire Fivos. Tritt feels that Fivos is one of the most promising young materials people in the country and looks forward to working with him. "If you see someone riding around campus in a silver & purple helmet on a motorcycle with long flowing brown hair, you have spotted Fivos. We are thrilled to have him join the Physics and Astronomy family!" says Tritt. (Continued...)

Fivos Drymiotis Cont'd.....

Fivo's research focuses on the growth of high quality novel crystalline materials. He has set up a lab for extensive growth of new and novel materials. In addition, he is also setting up a resonant ultrasound (RUS) laboratory to investigate the mechanical properties of materials. This will enable him to investigate the elastic moduli of these materials as a function of temperature. This is especially important when studying structural phase transition. He has also worked on zero volume expansion materials, which has been a hot topic the last few years. He has taught the honors sections of Physics 122 and 221, and the students seem very pleased with the job that Fivos is doing in teaching. He has his synthesis lab essentially complete and is starting on the RUS lab and has recruited several undergraduate students. He is currently looking for Ph.D. students to work with him. Again, we are very excited to have Fivos and are very proud we can continue to attract such high quality faculty to Clemson.

Welcome to Assistant Professor Meredith Newby

Dr. Meredith Newby is another new and promising hire in the Physics Department. Before joining Clemson on July 1, 2006, Meredith held a prestigious National Institute of Health postdoctoral fellowship and worked closely under Professor Nils Walter at the University of Michigan, Ann Arbor. Meredith's appointment was a result of an extensive search conducted during later 2005 to spring 2006. Out of a pool of 55 candidates, Meredith was the overwhelming first choice by the departmental faculty.

Meredith was originally trained as a physicist and completed her transition from physics to molecular biophysics during her Ph.D. at Florida State University and her post-doctoral research at Michigan. Meredith's arrival adds a new dimension to the growing biophysics program at Clemson, and she is the second female faculty member in the department. Her research at Clemson focuses on the use of NMR and fluorescence spectroscopy to characterize the high-resolution structural and dynamic properties of specific biologically and medically significant non-coding RNA molecules. Her experimental studies seek to add to our growing body of knowledge about the physical properties of RNA that govern its ability to assume diverse roles in the cell, thus allowing individual RNA molecules to eventually be targeted by therapeutics for disease prevention and treatment.



Dr. Meredith Newby



Dr. Emil Alexov

Welcome to Associate Professor Emil Alexov

The Department of Physics and Astronomy welcomes the arrival of **Dr. Emil Alexov**. Before taking the appointment at Clemson in August, 2005, Emil was a senior scientist at Howard Hughes Medical Institute and an associate research scientist at Columbia University, working under Professor Barry Honig. Emil's other appointments include as a research associate at the City College of New York, a visiting scientist at RIKEN, Japan, and an assistant professor at Sofia University, Bulgaria. Emil's hiring was a result of a biophysics faculty search conducted during late 2004 to spring 2005 with 45 candidates applying worldwide. (Continued...)

Emil Alexov Cont'd....

Emil's Ph.D. training at Sofia University was in plasma physics, and his research thereafter has been centered on computational biophysics and bioinformatics. Emil's appointment complements the experimental biophysics component and strengthens the biophysics program at Clemson because of his extensive research experience. His current research topics include proteomic studies as predicting protein-protein interactions in the cell, as well as modeling of binding affinity of protein complexes and associated conformational changes. Plant photosynthesis is also a current topic of his research.

Professor Donald Clayton Retires



Dr. Don Clayton

Don's books in print are:

Handbook of Isotopes in the Cosmos: Hydrogen to Gallium, 2003
Joshua Factor: A Novel, 1986
Principles of Stellar Evolution and Nucleosynthesis: With a New Preface, 1983
Essays in Nuclear Astrophysics: Presented to William A. Fowler on the Occasion of His Seventieth Birthday/ with C.A. Barnes and D.N. Schramm, 1982
Dark Night Sky: A Personal Adventure in Cosmology, 1975
Principles of Stellar Evolution and Nucleosynthesis, 1968

Professor Donald D. Clayton retired from the Department of Physics and Astronomy in August 2005 after seventeen years of service to Clemson University. Don has had a long and distinguished career in nuclear and gamma-ray astrophysics and has made numerous contributions to our understanding of element formation in stars, the evolution of the chemical elements in the Galaxy, gamma-ray emissions from astronomical objects, and primitive materials in meteorites. His textbook "Principles of Stellar Evolution and Nucleosynthesis" remains a standard in the field of nuclear astrophysics, and his recent book, "Handbook of the Isotopes in the Cosmos: Hydrogen to Gallium" is fast becoming a popular reference work. For his contributions to science, Don has received numerous awards, including the prestigious Leonard Medal of the Meteoritical Society and was made a Fellow of the National Academy of Arts and Sciences.

Don grew up in Iowa and Texas. He received his Bachelor's degree from Southern Methodist University in Dallas and his Ph. D. from the California Institute of Technology in 1962. He then joined the Department of Space Physics of Rice University as a faculty member. In 1988, Don moved to Clemson and continued his vigorous research program in nuclear and gamma-ray astrophysics. He initiated several hires to form an astrophysics group at Clemson, which now includes seven faculty and approximately 14 graduate students.

Did you know the following about Clemson's Physics & Astronomy Program?

NUMBER OF PROFESSORS (FULL TIME) - 24
NUMBER OF CURRENTLY ENROLLED GRAD STUDENTS - 44
NUMBER OF DECLARED UNDERGRAD STUDENTS - 77
NUMBER OF COUNTRIES REPRESENTED - 8 (INCLUDING THE USA)
China, Taiwan, Romania, India, Turkey, Dominican Republic, and one Fulbright Fellow from Bahrain

Assistant Professor Chad Sosolik Joins Physics Department, Recipient of National Science Foundation Award

Dr. Chad Sosolik joined the faculty as an Assistant Professor in August of 2003. Prior to coming to Clemson, he was pursuing postdoctoral research on a National Research Council Associateship as a member of the Electron Physics Group at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland. His research at NIST was focused on the low temperature, atomic resolution microscopy of superconductors in the presence of applied magnetic fields. Dr. Sosolik received his Ph.D. from Cornell University (2001) and his Bachelor of Science degree from Texas A&M University (1995), both in physics.



Dr. Chad Sosolik

Dr. Sosolik subsequently was awarded a National Science Foundation CAREER award that will fund his research and educational/outreach activities for the next five years. The CAREER is one of the most prestigious awards given by NSF to young, tenure-track faculty members.

Dr. Sosolik's funded proposal is aimed at developing an understanding of the physical mechanisms that control the transfer of energy between atomic and molecular gases and precision-engineered diode surfaces. Specific applications of this work include the development of lightweight, chemically-specific gas sensors, work for which Dr. Sosolik has subsequently received additional research support through NASA. Educational activities associated with this project include a new summer intern program developed in association with Hanna High School in Anderson, SC. Beginning in the summer of 2007, one or more rising seniors from the school will be invited to join Dr. Sosolik's group as part of the Summer Program for Research Interns.

Daw Receives Centennial Professorship and Becomes Fellow of American Academy of Arts & Sciences



Dr. Murray Daw explaining the finer points of a problem to a Clemson University student.

Dr. Murray S. Daw recently received the Centennial Professorship Award, a rotating bi-annual award given by the Clemson University faculty to an outstanding colleague who is tenured or in a tenure-track appointment. The professorship is supported by an endowment jointly funded by the Clemson University faculty, friends and a matching grant from the Commission on Higher Education that results in an award of approximately \$12,000 per year.

Dr. Daw, the R.A. Bowen Professor of Physics at Clemson University, has also been elected a Fellow of the American Academy of Arts and Sciences. He joins 150 Nobel laureates and 50 Pulitzer Prize winners who are among the 4,500 academy members.

Daw's work on metals is funded by NASA, the Department of Energy and the National Science Foundation. He uses theoretical physics to understand what makes metals strong. Through his research, Daw aspires to suggest ways in which metals could be strengthened.

"The challenge is to find the simple and elegant in something that doesn't seem simple and elegant at first," Daw said.

Daw's work could lead to new metal alloys capable of enduring extreme stress and temperatures. These improved metals could be used for spacecraft, turbine engines and in other extreme environments.

Graduate Student News

Astrophysics Student Awarded Prestigious Leo Goldberg Fellowship

Simon Schuler, a May 2006 Physics Ph.D. graduate student, has been awarded the prestigious five-year Goldberg Fellowship, awarded each year since 2003 by the National Optical Astronomy Observatory (NOAO) to one outstanding young astronomer. The recipient commits to four years of researching at a NOAO location and one year of research and teaching at a university.

During his time as a Goldberg Fellow stationed at NOAO/ South in La Serena, Chile, Simon plans to pursue research focused on the chemical abundances of metal-poor stars, as well as expand upon his dissertation findings. "This fellowship will provide a great start to my career as a professional research astronomer, allowing me to pursue the science questions that are of most interest to me, as well as granting the opportunity to collaborate with some of the current 'greats' in the field", said Schuler.

Schuler graduated with his B.S. in 2001 from the University of Miami. He continued his studies at the University of Nevada—Las Vegas where he obtained his M.S. in 2002. His doctoral thesis, "Chemical Abundances of Solar-Type Dwarfs in Open Clusters" focused on the abundances of elements in stars similar to the sun and was directed by Professor Jeremy King. During the course of his doctoral studies at Clemson, Simon has worked with a number of collaborators from various institutions, including University of Chicago/Yerkes Observatory, Ohio State University, University of Toronto, and the Thüringer Landessternwarte Tautenburg Observatory in Germany, and his research has made use of data from some of the foremost observatories in the world, including the 10-m Keck telescope, the 9.2-m Hobby-Eberly Telescope, the 8.2-m Very Large Telescope (VLT), the 4-m Mayall telescope at Kitt Peak National Observatory, and the 2.7-m Smith telescope at McDonald Observatory.



Simon Schuler, Goldberg Fellow



Simon in front of the domes of the twin 6.5 meter Magellan telescopes in Chile.



Noteworthy...

Congratulations to Assistant Professor Chad Sosolik and his wife, Janet Lee, on the birth of their first child, Jackson Lee-Sosolik on September 1, 2006.

Congratulations also go out to Instructor Amy Pope, and her husband Alan, on the birth of their son, Levi Edwin, on August 17, 2006.

Physics & Astronomy Gets New Grill for Department Functions

Recently the department purchased a new grill for department functions.



Newly-appointed Graduate Student Liaison, Allen Parker, convinced the department chair, Peter Barnes, that providing a budget in support of social events would be a good idea. The department purchased a gas grill and canopy tents in support of outdoor social events that Allen hopes will include students, faculty and alumni.

The first graduate student sponsored social event, a tailgate party prior to the Clemson–Central Florida football game, was a great success. The event was well-attended by graduate students and faculty from all of the individual groups within the department, as well as a few alumni. The party took place on the lawn between Martin and Kinard Halls.

During the course of this first graduate student sponsored event, food prepared on the new grill and beverages were served. In addition, touch football game took place (in which the faculty attempted not to look too clumsy!).



Clemson students and faculty enjoy a pre-game tailgating party.



Faculty and grad students enjoying an impromptu football game.



We are currently entertaining suggestions for a new title for the newsletter. If you would like it to remain "Schroedinger's Tiger", or if you have a suggestion for a new name, or any other constructive input on its format, please email your suggestions to:

elizabethvogt@clemson.edu



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Flower and Tritt Publish Texts

Dr. Phillip Flower and Dr. Terry Tritt have recently published textbooks.

Flower's text, **Understanding the Universe, Volume I- The Solar System, Second Edition** was published by Pearson.

Flower is an Associate Professor with interests in stellar structure and the evolution of stars, as well as color-magnitude diagrams of galactic and extragalactic star clusters. Flower received his PhD from the University of Washington at Seattle.

Tritt's text, **Thermal Conductivity- Theory, Properties and Applications** was published by Plenum Publishing Corporation.

Tritt is a Professor with interests in the investigation of solid-state materials for thermoelectric applications, colossal magnetoresistance systems, thermal conductivity, and the electronic properties of low-dimensional conductors. Tritt received his PhD from Clemson University.

