

Schrödinger's Tiger



The Clemson University Physics and Astronomy Newsletter

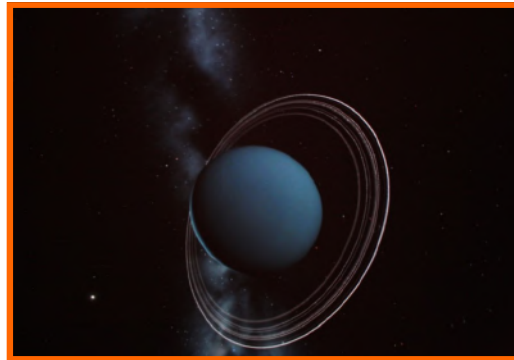
Fall 2011

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Clemson Planetarium Begins Its Second Half-Century

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Visit other planets at the Clemson Planetarium.
Photo by Kellie Jureka

Shortly after the opening of Kinard Laboratory in 1961, the planetarium was installed. The unexpected upgrade to a Spitz A3P projector required a twenty-four foot diameter dome, which did not quite fit the provided space. The fiberglass panel dome had to be truncated with a flat vertical portion on the "south" side. A wooden platform was constructed around the central projector well, and bench seats were installed. Most of this work was performed by faculty members, including the long-serving professors **Tom Collins** and **John Gilreath**. The projector was an amazing optical-mechanical machine. An arc lamp inside the star ball projected nearly 3,000 stars through pin holes and lenses for the brighter ones. It also showed the Milky Way and the Andromeda galaxy.

The sky could be shown for any place and time, by rotating the star ball and changing its elevation angle. Small projectors displayed each of the Sun, Moon, terrestrial and giant planets. Rotating and pivoting mirrors, tied to the motion of the projector by systems of gears, accurately position these bodies for any time over many centuries. All of this was controlled with analog electronics by the operator, in the dark, via a set of dials and switches. Separate special effects projectors, which showed a solar system orrery, a polar orbiting satellite, a meteor shower, a solar eclipse and various coordinate lines and grids, among others, were added.

Approximately 100,000 visitors have attended Clemson planetarium shows over the years. It was closed in 1994 for budgetary reasons, but with contributions from Ph.D. students **Peter Milne** and **Grant Williams**, it was reopened as an all-volunteer operation. Finally, the decision was made to renovate the planetarium and upgrade the equipment.

(Continued on page 3)

A Message from the Department Chair

We got off to a great start to the academic year with our inaugural Physics and Astronomy research symposium in August, an event featured in this issue. Many excellent talks and posters represented all of our research areas and set a high bar for our new students. If one did not already know, it was difficult to tell which presenters were faculty and which were students. We have an excellent new group of Ph.D. students and outstanding incoming freshman. They have high aspirations, which we will do our best to help them realize. We are reaching a new generation of young South Carolinians with our refurbished planetarium. Clemson University is, according to **President Jim Barker**, “back on offense,” after tough years, and Physics and Astronomy is hiring new faculty now. (Clemson football, you might have noticed, got back on offense a few different times this year.)

As the Interim Chair, I would like to note the retirement of **Dr. Peter Barnes**, who preceded me as Chairman of the Department. He promised us five or six years of service when he arrived, but gave us ten. Peter hired some great faculty members, increased the number of Physics majors, elevated our visibility on campus, and founded this newsletter. He led our first ever Research Experience for Undergraduates program, and started the summer undergraduate program in Surface Physics at the Italian synchrotron in Bosavizza. Peter facilitated new donations for student travel, scholarships, and research. In a time when research is viewed in terms of economic development and as a revenue stream, Peter has constantly emphasized the value of discovery and fundamental work, which are the best reasons to do Physics and Astronomy research. After six months in this position, I have a renewed appreciation for his work. Professor Emeritus Barnes is still working with students in the Calhoun Honors College and the Society of Physics Students, and in our continuing fundraising efforts. We all wish Peter all the best in his retirement years, which we hope are many.

Dr. Mark D. Leising
Interim Chair, Department of Physics and Astronomy
Voice: (864) 656-3416/email: [lmark@clermson.edu](mailto:mark@clermson.edu)

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. Endowments to Clemson assure the best faculty, the brightest students and the most creative research projects. A substantial endowment can transform a good university into a great one.

As a non-profit 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.

There are several ways to donate. You may use the enclosed envelope or send a check to the Clemson University Foundation, P.O. Box 1889, Clemson, SC 29633. Checks should be made payable to the Clemson University Foundation with Physics and Astronomy specified on the memo line. Alternately, you may visit the Clemson website <http://www.clemson.edu/alumni/giving/ways/index.html> and make a secure electronic donation. Again, please specify that the donation go to the Physics & Astronomy Department and indicate to which project you would like to donate. Thank you, as always, for your continued support of the Department. You may contact the Annual Giving Office at (864) 656-5896, should you have any questions regarding your donations. If you have other questions you may contact the Department directly at (864) 656-3416.



In December 2010, it was closed, and everything except the dome (including floor and seats) was removed from the room. The second floor stock room that intruded into the original dome was removed. The fiberglass hemisphere was completed, and a new platform, seats, electrical flooring, and paint were added. The new projection system is a fully digital Digistar 4 by Evans and Sutherland, and this was installed in March of this year. Two HD projectors on opposite sides of the dome cover it with images, which are generated on a dedicated workstation for each. Another workstation controls the display system, while a fourth handles the surround audio. Anything that can be generated on the

computers can be displayed on the dome. The standard database includes nearly one million astronomical objects, with locations in three dimensions and other properties. Many are three-dimensional objects themselves, and all can have images placed on them. The view from anywhere can be displayed. We can fly among the planets, then, speeding along at faster than light, fly among nearby stars, out to nearby galaxies, and even to the edge of the observable universe.

Shows can be controlled with point-and-click GUIs, or with scripted commands. The images displayed can be recorded and replayed as full-dome video. Professionally produced video can also be purchased from other sources. We began shows in the fall of this year for astronomy labs and for visiting school and university groups. Favorite shows include “The Sky Tonight,” “The Life of a Star,” “Fly,” and “The Wonders of the Universe.” We plan regularly scheduled public shows starting in the spring of 2012.



The renovation was funded by student lab fees with substantial contributions from the College of Engineering and Science and the Office of the Provost. We are seeking additional support from private donors for paying student presenters and purchasing additional full-dome shows. Please contact the Department at (864) 656-3416, if you wish to see a show or are interested in making a donation to the program.

First Symposium for Introduction to Research Held by Department

On August 22, 2011, the Physics and Astronomy Department hosted its first Symposium for Introduction to Research. The full-day event consisted of graduate student and faculty research presentations, followed by a poster session at the Clyde V. Madren Conference Center on the banks of Lake Hartwell. The purpose of the conference was to introduce incoming graduate students to the various research groups within the Department and their ongoing projects.

The highlights of the conference included talks and posters on astrophysics, Earth’s atmosphere, fundamentals of physics and quantum mechanics, quantum computing, computational modeling of biophysical molecules, nanoscale materials, and ion beam physics.

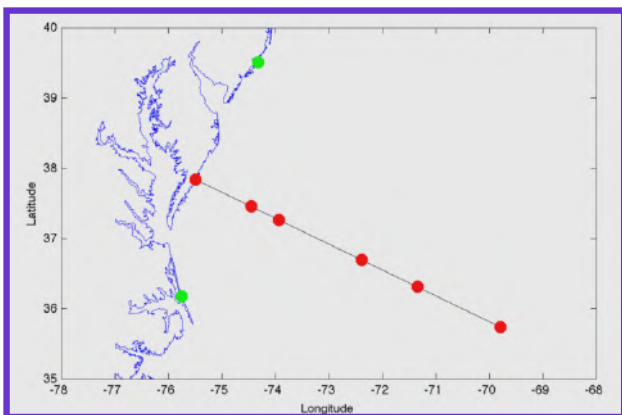
The conference was well-attended by faculty, students, and the Department staff. There were nine talks by professors and twelve by students, including one presentation by a post-doctorate who recently graduated from Clemson University. Over twenty-five posters were displayed in the connector of the Madren Center from all disciplines, and the families of everyone in the Department were invited to dinner served in the Grand Ballroom. In addition, the conference was attended by retired faculty, a representative of the Clemson University Research Foundation, and **Dr. Larry Dooley**, the Interim Dean of the College of Engineering and Science. The Department hopes that this will be an ongoing event in the future.



The ATREX Experiment: Jetstreams in the Earth's Geospace Region

The jetstream is now a well-known feature of our atmosphere's global weather system. Most people are familiar with the band of enhanced winds located near the base of the stratosphere where many commercial aircraft fly. Flights are often helped or hampered by strong head winds. Maps that show the location of the jetstream are a regular feature of the evening weather forecast on local television stations or the Weather Channel. Clear evidence of the existence of the jetstream as a regular feature in the atmosphere did not emerge until the second World War when long flights across the Atlantic and Pacific became common. As aircraft performance improved and aircraft routinely started to fly at higher altitudes, it quickly became apparent that strong winds with a general west-to-east direction were a common characteristic at altitudes near 30,000 feet. During the last decade, new evidence has shown that another band of strong winds and significantly enhanced transport exists much higher in the atmosphere, in the region that we typically think of as the Earth's near-space environment, or geospace, as it is also known. The geospace atmosphere is a tenuous gas with a mixture of charged and neutral gas particles. The flow of the neutral portion of the atmosphere is particularly difficult to measure at those heights, because the gas densities are low. Some of the first measurements became possible in the late 1950s, when new high-power rockets became available that could reach that part of the atmosphere. At least a few of those early rocket flights involved the use of luminous chemical tracers that were released from the rockets to measure the winds by tracking the releases with cameras on the ground. Over the next four decades, more than 500 such measurements were made of the wind profiles at locations around the world in different seasons and at different times of day. The wind measurements from the large rocket data set were analyzed by **Dr. Miguel Larsen** from the Department of Physics & Astronomy at Clemson University and described in a journal article published in 2002. A surprising result was that nearly all the measurements showed a region with very strong winds between 100 and 110-km altitude (62 to 68 miles). The peak winds were often between 100 and 150 meters per second (225 to 335 m.p.h.). Such large winds at those heights are difficult to explain, based on our current understanding of the forces that drive the winds at those altitudes. The analysis provided the first evidence of the high-speed flows at high altitudes based on an extensive set of data. Additional critical information came to light soon after, as a result of the long series of Space Shuttle launches

carried out in the last two decades. The Shuttles were launched from Florida and, after the initial ascent, would settle into a long, nearly-horizontal flight path along the east coast of the United States as they burned the fuel in the main motor and accelerated to get into the final orbit. The horizontal portion of the flights occurred in the altitude range between 100 and 110 km, which coincidentally is where the large winds were observed with the rocket tracer releases. The height chosen for the horizontal burn was based on orbital dynamics, rather than any particular relation to the atmospheric winds.



Red dots show the location of the tracer releases in the ATREX experiment. Green dots show the camera sites used to support the equipment.

The observations showed a strong coherent flow, the type typically associated with an atmospheric jetstream. Theoretical predictions for the winds at the high-altitude jetstream height show wind systems dominated by atmospheric tides driven by solar heating. Such tides are expected to have maximum wind speeds that are half or less of the peak winds that are observed. The motion for a cloud embedded in a tidal flow is expected to be a slow elliptical motion that returns the cloud to its original position after a fraction of a day. The transport of the Shuttle exhaust cloud is more similar to the high-speed transport and large north-south swings that characterize the lower atmosphere jetstream, although with much larger wind speeds.

A new experiment has been approved to gather more detailed information about the forces responsible for the high-altitude jetstreams and the effects of the winds and turbulence associated with the high-speed flow. **Drs. Miguel Larsen** and **Gerald Lehmacher** from the Physics & Astronomy Department are the Principal Investigator and Co-Investigator, respectively, for the NASA-funded Anomalous Transport Rocket Experiment (ATREX) that is scheduled for launch from the NASA/Wallops Flight Facility on the eastern shore of Virginia in March 2012. Five rockets will be launched with instruments to measure pressure and temperature and tracer material releases to track the flow and show small-scale turbulence in the medium over a broad horizontal extent.

The chemical tracer used in the experiment is trimethyl aluminum, a chemical that reacts with oxygen and produces chemiluminescence when exposed to the atmosphere. The products of the reaction are aluminum oxide, carbon dioxide, and water vapor, which also occur naturally in the atmosphere. The experiment will be carried out at night during moonless conditions, so that the chemical tracer trails are easily visible to the human eye and to cameras. Cameras will be set up at locations in New Jersey and North Carolina, as well as at the launch site, to track the trails as they move across the night sky. All five rockets will be launched within a period of a few minutes, and all the trails will be visible at the same time. NASA provides the launch vehicles and carries out the launches, but the scientists are responsible for the science instruments that are flown on the rockets.

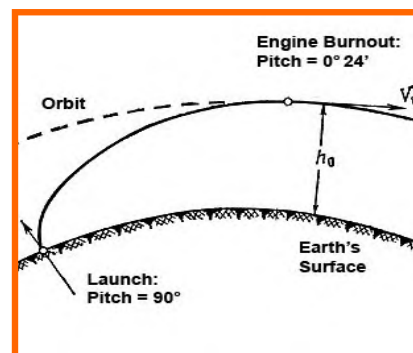


Diagram shows the typical initial flight path of the Space Shuttle, including the long, nearly-horizontal flight path during the main motor fuel burn.

The Physics Department's Instrument Shop has had primary responsibility for designing and manufacturing the rocket instrumentation that will be transported to the facility at Wallops in January for integration into the rocket payload structures, as well as for mechanical and electronic testing. The Instrument Shop has been involved in rocket payload design and manufacturing for more than sixty launches since 1991. The project involves both undergraduate and graduate students, as well. Undergraduates **Brenden Roberts** (Physics major) and **Eric Roper** (Mechanical Engineering major) have been involved in data analysis and payload structure design in preparation for the experiment. Graduate students **Andrew Kiene**, **Jonathan Nooner**, and **Tyler Scott** from Physics are involved in the experiment preparations. Clemson personnel will be deployed at remote camera sites in New Jersey and North Carolina during the launch window to operate the camera systems used to track the releases. Other personnel will be at the launch site at Wallops Island, Virginia, to support the rocket payloads and to make the decision about when to launch. The public can follow this launch, as well as other launches from Wallops Flight Facility, at the Wallops web site (www.wff.nasa.gov). The web page has real-time video and audio streams during the launch operations. The ATREX launches are expected to provide the first highly-detailed measurements of the processes in the high-altitude jetstream region and are expected to provide new insights into the forces responsible for this recently discovered and important atmospheric circulation feature.

Clemson Students Visit Hangzhou China Summer of 2011



Left to right: Junjie Shen, Wenjie Xie , Dale Hitchcock, Dr. Terry Tritt, Jennifer Graff and Kristin Tritt.

This past summer, from June 24 to July 9, 2011, **Dr. Terry M. Tritt** and two graduate students visited China for a collaboration with Zhejiang University in Hangzhou, China. Hangzhou is in the Zhejiang province and is about a three-hour drive southwest of Shanghai; however, the group traveled to and from Shanghai aboard the new fast train system in China with speeds over 330 Km/hr. In fact, a week before the wreck of the fast train system, they were aboard that very train. The scientific interaction between Clemson University is part of NSF Materials World Network, which is lead by **Dr. Tritt** and **Asst. Prof. Jian He** on the U.S. side and NSF-China and **Drs. T.J. Zhu** and **X. Zhao** on the Chinese side.

The two graduate students were **Jennifer Hubbard Graff**, a Ph.D. student in MS&E, and **Dale Hitchcock**, a Ph.D. student in Physics, whose advisors are **Dr. Tritt** and **Dr. He**, respectively. Each of the students presented lectures at Zhejiang University on their research efforts at Clemson University. **Dr. Tritt** conducted a workshop consisting of four lectures (about one and a half hours each) on thermoelectric materials, including an introduction to the materials, selection criteria and the various measurements and potential issues in characterizing these materials, along with a view of some of the state-of-the-art materials and their potential for further improvement.

While there, Dr. Tritt's daughter **Kristin** was able to join them. She is a student at the Fashion Institute of Technology in New York City and is a rising Senior who is majoring in Fragrances and Cosmetics (quite a different career path than Dad, although a recent Materials Research Society Bulletin was on "Cosmetics!") . During the time in China, **Jennifer**, Dale and **Kristin** were able to take five days to visit



Beijing with another one of Professor Tritt's students **Xiaoyu Zeng** (or Bella), who was in China on summer vacation. Dr. Tritt asked if they timed it so as to miss the long workshop? He wondered if they knew "something the poor Chinese students didn't know?" The students had a wonderful time visiting the Forbidden City, the Great Wall, and the sights of Beijing, including Olympic Park. They were glad, however, to return to Hangzhou after such a tiring trip. After returning to

Hangzhou and all the lectures were over, they got to relax a little and were able to see the very famous West Lake Drama Show, which is shown on the lake at night with many colorful lights and over 100 actors and dancers in the play. They had a wonderful farewell dinner with **Drs. Zhu** and **Zhao** and their group that consisted of many of the favorite local Chinese dishes. Then they returned to Shanghai the last night before the trip home and traveled downtown aboard the MagLev train from their airport hotel.

Upon their return to the U.S., one of the Zhejiang University students, **Junjie "Irwin" Shen**, came to Clemson University to work with the students. Junjie was able to stay about three weeks. While here, he and many of the Prof. Tritt's and Asst. Prof. He's students were able to attend the International Thermoelectric Conference in Grand Traverse, Michigan and gave presentations on their research work at the conference.



The Chinese student in the Shanghai picture on the previous page, **Wenjie "Michael" Xie**, spent over two years at Clemson working with Dr. Tritt's group. He received the 2011 Goldsmid Award for the Outstanding Graduate Student in Thermoelectrics Research. He is co-advised by **Drs. Tritt** and **Tang** at the Wuhan University of Technology and is part of a separate collaboration. He wanted to visit the Clemson group during its trip to China. Dr. Tritt traveled to Wuhan last April to attend Wenjie's very successful Ph.D. defense. Tritt said that this trip was a wonderful opportunity for the students to be able to share ideas and research discussions with the other students, as well as to have a tremendous cultural experience. It was a very successful trip, and their Chinese hosts were exceedingly helpful in making the trip both culturally and scientifically fulfilling for all of the participants.

Dr. Tritt Becomes Fellow of the American Physical Society



Dr. Terry Tritt

Dr. Terry Tritt has also been made a Fellow of the American Physical Society at its November 2011 meeting "for his career-long contributions to the science and engineering of thermoelectric materials, the industrial application of that knowledge, and for the education and promotion of numerous young scientists and engineers." In addition to this distinguished award and many travels, **Dr. Tritt** and **Dr. Satish Vitta** of the Indian Institute of Technology-Bombay will be hosting the first Indo-U.S. Workshop on "Thermoelectrics, its Theory, Materials and Applications," from January 30 to February 01, 2012 at the Indian Institute of Technology in Mumbai (Bombay), India. The conference is organized by the Indian Institute of Technology Bombay and Clemson University and is supported by the Indo-U.S. Science and Technology Forum. **Dr. Vitta** was a Fulbright scholar who worked with Dr. Tritt at Clemson last year. Dr. Tritt joins **Drs. Murray S. Daw, Bradley S. Meyer, Aparao Rao, and Raymond Turner** as Fellows of the American Physical Society from the Department of Physics and Astronomy.

Dr. Aparao Rao has been elected a Fellow of the American Association for the Advancement of Science (AAAS). Each year the AAAS Council elects members whose “efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished.” The honor of being elected a Fellow of the AAAS began in 1874 and is acknowledged with a certificate and rosette. Dr. Rao is being honored for his distinguished contributions to carbon science, particularly fullerenes and carbon nanotubes through synthesis and Raman spectroscopy, and elucidating their structure-application and fundamental properties. He will receive his award in Vancouver, British Columbia in February 2012 during the AAAS Fellows Forum, a part of the Association’s Annual Meeting. The Department wishes to congratulate Dr. Rao for this recognition of his outstanding research achievements.



Dr. Aparao Rao in his lab

Department Establishes Dual Ph.D. Program with the University of Paris

The dream of every graduate student is to get a Ph.D. What about getting two, instead? **Zhe Zhang** is a fourth-year Ph.D. student in the lab of Computational Biophysics and Bioinformatics at Clemson. His research is devoted on modeling effect of disease-causing missense mutations on proteins’ structure, function and interactions, with particular emphasis on mental disorders. This is a collaborative research with the Greenwood Genetic Center and **Dr. Charles Schwartz**. So far, Mr. Zhang has completed several studies on the molecular effects that cause Snyder-Robinson and Creatine Deficiency syndromes and has developed a computational method to predict the effect of single mutations on protein stability. He has published seven papers, of which he was first-author of three. He also presented his research at several meetings of American Biophysical Society and American Physics Society and at various workshops. Also, Zhe received the prestigious Chateaubriand Fellowship, which is supported by the French Department of Science and Technology and the Embassy of France. He will be going to France for six months this fall, followed by another visit in 2012, with the goal to get dual Ph.D. in Physics from Clemson and a Ph.D. in Life Sciences from the University of Paris. We anticipate that he will graduate in 2012. The Chateaubriand Fellowship is part of an international initiative between the U.S.A. and France to promote collaborations between scientists. Currently, the program supports thirty-six co-supervised Ph.D. students in various science and humanities disciplines. Zhe is one of ten students of Physics with a dual Ph.D. funded by the program, and he is the only student from Clemson supported by this Fellowship.

Interdisciplinary Seminars in Biophysics and Bioinformatics

Six departments of Clemson University have initiated a collaborative interdisciplinary seminar in Biophysics and Bioinformatics, the aim of which is to promote the exchange of ideas and to facilitate joint research across different re-groups in the College of Engineering and Science.

The first seminar was on February 1, 2011, and it is currently running this fall. The departments are: Physics and Astronomy, Computer Science, Bioengineering, Biochemistry and Genetics, Chemistry and Material Science. Such participation assures that the topics presented will cover almost all areas of Biophysics and Bioinformatics. Our goal is to expand departmental involvement and the number of participants, and to maintain it as a permanent forum that will promote Biophysics and Bioinformatics research at Clemson. For information, please contact **Dr. Emil Alexov** at ealexov@clemson.edu.



Conference on Time Domain Astrophysics with Swift



Group photo of the conference participants with the Clemson Tiger

An international conference on Time Domain Astrophysics was held at the Madren Center from October 24 to 26, 2011. **Drs. Dieter Hartmann** and **Mark Leising** brought together scientists who have been working with NASA's Swift satellite. The goal of the meeting was to discuss key science topics from Swift's successful past seven years and to focus attention on opportunities for further improvements in its observing program and Target of Opportunity strategies for the coming years. A comprehensive analysis of the road ahead is extremely important, considering that Swift is now in its extended-life operating phase and that stiff competition in the upcoming 2012 Senior Review will include missions such as the Hubble Space Telescope and Fermi.

Swift science crucially depends on the active role of its user community, which plays a significant role in the design of a vital scientific program. When Swift was launched in 2004, its prime objective was to chase gamma-ray bursts. However, it was quickly realized that its multi-wavelength and fast-scheduling capacity make it the most versatile mission ever flown. It is used for an impressive variety of targets, including active galaxies, supernovae, novae, variable stars, etc. Swift has also observed nearby solar system objects (comets) and reached out to GRB 090423, one of the most distant objects in the Universe. The detection of J1644+5734/GRB 110328A has shown that Swift continues to discover new object classes. In this meeting sessions were dedicated to each class and accompanied with overarching discussions of future direction and emphasis for Swift science. The general meeting was held for two and a half days, followed by a half-day of planning for NASA's Senior Review by a limited group of people, led by the Principal Investigator, **Dr. Neil Gehrels** of NASA and the Goddard Space Flight Center joint program.

The conference was introduced by acting **Dean Larry Dooley** and was attended by nearly 100 participants from Japan, Europe, South America, and the U.S. The weather was excellent throughout the whole meeting. The participants enjoyed bluegrass music and a visit from the Tiger cub. The support staff at the Madren Center was excellent, and the organizers are most grateful for our local staff from the Department of Physics and Astronomy, with special thanks to **Amanda Crumpton**, **Lori Rholetter**, and **Janet Lee**.

STUDENT AWARDS & ACHIEVEMENTS



Left to right: Dina Drozdov, Ginger Bryngelson, and Amber Porter at Kitt Peak

This fall, **Ginger Bryngelson**, **Julie Djordjevic** (not pictured), **Dina Drozdov**, and **Amber Porter** traveled to Arizona to observe on the 4m Mayall Telescope at Kitt Peak National Observatory. Ginger requested viewing time through the National Optical Astronomy Observatory and was granted four nights. While there they imaged Type Ia Supernovae in nearby galaxies in optical and near-infrared light. These stellar explosions were 200 to 400 days old and were at a stage where light from deep in the explosion begins to escape. Unfortunately, high winds and two separate snowfalls limited the amount of time the telescope could run, but it was a great experience, nonetheless.

Dale Hitchcock, graduate student of **Dr. Jian He**, won the best symposium poster presentation award (with a \$500 check) at the 2010 Materials Research Society fall meeting in Boston. Four posters were selected from a pool of eighty-two poster presentations in that symposium. The title was "The Impact of Melt-spinning Process on the Microstructures and Thermoelectric Performance of $(\text{Bi,Sb})_2\text{Te}_3$: A Combined Neutron Scattering, Microscopy and Thermoelectrics Study." The project is a collaboration between Clemson University, Wuhan University of Science and Technology (China), and National Institute of Standards and Technology (MD, USA). Congratulations to Dale on this outstanding achievement.



Dale Hitchcock and his presentation

Soft Matter and Environmental Physics Research Wins Recognition



Priyanka Bhattacharya

Priyanka Bhattacharya, a graduate student in the Ke lab, won a Sigma Xi grant-in-aid this April for her proposal "Investigating the Physicochemical Properties of a Novel Tris-Dendrimer for Environmental Applications." Sigma Xi is an international, multidisciplinary research society which promotes the health of the scientific enterprise and honor scientific achievement. This grant enabled her to attend "Sustainable Remediation 2011," an international conference held this June at the University of Massachusetts at Amherst. She won second prize for her poster presentation "A Dendritic Nanotechnology for Efficient and Biocompatible Water Purification," drawing notice from scientists of the U.S. Environmental Protection Agency. Later she visited scientists **Baoshan Xing**, **Paul Dubin**, **David Hoagland** and **Murugappan Muthukumar** and performed viscometry measurements on the hydrodynamic properties of polyethyleneimine hyperbranched polymer and polyamidoamine dendrimer at the Dubin lab.

CLEMSON PARTICIPATES IN THE SECOND AZARQUIEL SCHOOL OF ASTRONOMY HELD IN BEIRUT, LEBANON

The “Azarquiel School in Astronomy” is named in honor of Abu Ishāq Ibrahim Ibn Yahyà al-Zarqalluh, or Azarquiel, the most famous among the medieval Andalusian astronomers of Spain. The first school was held in Granada, Spain in July 2010, and the second school was hosted at the American University of Beirut from June 19 to 26, 2011. The goal of the program was to bring together an equal number of university students from Arab or Middle-Eastern and European countries, in order to promote cultural and scientific exchange in the fields of Astronomy & Astrophysics. These dynamic sessions hopefully motivated future research activities in these fields. The program was held at the campus of the American University of Beirut (AUB), which overlooks the Mediterranean. Founded in 1866, AUB has always been a place of cultural and scientific interaction between the East and the West.



School participants visited the Roman ruins at Baalbek in the Bekaa Valley.

Dr. Bradley S. Meyer from Clemson was a lecturer at the School, in addition to a number of distinguished American and European invited speakers. Dr. Mounib El-Eid of AUB, a long-standing Clemson collaborator, was the program organizer. The plan for next year’s School is that it will be held in Istanbul, Turkey. For more information, please visit <http://www.azarquiel-school.org>.



Bottom right: Dr. Claus Rolfs makes a toast at the sumptuous lunch in the Armenian village of Anjar, in the Bekaa.

Share Your Story with Us

Gotten married? Added a new member to the family? Landed your dream job? If so, we’d love to share your good news in future issues. Visit physics.clemson.edu for contact information, or use the form below. Mail your completed form to: **Department of Physics & Astronomy, Clemson University, 118 Kinard Laboratory, P.O. Box 340978, Clemson, South Carolina 29634-0978.**

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YOUR GOOD NEWS:

The Clemson University Physics and
Astronomy Newsletter

118 Kinard Laboratory
Box 340978
Clemson, SC 29634-0978

Tel: (864) 636-3416
Fax: (864) 656-0805
E-mail: hdebra@clemson.edu



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Department News



Former Clemson astronomy professor, **Dr. Beverly Bookmyer** died April 20, 2011 at her home in Sequim, Washington. Born Beverly Brandon, she married **Edwin Bookmyer** in 1942 and received a Ph.D. from the University of Pennsylvania in 1964. Prior to coming to Clemson, she worked at Villanova University and the University of Arizona. She served on the faculty in Physics and Astronomy at Clemson University from 1971-1989, working mostly in the study of close binary star systems.



New Clemson professor, **Dr. Anthony Valentini**, formerly of the Imperial College in London is featured in a new book, *Elegance and Enigma: the Quantum Interviews* by **Maximilian Schlosshauer**, published by Springer Press. The book is a set of controlled interviews with seventeen world leaders in the field of the fundamentals of quantum mechanics.



The Department wishes a speedy recovery and good health to **Fran Turner**, wife of retired physics professor, **Dr. Ray Turner**.

If you have any suggestions for the newsletter, or any other constructive input on its format, please email your thoughts to: rvogt@clemson.edu. To subscribe or unsubscribe to *Schrödinger's Tiger*, please go to our mail list at: <http://www.ces.clemson.edu/mailman/listinfo/panda-newsletter>.