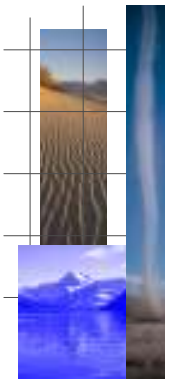


Schrödinger's Tiger

The Clemson University Physics and Astronomy Newsletter

Fall 2013 Volume 8, Issue 2

In this issue:

Clemson Unveils New Nanomaterials Center

At one-billionth of a meter (nanometer), materials begin to exhibit unusual and often very useful properties. As many academic and industrial researchers continue to harness the power of nanomaterials, Clemson University has completed construction of a world-class nanomaterials facility designed to make new breakthroughs that can result in paradigm-shifting technologies. The new Clemson Nanomaterials Center (CNC) allows leading scientists and engineers to better conduct interdisciplinary nanotechnology research, including the development of high-energy storage and generation devices, superconducting wires and composites, and gaining new insights into the nano-bio interface. "The research work has already begun, with most of the equipment under extensive use," said **Apparao Rao**, Director of CNC, R. A. Bowen Professor of Physics in Clemson's Department of Physics and Astronomy.

The new Clemson Nanomaterials Center

Rao's work has primarily focused on broadening the frontiers of nanoscience and translating nanotechnology research to energy generation and storage, thermal management, and the nanomedicine industry. "We have reached fundamental limits in many technologies. For example, silicon is on the verge of Moore's Law. There are many imminent bottlenecks in materials for energy, computing, and medicine," explained **Dr. Ramakrishna Podila**, a faculty member in Rao's group. "Currently researchers are trying to find materials that can generate and store energy efficiently and technologies that can go beyond Moore's Law in terms of computing." With this end in mind, Rao and his team have been endeavoring to produce new technologies that are poised to strongly impact nanoscience research.

The team at CNC has recently succeeded in making a major breakthrough in thermoelectric technology that can generate electricity from heat. Rao's group, in collaboration with **Drs. Jian He** and **Terry Tritt** of Clemson P & A, recently published a research article titled "Preferential scattering by interfacial charged defects for enhanced thermoelectric performance" in Nature Scientific Reports, which shows that peeling bulk Bi2Te3 (a state -of-the art thermoelectric material) into thin atomic layers akin to graphene can lead to an

(Continued on page 3)

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 the1986 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/giving/how/** and make a secure electronic donation. Again, please specify that the donation go 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.

Clemson University Electron Ion Trap (CUEBIT) Is Now Operational

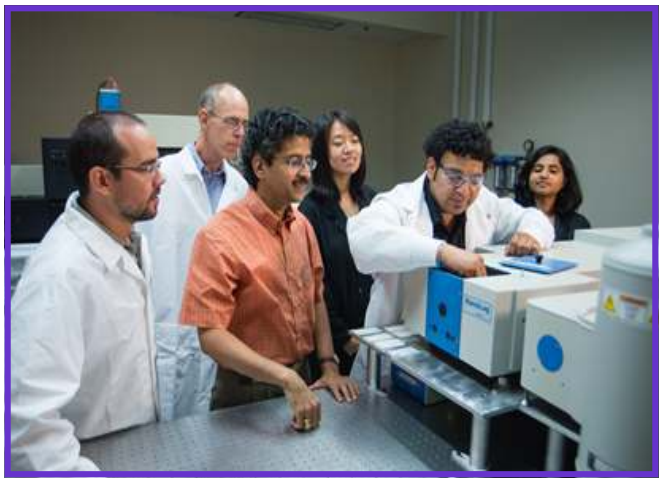
The Clemson University Electron Beam Ion Trap (CUEBIT) (pictured at right) officially came online this past summer and fall after our ion trap and beamline were delivered to us from Germany. This closed-cycle, helium-cooled superconducting EBIT is the first of its kind to be delivered to North America from DREEBIT, GmbH, and is only the second machine of this type built by the manufacturer.

Our facility reached its first operational milestone on July 10, 2013 when a beam of Argon ions with charge states reaching up to +13 was extracted from the trap.

Since that time, **Dr. Chad Sosolik** and his group have made numerous measurements related to the ion irradiation of thin film diamond samples, and **Dr. Endre Takacs** (featured on page 4) has made our first in-trap x-ray measurements. Slated as a user facility, CUEBIT was funded in 2010 by an NSF Major Research Instrumentation award for over $1.6 million, and the group has been holding a weekly seminar series focused on EBIT-based research, to initiate collaborative experiments with both on- and off-campus researchers. Anyone interested in learning more about CUEBIT and gaining access to the new facility may contact Dr. Sosolik at 864-656-0310, or by Email: sosolik@clemson.edu.

increase in its thermoelectric performance, by maintaining the same efficiency over a wider range of temperatures than ever before—a challenge that has "frustrated" thermoelectric researchers to date.

"Simple nanosizing does not work in this case, because it downgrades all the physical properties simultaneously," observed Jian He. "One needs to design careful approaches to decouple otherwise strongly interrelated materials properties to achieve high thermoelectric performance. It is, indeed, extremely difficult to elicit materials properties that are different from the materials properties endowed by nature." In an earlier discovery, published in *Advanced Materials*, one of the top three scientific journals in nanoscience technology, Rao and team demonstrated a new way to doubly decouple thermal and electrical properties in nano-sized Bi.



Apparao Rao (in orange) and his lab watch as Ramakrishna Podila loads a cuvette with graphene quantum dots into a photoluminescence spectrometer. From left to right: Mehmet Karakaya, Herbert Behlow, Jingyi Zhu, and Deepika Saini. Rama and Rao's work on the origin of photoluminescence in graphene quantum dots is featured on the cover of the October issue of *Advanced Functional Materials*.

While a part of Rao's team continues to make striking discoveries in the field of energy, one of his other focus groups has developed new optical nanoscale technologies that can lead to all carbon-based, inexpensive and flexible optical diodes. Diodes and transistors are at the heart of the electronics industry. To satisfy the ever-increasing demand for speed and data storage, we need to reinvent diodes to transmit light akin to electrons. The problem is the reciprocity principle, which is a fundamental concept in light transport that states: "If I can see you, you can see me." Rao's group collaborated with the Sri Sathya Sai Institute of Higher Learning and the Raman Research Institute, India to develop graphene-based, nano-scale flexible, all-carbon optical diodes that break the "reciprocity" principle, in order to allow the development of optical diodes and computers.

Rao's team is also closely working with **Dr. Frank Alexis** (Bioengineering, Clemson University) and **Dr. Jared M. Brown** (University of Colorado) to evaluate the toxicity of nanomaterials and to develop new scaffolds for cancer drug release. "Our ongoing work with graphene and other two-dimension materials points to advances in electronics, optics, energy storage, and nanomedicine. The Clemson Nanomaterials Center serves as a nexus for teams of researchers to come together to find solutions to problems of the 21st century," noted Rao.

Dr. Pooja Puneet Recently Appointed Lecturer

Pooja Puneet

Dr. Pooja Puneet has recently been appointed as a Lecturer in the Department. She received her Masters in physics from the Indian Institute of Technology at Roorkee in 2007 and her Ph.D. in physics from Clemson in 2013. As a graduate student at Clemson, she received the Outstanding Graduate Researcher Award earlier this year. Her research focuses on the development of highly efficient low-dimensional thermoelectric materials and high-critical current superconducting materials, and her results have been published in high-impact scientific journals, including *Nature Scientific Reports*, *Advanced Materials*, and *Nanoscale*. She also works collaboratively with **Drs. Rao**, **Tritt**, and **He**.

Dr. Endre Takacs

Endre Takacs Joins Department as Associate Professor

Dr. Endre Takacs is an atomic physicist whose interest is the radiation emitted by exotic atomic systems. He has recently been hired as an Associate Professor, and his work focuses on the use of the CUEBIT electron beam ion trap facility at the Department of Physics and Astronomy that generates highly-ionized atoms and applies advanced spectroscopic and imaging techniques for his research.

Takacs received his Ph.D. at the University of Debrecen, Hungary in 1992 in the field of collisional atomic physics. He earned a Soros Scholarship to Oxford University in England, where he studied slow atomic collisions by photo-dissociation of diatomic molecules. As a post-doc at the National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland, he helped to install an electron beam ion trap that was the second of such facilities in the world at that time.

Between 1995 and 2013, he was a faculty member at the Department of Physics of the University of Debrecen in Hungary and concurrently held guest researcher positions at NIST, including three years as a joint MIT-NIST research scientist. His experiments included the high precision x-ray spectroscopy of a few electron heavy ions, testing the limits of quantum electrodynamics and measuring the lifetimes of metastable energy levels in highly charged ions. Additionally, he studied the interaction of ions with condensed media. In 2006, he led the medical physics group in the rotating gamma-knife facility at the Rotating Gamma Institute in Hungary, where he worked with neurosurgeons to use gamma-ray radiation for radiosurgery of the brain. The interaction of high-energy radiation with biological tissues for diagnostic and treatment purposes is one of his continued interests to pursue at Clemson.

Jim Harriss

Dr. Jim Harriss has also recently joined the faculty as a Research Associate and principal operator of the CUEBIT in the Department. He earned a Ph.D. in physics at Georgia Tech, studying the scattering of protons from metal surfaces and then subsequently worked ten years for Rockwell International as a Senior Quality Engineer, manufacturing computer chips, modem devices, and even Pac-Man.

Dr. Jim Harriss

During his time at Rockwell, he earned awards for programs that streamlined computer-aided manufacturing, developing a process for oxygen precipitation in silicon, and the co-creation of a statistical process control course for training managers and line workers. In 1989, he came to Clemson to run the Microstructures Laboratory, a class-100 semiconductor cleanroom facility in the Electrical and Computer Engineering Department, which he continued to operate for more than twenty-three years, before moving to his current position. In his off hours he does volunteer work for the Clemson Little Theatre in Pendleton.

Strong Presence of Clemson Biophysics at International Symposium on Physical Chemistry

Margo Petukh, Lin Li, and Chuan Li

Encouraged by the success of previously organized symposia, Clemson biophysics professor **Dr. Emil Alexov,** together with **Dr. Ray Luo** from California University at Irvine, organized another international symposium within the 246th American Chemical Society (ACS) National Meeting. The symposium was held in Indianapolis in September. It should be mentioned that the annual meeting of American Chemical Society is the largest scientific meeting, typically involving more than 20,000 attendees. It covered a broad spectrum of topics, both experimental and computational, including computational biophysics.

The symposium on "Electrostatic and polarization effects in Physical Chemistry: *In silico* and *in vitro*" was a four-day event and attracted a large number of attendees and prominent speakers. Among them, three Clemson biophysicists, **Drs. Lin** and **Chuan Li**, and **Margo Petukh** presented their research at the symposium.

Dr. Lin Li gave an invited talk, describing his recent development of a smooth Gaussian-based dielectric function for modeling macromolecular electrostatics. Margo Petukh presented a talk on her joint project with the National Institutes of Health to develop a method and algorithm to predict the changes of the binding free energy of protein complexes induced by single point mutations. Dr. Chuan Li's presentation addressed the role of electrostatics in guiding electrons and electron carriers in macromolecular complexes.

Overall, the entire symposium was a great success and was very much appreciated by the researchers within the field of computational and experimental biophysics and chemistry. The strong presence of Clemson researchers was noted and contributes to Clemson's reputation as one of the best public institutions currently conducting this type of research.

Kudos to Great Clemson P & A Students!

Ph.D. student **Dale Hitchcock** has won a Clemson University Distinguished Graduate Fellowship for the 2013-2014 academic year.

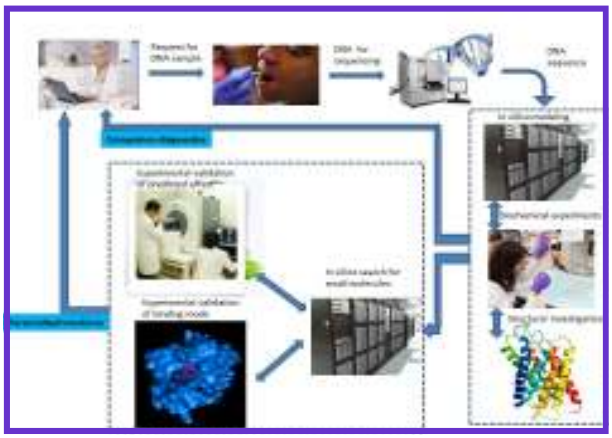
Undergraduate student **Elizabeth Clark** was awarded a South Carolina Space Grant Minorities in STEM Research Fellowship. This was announced during spring semester of this year.

Ph.D. students **Dale Hitchcock** and **Menghan Zhou** were both invited to attend the National Neutron Summer School sponsored by DOE and NIST/NSF, respectively.

Brenden Roberts received a $10,000 check for the Astronaut Scholarship during the Clemson-Georgia Tech football game on November 11, 2013. The award was presented by Space Shuttle astronaut Frank Culbertson.

The Biology of Human Diseases – Mechanisms, Diagnoses, and Personalized Medicine

The Provost of Clemson University, **Dr. Nadim Aziz,** has granted three postdoctoral positions to a team led by **Dr. Emil Alexov** to carry out research on the biology of human diseases and their mechanisms, diagnoses, and personalized medicine. The team includes faculty members from several departments: **Dr. Susan Chapman** (Biological Sciences), **Dr. Weiguo Cao** (Genetics and Biochemistry), **Dr. Feng Ding** (Physics and Astronomy) and **Dr. Brian Dominy** (Chemistry). The project is in close collaboration with the Greenwood Genetic Center (GGC), which is represented by **Dr. Charles Schwartz** and his team.



Flowchart representing the major components involved in companion diagnostics and personalized medicine

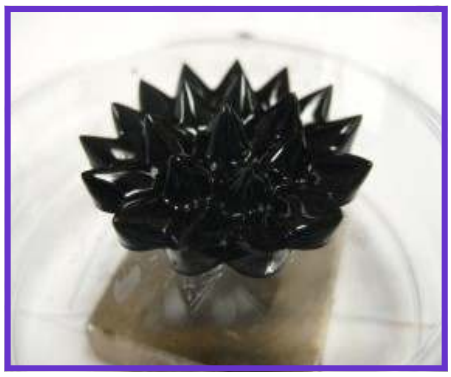
The proposed investigation represents a comprehensive extension of research capacity that begins with a clinical phenotype (GGC) to gene variant mapping and characterization, with an ultimate goal of developing tools for potential curative or ameliorative therapies that translate across areas of various specific scientific expertise. In brief, genetics researchers identify disease-associated genes, pathways and genetic variations using various approaches, including targeted or whole genome sequencing and data mining through bioinformatics. Cell biologists, developmental biologists, biophysicists, physiologists, and biochemists epidemiologists then analyze that data in order to determine the impact of the variant or mutation on cellular and organismal function, and what other modifying factors (epigenetics and environment, e.g. environmental factors) may play a role in exacerbating or resolving the disease status.

Overall, this collaboration represents a unique partnership with a strong potential for corporate research support. The proposal combines the academic resources of the Clemson University departments of Biological Sciences, Genetics and Biochemistry, Physics, and Chemistry, the medical and clinical resources of the GGC, private sector interest from existing company partners at the GGC, and the political commitment to this collaboration at the local and state level. By expanding our research capacity in health and human diseases, we will open opportunities for translational research, collaboration with private sector partners, and begin to build a reputation for Clemson's specialized capacity in this area.

Such a team of researchers will provide unique environments at Clemson University and GGC, since each location has specific, well-defined functions in the framework of the major goals described above. To the best of our knowledge, such a synergy does not exist at most of academic institutions, although it is likely under development. The work of the team will be at the frontiers of modern medicine and will add to the economic development of the Upstate and the State of South Carolina.

Basic research on human disabilities and diseases, including intellectual disabilities, developmental syndromes, neurological, and metabolic disorders, will be complemented with the development of new diagnostics that may be used to predict the efficacy of therapeutics for targeted disease states.

Clemson SEC/ACC Collaborations across the Gridiron



Ferrofluids form a spiking pattern on top of a rectangular magnet.

Clemson and UGA are Developing a Low-Cost Device to Detect Cancer

(Adapted from http://media-relations.www.clemson.edu/5052)

While many college football fans focus on the historic rivalry between the Georgia Bulldogs and the Clemson Tigers, researchers from the two institutions are working together off the playing field to develop a low-cost technology that can detect cancer.

Jian He, Assistant Professor of Physics and Astronomy at Clemson, and **Leidong Mao**, Associate Professor in the College of Engineering at the University of Georgia, have discovered a system to measure the magnetic properties of materials, by combining their knowledge of ferrofluids (or liquid magnets) and microfluidics, fluids that are geometrically constrained to a small, typically sub-millimeter, scale. "Conventional equipment for measuring magnetic properties of materials is large and expensive," Mao said. "By combining these two technologies, we are able to measure magnetic properties of materials using a low-cost, small device that works quickly and leaves a small footprint." The researchers use their technology to isolate cancer cells with magnetic particles from a sample. "This research collaboration will continue to build on current results of their technology and apply to other types of applications, including materials research and cancer diagnostics. Dr. He's research is supported by the National Science Foundation and the Experimental Program to Stimulate Competitive Research (EPSCoR).

Clemson, UVA Researchers Turn Waste Heat into Electricity

(Adapted from http://media-relations.www.clemson.edu/5202)

Clemson University and the University of Virginia compete on the football field in the ACC Conference, but researchers from these two institutions are working together to convert waste heat into high-quality electricity. The researchers say that the conversion of waste heat into electrical energy will certainly play a role in today's challenge for alternative energy technologies, in order to reduce our dependence on fossil fuels and lessen greenhouse gas emissions. **Terry Tritt**, Alumni Distinguished Professor in Clemson's Physics and Astronomy Department, and **Joe Poon**, an endowed professor and Chairman of the University of Virginia's Physics Department, are developing thermoelectric materials that provide direct conversion of heat into electricity.

"Over the past ten to fifteen years, there have been significant advances in the scientific understanding of thermoelectric materials," Tritt said. "Thermoelectric materials can be incorporated into power-generation devices that are designed to convert waste heat into useful electrical energy." These materials are currently being used in automobiles, including the Chevy Suburban and the BMW X5. The installed devices are converting waste heat from the exhaust system into electricity for the automobile, recovering more than sixty percent of waste heat that is lost relative to the input energy. Moving forward with this research, the team hopes to find new sources of waste heat and develop thermoelectric devices to capture the large amount of the waste heat that the world produces. They're also working on thermoelectric cooling materials that will provide zonal cooling for the automobile.

Reflections of Outgoing Faculty Senate President Jeremy King

Dr. Jeremy King (left) receives the Faculty Senate gavel from Past-President Dan Warner

By Dr. Jeremy R. King

The 2012-2013 academic year afforded me the great privilege of serving my colleagues as Faculty Senate President. The position offered a sweeping view of the university enterprise and the opportunity to be engaged in the nuts-and-bolts aspects of diverse issues — all while still teaching, mentoring, and advising students. That sustained engagement with the core university mission was, I quickly discovered, critical: insulating oneself in dealing with the host of daily issues, problems, and challenges quickly creates the illusion that the entire university is crumbling.

Happily, it was the opportunity to work with many dedicated faculty, well-intentioned administrators, talented staff, and incredibly passionate and thoughtful students that enabled me to see this illusion as just that. In particular, I want the readers of this newsletter—our students, their parents and families, faculty, alumni, and friends—to know that from the 40,000 foot view I had, it is crystal clear that Clemson Physics and Astronomy is a healthy academic unit in a great university. Or, as one University administrator recently quipped to me when I bumped into him on campus, "we need more physics!"

Professional physics provides a surprisingly useful context for the role of Faculty Senate President. I offer the following observations related to this:

- Physics is, fundamentally, about change. Even systems that physicists describe as being in equilibrium are, viewed on different spatial or temporal scales, in fact, dynamic. Physicists don't shirk from change — it's the coin of their realm. That was especially helpful in refocusing dismissive claims by some that faculty "fear change" into more productive discussions of what is actually correct: faculty (like other rational human beings) justifiably fear loss of important things as higher education undergoes change.

- Context is important in solving problems. In physics, that "context" might be in the form of constraints, plausible boundary conditions, substitutions, reasonable approximations, etc. Discerning and exploiting such context is what gives solving difficult physics problems an element of artisanry. This artisanry may be applied to the challenging problems in higher education. Exhaustive efforts to preserve the status quo *in toto*, (as reflected in policies, procedures, curriculum, and assessment) can create needless, significant, and possibly insurmountable challenges for achieving educational sustainability in a fluid environment of change, fiscal challenges, income disparities, and institutional economic foundations.

- Physicists are good at quickly estimating the seemingly impossible and understanding and expressing the uncertainties in those estimates. Universities are often most comfortable in only estimating easy, closely-held quantitative data, and ignoring uncertainties. Making mental estimates of closely-held data and/or unstated uncertainties was a frequent and useful task as Faculty Senate President. Armed with such estimates, one can effect a healthier culture of transparency. The states and state functions of higher education and its institutions often aren't thermodynamically sharp. Important things really are distributed, and with significant variance. Understanding that and properties of distributions is helpful—nay, necessary.

- The perception that large universities in the research vanguard are data-starved and not prepared to make conscious data-driven decisions is largely incorrect, but there's a good reason it often appears that way. Universities are beginning to become awash in data—often data forced upon them—and governing boards are becoming proactive in seeking conscious data-driven decisions. The institutional data/analysis/research resources that universities maintain to study themselves, though, have become inadequate in a landscape of increasing complexity. These offices are generally engaged in attacking problems using basic inferential statistics. The truth is that the really important Big Questions facing many universities can't be answered robustly with such tools.

- While physicists might be well suited to attack such problems in future, my observation is that physics enables one to do something more foundational: simply recognize problems as much more complex than realized by many thoughtful people who are asking excellent questions, but are overmatched by the nature of the problem in trying to answer them—and don't understand that they are overmatched.

- The apparent confounding irrationality of universities obscures a more fascinating and, in some respects anyway, probably healthy feature in their evolution as systems—they're becoming cybernetic, and they'll have to be, in order to survive in a more complex, fluid, and unpredictable environment. A university would like to increase its minority undergraduate enrollment, yet it offers no-to-little transfer aid to students to accomplish this. That same university wrings its hands in seeking a means to combat dangerous alcohol abuse, but also goes to great lengths to support an athletics and Greek culture that sustains this abuse. The university expends increasing effort on regulation and safety, yet wants its faculty to be more entrepreneurial. Administrators and governing boards expect faculty and students to throw our education and intellectual weight around and publicly change the world, yet university presidents cut in this mold (e.g., a modern Fr. Hesburgh) are nowhere to be found.

In sum, there is rarely a good idea or initiative that a university does not like, and whether any two good ideas or initiatives or policies work against each other is immaterial. Many see all this as insane or irrational. A physicist, though, might recognize the above examples as self-correcting and sensing mechanisms allowing balance to be maintained between competing interests—much like a star attempting to achieve hydrostatic equilibrium. Thus, when readers of this article hear statements such as we can engineer a better human system that is higher ed, or that higher ed is the philosopher's stone that will mint economic development, or that if this lever is pulled or that knob is twisted then all our challenges will be met, I hope they are skeptical. They should be—good physicists are.

Dr. Emil Alexov has received the Clemson University "Excellence in Mentoring Award." He would like to thank his graduate students for nominating him and for their outstanding work in his lab.

The research in the lab focuses on computational modeling of biological macromolecules and their assemblages, as well as predicting biophysical quantities associated with them. In the picture, left to right, **Lin Wang**, **Margo Petukh**, **Dr. Emil Alexov**, **Shannon Stefl** and **Nick Smith**.

Dr. Phil Burt

Dr. Philip B. Burt Memorial Fellowship Endowment

Dr. Philip B. Burt was a beloved professor who inspired his students and fellow faculty members with his keen intellect and his sincere desire to see others succeed. In his memory, an endowed fellowship has been created by one of his former students. This endowment, once fully-funded, will provide fellowship support for graduate students in the Department of Physics and Astronomy. Please join the effort to preserve Dr. Burt's legacy and provide assistance to current and future graduate students in theoretical physics. To donate to the endowment, you may visit: **https://cualumni.clemson.edu/remember/burt**

The initiator of the fellowship is **Kevin Kindall**, a 1997 Ph.D. graduate of the Department. Most recently, Kevin was the Director of Quantitative Analysis for the Commercial Division of ConocoPhillips. His group was responsible for derivatives pricing, risk management, and trading support, and served as an internal consultancy to other areas of the company. Kevin originally joined the firm as Director of Risk Analysis.

Kevin graduated from Bob Jones University with a B.S. degree in 1991 and received the Alumnus of the Year Award from that institution in 2008. He also earned a M.S. in 1995 and a Ph.D. in physics in 1997 from Clemson University and an M.S. degree in computational finance in 1998 from Carnegie Mellon.

Prior to his time at ConocoPhillips, Kevin was a manager for the Forward Markets Group of FPL Energy, where his activities included asset optimization and market analysis, in particular the assessment of wind energy. Before joining FPL, Kevin served as a member of the research group at Enron, where his work centered on enterprise risk management. He was one of the whistleblowers who brought he scandal at Enron to light, and his role was discussed in three pages of one of the leading books on the ensuing corporate debacle, Kurt Eichenwald's *Conspiracy of Fools*. Kevin speaks at several conferences per year, both in industry and in academia, and has co-authored technical articles for industry publications. His lecture venues have included Rice University, the University of Michigan, the University of Texas at Austin, and the University of Tulsa. He is also a member of the World Affairs Council of Houston, an organization that sponsors presentations on international issues. To read about Kevin's role in bringing the Enron scandal to light, please visit: **http://www.randomhouse.com/crown/features/conspiracyoffools/excerpts4.html**

School students compete in math contest.

29th Annual American Mathematics Competition

On November 19, 2013, the Department hosted the 29th Annual American Mathematics Competition – AMC 8 for middle school students. This event was sponsored by Clemson through a Creative Inquiry project designed to promote interest in advanced mathematics and science to pre-college students in an atmosphere of competition and fun. Over sixty fifth through eighth graders participated in this national competition. **Dr. Jason Brown** was the contest manager, and seventeen undergraduate students from physics and other departments enrolled in the Creative Inquiry class.

Physics graduate students with interests in outreach activities (**Jeremy Capps**, **Shannon Stefl**, **Amber Porter**, **Shihwei Chao**, **Dina Drozdov** and **Courtney McGahee**) actively participated in organizing the event, from designing the t-shirts to promoting the competition and proctoring the test. A week before the test, visiting computer science graduate student **Agnes Cseh**, who has organized similar math competitions in Europe, held a test preparation in Kinard. This session was well received by students and parents, and we are currently working in collaboration with the Math Department at Clemson to organize a regular series of such lectures as training opportunities for future contests. Next on our competition calendar are the AMC 10/12 contests for high-school students in February 2014 and Kangaroo Math, an international math competition that involves over six million students in grades 1-12, in March 2014. If you have children interested in upcoming mathematics competitions at Clemson, please do not hesitate to contact Dr. Jason Brown by email at: brown6@clemson.edu.

Post-Doc Says Goodbye after Year at Clemson

Dr. Ignacio Mendigutía

Dr. Ignacio Mendigutía recently departed Clemson University after spending a year working as a post-doctoral fellow at the Department of Physics and Astronomy. His work at Clemson was conducted in collaboration with **Dr. Sean Brittain**, studying the mechanisms by which dust and gas disks that surround young stars evolve into planetary systems. Beginning in January 2014, he will continue working in the same research field and collaborating with Clemson's staff at the University of Leeds (UK).

A native of Madrid, he obtained his B.S. in astrophysics at the Universidad Complutense de Madrid. Later, he spent almost a year working on data taken by the Infrared Space Observatory (ISO) as a trainee at the European Space Astronomy Centre (ESA/ESAC, Madrid), eventually earning his Masters in astrophysics on 2008 at Universidad Complutense de Madrid and the Universidad Autónoma de Madrid. He was awarded a "Calvo Rodés" grant at the end of 2007, with which he started his Ph.D. thesis research on protoplanetary disks around young stars. He spent a few months at the Space Telescope Science Institute in Baltimore during 2010, as part of his thesis research. His defended his Ph.D. thesis, "Accretion and circumstellar properties of Herbig Ae/Be stars" in January 2012 at the Universidad Autónoma de Madrid, where he was contracted for one more year to continue his research. This Ph.D. thesis was a runner-up in the Sociedad Española de Astronomía (SEA) contest for the "Best Spanish Thesis in Astrophysics," and was nominated by the SEA, along with two other Spanish theses, for the "MERAC" prize for the best European thesis in astronomy (2014).

The Clemson University Physics and Astronomy Newsletter

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Department News

Tianhong Yu, *a graduate student of* ***Dr. Bradley S. Meyer***, *has graduated with a Ph.D. in physics. Tianhong accompanied Meyer during spring semester 2013 on Meyer's sabbatical at the University of Hawaii at Manoa. He has accepted a position in Houston at CGG as a Seismic Imager.*

Congratulations to ***Dr. Joe Johnson*** *(Ph.D. 2010) and his wife* ***Beth***, *who had a baby girl on October 4, 2013. Her name is* ***Emily Nedia Mae***. *Joe is a professor of physics at Southeast Community and Technical College in Middlesboro, Kentucky.*

Dr. Sanjib Gupta *(Ph.D. 2002) recently published his collaborative work with researchers through the Joint Institute for Nuclear Astrophysics, "Strong neutrino cooling by cycles of electron capture and β− decay in neutron star crusts," in a Letter in the December 1, 2013 edition of Nature. Sanjib is currently a professor at the Indian Institute of Technology at Ropar.*

Celeste Hackett, *the Department's Undergraduate Student Services Coordinator, and her husband* ***Brian*** *recently added a daughter to their family,* ***Catherine Elise***. *Catherine was born on June 27, 2013. In addition to Catherine, Celeste and Brian have a daughter* ***Christina***.

Dr. Robert Reed, *(Ph.D. 1994) former graduate student of* ***Dr. Pete McNulty***, *was recently named a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for 2014. Dr. Reed is a professor of electrical engineering at Vanderbilt University in Nashville.*

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