The University of Connecticut

College of Liberal Arts and Sciences

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DEPARTMENT OF

PHYSICS NEWS

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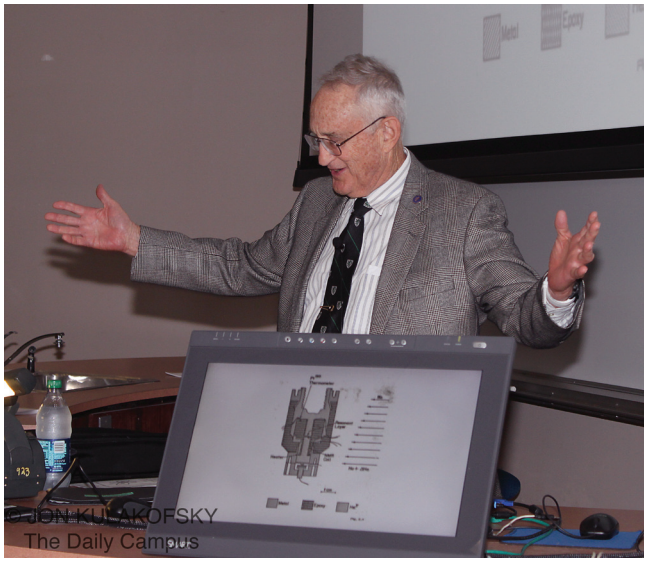


Photo courtesy of the Daily Campus, UConn.

David M. Lee, 2013 Katzenstein Lecturer

The Katzenstein Lecture this past year ran into a surprising hiccup. We had invited David Wineland of the National Institute of Standards and Technology and Nobel Laureate in 2012 to be our speaker. However, political turmoil in Washington hit us in Storrs as Dr. Wineland, a federal government employee, was forbidden to do any work during the government shutdown including giving the Katzenstein Lecture. However, David Lee, our own alumnus and good friend to the Department, came through and saved the day. Dave and his wife Dana were already planning to visit Storrs for the event, and Dave graciously agreed to step in at the last minute as a substitute Katzenstein Lecturer – a substitute who himself was a Nobel Laureate.

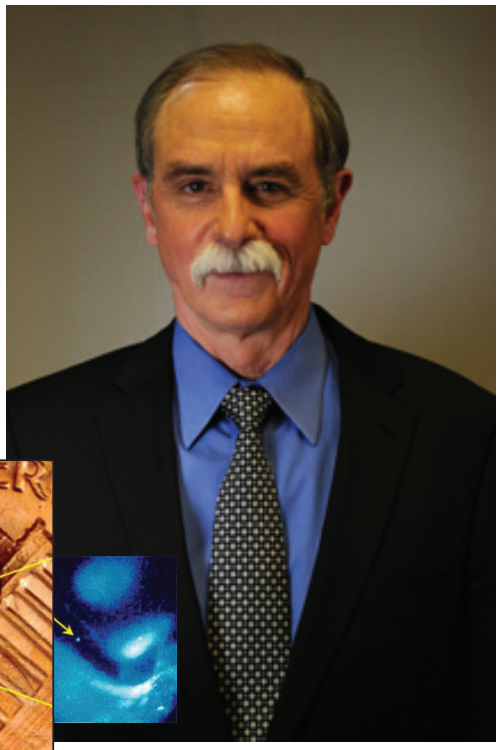
As part of his visit to Connecticut, Dave treated us to a special topical lecture on his recent research in cryo-chemistry at Texas A&M on Thursday, October 3rd. This was in addition to the public Katzenstein Lecture delivered on Friday, October 4th, where Dave gave a broader perspective on his recent research and the path to cryo-chemistry after his earlier work on superfluid ^{3}He, for which he shared the Nobel Prize in 1996.

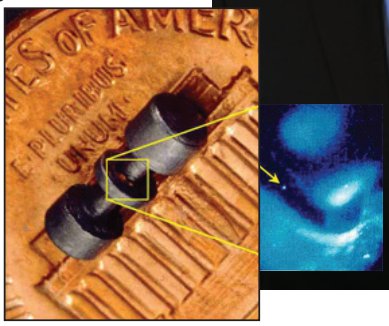
Professor Lee received his B.S. at Harvard (1952), his M.S. at UConn (1955) and his Ph.D. at Yale (1959). After Yale, Dave joined the faculty at Cornell University where he was able to isolate and condense ^{3}He (or helium 3, a fermionic atom with two protons, two electrons, and one neutron), the isotopic cousin of the far more abundant ^{4}He (a bosonic atom with two protons, two electrons, and two neutrons). With student Doug Osheroff and colleague Robert Richardson, Dave observed phase transitions which were hallmarks of superfluidity in a fermionic system. The trio were awarded the 1996 Nobel Prize in Physics for their novel discovery, which had broad implications for quantum matter. Dave also led the Laboratory for Atomic and Solid State Physics at Cornell, whose activities unveiled many profound physical concepts and offered lasting contributions to several fields of physics through the education of its many excellent graduate students, many of whom are leaders in diverse scientific fields and include members of our own UConn physics faculty.

Professor Lee is currently emeritus professor at Texas A&M University where he maintains an active research program and has turned his curious eye and capable hand toward macroscopic manifestations of quantum mechanics in a different context. Working with experimentalists in Finland and drawing on highly developed expertise in challenging low-temperature experiments, Dave presented some of the unexpected effects that occur when chemical reactions take place at near-zero temperatures. These exciting gateway re-

sults showed that cryo-chemistry is an exciting field at the nexus of condensed matter, atomic physics and chemistry.

David Wineland,
Katzenstein Distinguished Lecturer
Friday, October 24, 2014





On Friday, October 24, Dr. David J. Wineland of the National Institute of Standards and Technology (NIST) in Boulder, CO will deliver the seventeenth annual Katzenstein Distinguished Lecture: "Superposition, Entanglement, and Raising Schrödinger's Cat." Dr. Wineland and Professor Serge Haroche of the Collège de France and Ecole Normale Supérieure in Paris shared the 2012 Nobel Prize in Physics "for ground-breaking experimental methods that enable measuring and manipulation of individual quantum systems." Their fundamental research not only elucidates fascinating and counterintuitive aspects of quantum mechanics, but also has practical value, paving the way to future technologies such as quantum computing and atomic clocks.

Dr. Wineland and Prof. Haroche worked on complementary aspects of quantum systems. In Wineland's research on laser-cooled trapped ions, precisely-controlled laser light produced exotic quantum states of the particles, including quantum superpositions in which a particle can be in two distinct energy states at once. On the other hand, Haroche's work used highly-excited atoms to manipulate quantum states of photons, or particles of light. In both cases, a key aspect was being able to nondestructively measure a quantum state. Dr. Wineland and his colleagues developed techniques to laser cool ions to their lowest possible energy state and then coherently manipulate both their internal energy and their motional degrees of freedom. They demonstrated a logic gate based on the principles of quantum mechanics, a prerequisite to the realization of a quantum computer. This type of futuristic computer, which would store and manipulate information in superposition states, has the potential to vastly outperform classical computers in certain tasks. The coherent manipulations pioneered by Dr. Wineland also form the basis of an optical atomic clock based on a single trapped ion. Such a clock, a hundred times more precise than the present cesium-atom-based time standards, would be off by only five seconds over the age of the universe! It has enabled direct observation of the relativistic effect of gravity on time, the so-called "gravitational red shift." Two such clocks, differing in height by only 30 cm, were seen to run at slightly different rates.

Dr. Wineland was born near Milwaukee, attended high school in Sacramento, and studied physics at the University of California, Berkeley. His graduate work at Harvard was done with Prof. Norman Ramsey (Nobel Laureate 1989). Following postdoctoral research with Prof. Hans Dehmelt (also Nobel Laureate 1989) at the University of Washington, he joined NIST, then known as the National Bureau of Standards, in 1975. He is currently a NIST Fellow and Group Leader of the Ion Storage Group. In addition to the 2012 Nobel Prize, Dr. Wineland has received many honors and awards, including the National Medal of Science (2007), the Benjamin Franklin Medal in Physics (2010), the Davisson-Germer Prize (1990) and the Arthur L. Schawlow Prize (2001) from the American Physical Society, and the William F. Meggers Award (1990) and the Herbert Walther Award (2009) from the Optical Society of America. He is a member of the National Academy of Sciences.

Sigma Pi Sigma Events and Undergraduate Awards

The Sigma Pi Sigma Honor Society induction ceremony and banquet took place May 2. The featured guest and speaker was Professor Meredith Hughes (Wesleyan). Her talk, entitled "Planet Formation through Radio Eyes," was very interesting and well received, and marked the second consecutive talk on Astronomy (hint, hint). Sharing the spotlight with Professor Hughes was this year's select group of inductees: **Kara Googins**, **Michael Cantara**, **Shaun Benvie**, **Lukasz Kuna**, and **Isaac Packtor**. Kara is also an honors scholar and vice president of the undergraduate student government; Shaun is a 2014 Babbidge Scholar and Isaac was an honorable mention at the 2014 Calculus Competition. See page 13 for an article on Michael; Lukasz was featured in last year's issue. These scholars truly stand out academically, and the bar for induction continues to rise.

Professor Hughes filled P38 almost to capacity, and her talk did not disappoint. She described the Atacama Large Millimeter Array (ALMA) and how it will be used to test theories of planetary formation from direct radio wave observations (Atacama refers to a desert in northern Chile, home of some of the world's largest telescopes).

After the colloquium, 31 family members, friends, and faculty attended the SPS banquet, which was held for the third consecutive year in the Morosko Student Lounge of the Pharmacy Building. Our professional (except he is not paid) Emcee Professor Emeritus **David Markowitz** ran the show, supporting the SPS advisors, Professors **Thomas Blum** and **Barrett Wells** who managed their only important task, to not lose the Chapter Book.

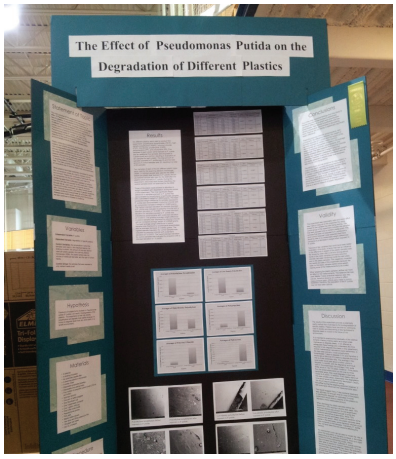
The SPS banquet is one of the department's most special events that brings us together for a great cause: to recognize the scholarly achievements of our best undergraduate students. It is also a great occasion to see fellow students and faculty before everyone disperses for the summer break. We encourage all of our faculty, alumni, students and their families to attend next year's celebration.

Science Down Under

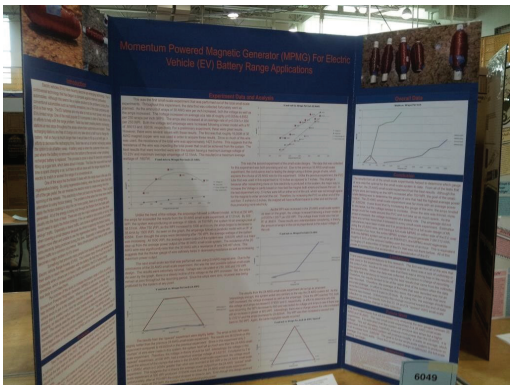
Steve Gensemer '00 announces that he has recently been hired into a permanent position as a Research Scientist at Australia's Commonwealth Science, Industrial and Research Organization (CSIRO). He is working in the Precision Optics group which builds optics for gravitational wave detectors (LIGO), astronomy and spacecraft, and has begun to branch into other fields including optical scattering of nanoparticles and solar energy. He lives with his wife and three boys within sight of the beach near Sydney, Australia. He would especially enjoy being contacted by any UConn folks who may be travelling down under at stephen.gensemer@gmail.com.

UConn Awards Promising Young Scientists at CT Science Fair

The 66th Annual Connecticut Science and Engineering Fair took place March 11-15, 2014 at Quinnipiac University. Awards were announced on Saturday, celebrating diverse contributions to this year's winners' circle. A team from the UConn Physics Department which included **Jason Hancock**, **Menka Jain**, **Heather Osborne** and **David Perry** convened at Quinnipiac University to judge the projects from all high school levels in the categories of physical and life sciences. The team distributed the UConn Physics Department and Early College Experience awards. Identities of the participants and their districts remain anonymous until after the fair. Each participant was awarded a $100 gift certificate as a cash prize.



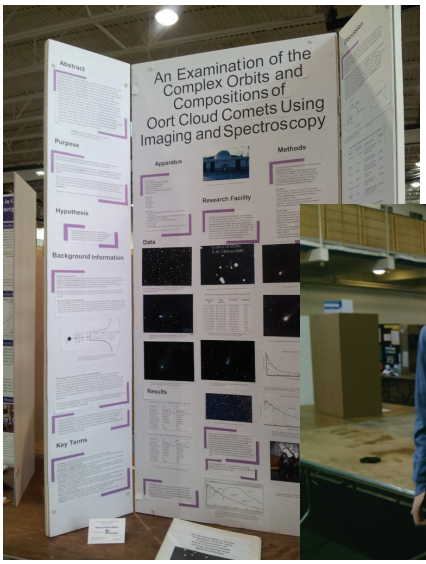
9th grader **Lauren Low** from Engineering and Science University Magnet School in Hamden was awarded the UConn Early College Experience Program in Life Sciences Award for her project entitled *The Effect of Pseudomonas Putida on the Biodegradation of Plastics* which showed clearly how a specific bacterium found in soil was effective at decomposing various types of plastic.

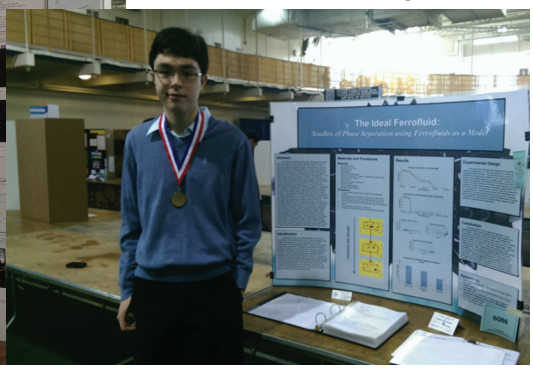


12th grader **Arthur Doelp** from Greens Farms Academy in Darien CT was given the UConn Physics Department Award for his project entitled *Momentum-Powered Magnetic Generator For Electric Vehicle Battery Range Applications* which sought to improve the operating range of vehicles using inertial effects to help reclaim energy of motion.

11th grader **Carly Klein-Stern** of New Milford High School in New Milford, CT was awarded the UConn Early College Experience Program in Physical Sciences Award for her project entitled *The Oort Cloud: A Cometary Reservoir,* where a systematic set of images was able to resolve the orbital parameters of the comet ISON from a land-based telescope.

In addition to judging the Life Sciences section of the fair, Dr. Jason Hancock mentored 11th grader and aspiring physicist **Joseph Neumann** of Amity High School in Woodbridge, CT, who was awarded the prestigious Connecticut Science Fair Board of Directors Award for his project entitled *Studies of Phase Separation Using Ferrofluids as a Model*. Joseph's research was conducted at UConn in close coordination with Amity High School's Science Research Program, headed by Ms. Deborah Day. Joseph's project involved an equipment-development component through the construction of a low-profile electromagnet, specifically designed to be compatible with a light transmission research microscope. This research addresses technology in the early stages of application with elite companies such as BMW and may be applied in contexts engineers have not yet discovered. Joseph received a certificate and a $50 gift card.





More information on the CT State Science Fair can be found at: http://www.ctsciencefair.org/.

Award-winning posters at the CT State Science Fair at Quinnipiac University March 11-15. The UConn physics department selected these posters from over 494 entries in categories ranging from middle school to high school in physical and life sciences. Joseph and his prize medallion attending his poster at the CT State science fair March 15.

David Pritchard presents Pollack Distinguished Lecture

The Edward Pollack Distinguished Lecture was presented on Friday, April 25, 2014 by David E. Pritchard, who is the Cecil and Ida Green Professor of Physics at MIT. This lecture series is funded by an endowment account established by members of the Pollack family and friends of the late Professor Edward Pollack and features a distinguished speaker on a topic related to Prof. Pollack's research interests in experimental atomic, molecular and optical physics or his long career as a devoted and successful undergraduate physics teacher. Pollack's tenure as a faculty member in our department began in the early 1960s, soon after he finished his Ph.D. in AMO physics, as a student of Benjamin Bederson at NYU.

In his Pollack Lecture, Prof. Pritchard spoke on the topic "How 10 years of Education Research Revealed 40 Years of Bad Assumptions," having shifted his research interests recently from basic AMO physics to Physics Education Research, a topic of broad interest to our faculty and students in the College of Liberal Arts and Sciences. Pritchard had lunch with faculty and took time for discussion with graduate students before the lecture. Todd Campbell, Associate Professor of Science Education, representing UConn's Neag School of Education attended. Rita Pollack, widow of Edward Pollack, Pollack's daughter Lois (now a professor of Applied Physics at Cornell) and her husband Ken Finkelstein (also on the Cornell research staff) also attended the lecture and the dinner that followed, along with our new Department Head, Nora Berrah. The dinner, attended also by colleagues Prof. Gould (a Ph.D. advisee of Pritchard's), Prof. Islam, Prof. and Mrs. Kessel, Prof. and Mrs. Smith (Smith spent a sabbatical with Pritchard) and Prof. Wuosmaa, afforded some time for an enjoyable informal discussion with the speaker.

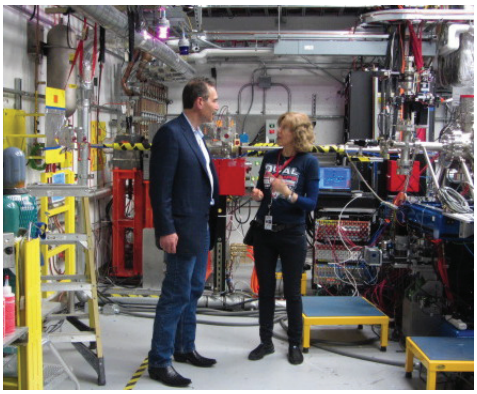
Photo courtesy of Gren Hren Photography/ Research Laboratory of Electronics at MIT.

This year's Pollack Lecturer David Pritchard, a graduate of Caltech (B.S.) and Harvard (Ph.D. 1968) has received four national or international prizes (including the Broida and Schawlow prizes and the Max Born optics prize) for his research in atomic physics. Pritchard's research areas span a broad range from laser spectroscopy, atom-molecule collisions, line broadening, and van der Waals molecules to atom interferometers, precision mass measurement, atom-light forces, atom traps, Bose-Einstein condensates and atom wave amplifiers. His group invented the MOT, a trap for cold atoms using laser light, and the Ioffe-Pritchard trap, both widely used in the study of ultracold atoms and molecules. He has mentored four winners of national thesis awards and four Nobel prize winners over his research career. He is a member of the National Academy of Sciences, and a Fellow of the AAAS, the American Physical Society and the Optical Society of America. Prof. Pritchard developed the software system MasteringPhysics® with his son, along with similar software in chemistry and other sciences, bundled with leading textbooks and used by 300,000 students in physics and over 2 million total users this year. His current education research at MIT focuses on Learning, Assessing, and Tutoring Effectively (http://RELATE.MIT.edu). The website describes his pedagogy for teaching problem solving and use of online resources for learning introductory physics.

In his lecture, Pritchard described how he used his Socratic online tutor, MasteringPhysics, to improve student performance in MIT's introductory physics course by about two standard deviations, a dramatic success. His research in physics education also elucidated exactly what the students learned, how much they remembered as seniors, and how what physics teachers want to teach (e.g. logic and derivations) and what students want to learn (how to do well on the tests and homework) do not jibe. Pritchard also touched on how to detect and reduce cheating on homework and tests and how to use online learning, MOOCs (massive open online courses), and other resources to improve physics performance and make learning physics more satisfying for students.

Mark Miller Tours SLAC National Laboratory

Mark E. Miller is a UConn alumnus who received his B.S. in physics in 1980 followed by his J.D. at Vermont Law School in 1983. He is now a partner at O'Melveny & Myers LLP in San Francisco, CA and New York City although his base is in California. He visited the physics department during his trip to UConn at the end of April and met with **Nora Berrah**, the new head of the physics department. During their conversation, Nora realized that Mark was aware of SLAC National Laboratory, which is located in Menlo Park, 20 miles south of San Francisco in the West Bay. SLAC is devoted to advancing science on many fronts and because Mark was very interested in finding out what was behind the fences and gates on Sand Hill Road, Nora invited him to visit the facility that houses her experiment using the Linac Coherent Light Source (LCLS). On May 16th, Mark toured the world's first x-ray laser and met with Nora's postdocs and collaborators on the experiment floor, while the laser beam was being tuned to provide the two x-ray wavelengths



needed to carry out the femtosecond experiments. Quoting Mark, "Touring SLAC and meeting your colleagues was a phenomenal experience. I am truly fortunate to have explored the guts of SLAC with you." If you live in or visit the bay area when Nora is there, she will be happy to show you the facility.

Mark recently established an endowment account, the Mark E. Miller Undergraduate Research Fund (#31409) with the College of Liberal Arts and Sciences. "I was very fortunate to have an opportunity to participate in research as an undergraduate physics major at UConn. That research was instrumental in setting up my career path. The invaluable opportunity provided to me at UConn has motivated me to create an endowment supporting undergraduate research in Physics." The account is dedicated to programmatic enhancements at CLAS to exclusively support undergraduate research programs and initiatives in physics.

Puckett Presents Plenary at Transversity 2014

Professor **Andrew Puckett** was invited to give a plenary talk reviewing the results on transverse-momentum-dependent parton distributions (TMDs), from the recently completed 6 GeV running of Jefferson Lab, at the 4th International Workshop on Transverse Polarization Phenomena in Hard Processes, which took place from June 9-13, 2014 in Chia, Cagliari, Italy (http://www.ca.infn.it/~tv2014/index.html). The workshop aims to cover the latest in the crucial physics and technology of the title. It follows those held in 2005 on Lake Como (Italy), 2008 in Ferrara (Italy) and 2011 in Lošinj (Croatia), organized within the framework of an Italian Ministry-funded inter-university Research Project of National Interest (PRIN).

Cynthia Peterson: UConn's First Female Physics Professor at a Milestone

Professor Cynthia Peterson joined UConn's Physics Department near the end of the 1960s, about the time men first walked on the moon. Recalling the famous words about a small step for a man that meant a giant leap for humanity, we may suggest that UConn's modest beginning for a woman has contributed to the giant achievements of women scientists in the United States.

A year after Cynthia began, the University asked her to teach astronomy and she has done so time and again. By her estimate, she has taught more than 9,000 UConn undergraduates through formal classes and many other individuals in outreach programs since she began. The milestone the University has recognized in formal events and in the blog today.uconn.edu ... is 45 years of service to the University and the community. UConn does this recognition event for service of 25 years and then further in increments of 5 years.

Cynthia eagerly describes the dramatic changes in investigating and understanding what the Universe is doing over its vast time-scales and distances to the farthest reaches. The Hubble Telescope, the Kepler Space Observatory, and huge arrays of radio-wave detectors are among the tools that reveal the accelerating Universe, the births and deaths of stars, and planets of different types outside our solar system. The new results are incorporated into astronomy courses, thus keeping them up-to-date.

Teaching has been transformed as well. Computer use has made classes more interactive and students more self-directed. Cynthia uses these features to motivate students to levels which were not possible when learning was more passive. Lab work still counts, however, as does "eye-to-eyepiece" telescope observation, as Cynthia puts it.

For most of her time at UConn, Cynthia was the only woman on the physics faculty, and for more years than that she was the only woman Professor in the department with tenure. She expresses gratitude to the late Professor Paul Klemens for hiring and mentoring her during her early years. As a small observation, when you are the only member of a group requested by the University to join some committee, then it's you or no one.

Cynthia's fond memories include recording the transits (passage of a planet between Sun and Earth) of Mercury in 1970 and Venus in 2012 in the rooftop observatory on the Physics Building. The Planetarium on North Eagleville Road on the campus holds a special place in her heart and in her children's memories.

A final few words: Cynthia's husband, physicist Jerry Peterson, has been a good friend to the Department. He and Cynthia accompanied many of us on the yearly climb of Mt. Monadnock in southern New Hampshire around Columbus Day in the days when we could do it. The annual hike still happens and mainly younger faculty and vigorous students tackle the mountain now.

Cynthia with Hyewon Pechkis (UConn Ph.D. 2010), new to the faculty at Bryn Mawr and Katherine Gebbie, former Bryn Mawr classmate and past Director of the Physical Measurement Laboratory at NIST.

Recent UConn Physics Graduate Student Placement, 2014

Our most recent Ph.D. graduates have promising beginnings to their careers. **Fahad Alhashmi Alamer** plans to teach in his home country of Saudi Arabia. **Han Chen** has accepted a position at Aetna. **Hui Chen** has accepted a position at Calmar Laser in California. **Liang Dong** has obtained a postdoc position at UPenn. **Robert Fischetti** has been teaching at MCC, the University of Hartford and Quinnipiac. **Kun Fang** will be an analytics software engineer at Pocket Gems in San Francisco. **Nicholas Lewkow** accepted a position at McGraw-Hill in Boston. **Taisiya Mineeva** has a postdoc position at the Institute of Quantum Computing at the University of Waterloo in Ontario. **Lahiru Narangammana** plans to teach in her home country of Sri Lanka. **Franz Rueckert** has a faculty position at Wentworth Institute of Technology in Boston. **Erin Seder** has a postdoc position at CEA Saclay in Paris, France. **Margo Staruch** was awarded an NRC Fellowship and has accepted a postdoc position at the Naval Research Lab in DC. **Vincent Tagliamonti** accepted a postdoc position at StonyBrook. **Elie Wolfe** accepted a postdoc position at the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, Canada. **William Zimmerman** has accepted a postdoc position at Duke University. We wish you continued success in your careers. Congratulations!

Second Edition Semiconductor Optical Amplifiers

Niloy Dutta and his former graduate student **Qiang Wang** (Ph.D. 2005) have published a second edition of their book on *Semiconductor Optical Amplifiers*. The first edition in 2006 and this second were both published by World Scientific. Their book provides a comprehensive treatment of design and applications of semiconductor optical amplifiers (SOA). SOA is an important component for optical communication systems. It has applications as in-line amplifiers and as functional devices in evolving optical networks. The functional applications of SOAs were first studied in the early 1990s and the diversity and scope of such applications have been steadily growing. *Semiconductor Optical Amplifiers* is self-contained and unified in presentation. It can be used as an advanced text by graduate students and by practicing engineers. It is also suitable for non-experts who wish to have an overview of optical amplifiers. The treatments in the book are detailed enough to capture the interest of the curious reader and complete enough to provide the necessary background to explore the subject further. Contents of the book include: Theory of amplification, Noise, Polarization dependence, Fabrication techniques and SOA designs, Low reflectivity designs, Pulse amplification, Gain and phase recovery, Four wave mixing, Quantum dot amplifiers, Reflective amplifiers, Functional applications in optical time division multiplexed systems, and Optical logic circuits.

Dan Potrepka Reports from US Army Research Laboratory

I work in the PiezoMEMS group in the Sensors & Electron Devices Directorate led by Ron Polcawich. Our group is recognized worldwide in the PZT PiezoMEMS field (using lead zirconium titanate to develop MEMS [microelectromechanical systems]) for materials and devices. Our work supports resonator, filter, and actuator applications of PZT MEMS devices, mainly for RF microwave radar applications. My major focus right now is a study I am leading on atomic (multi) layer deposition of PZT. The pace is frenetic but the work is exciting.

Other areas of research at ARL support magnetic detection under Alan Edelstein, who used to be at NRL but is an established ARL Fellow now, acoustic sensing, electro-optic/IR materials/devices, micro-photonics. There is even some optical trap work led by a former post doc of Bill Phillips at NIST, Qudsia Quraishi.

We do not match up to thermoluminescence work in my group. Right now the big thing at ARL is a new open campus concept that focuses on establishing collaborative partnerships with academic institutions, government, small businesses and industrial partners world-wide. It's such a new initiative, I am actually going to a presentation on it tomorrow, but it is rapidly rolling out. I would be happy to share more about it with the UConn community, particularly Physics, ME, EE, and materials science, as I learn more.

Spike Lee's script of "Time Traveler" is finished but no studio movie deal yet… Ronald Mallett recently presented a talk at Morehouse College in Atlanta, GA where Spike Lee and Samuel Jackson are notable alumni.

HUGS Competition

UConn Ph.D. student **Richard F. Obrecht** (major advisor, **Andrew Puckett**) was awarded a fellowship to attend the 29th Annual Hampton University Graduate Studies (HUGS) summer school at Jefferson Lab. The HUGS Program at Jefferson Lab is a summer school designed for experimental or theoretical nuclear and particle physics graduate students who have finished their coursework and have at least one year of research experience. Acceptance into the program is competitive, and all lecturers are internationally renowned leaders in their fields. The 2014 school will focus on experimental and theoretical topics of high current interest in strong-interaction physics. In particular, students will receive excellent insight into the physics to be studied at Jefferson Lab in the upcoming years, as well as related topics of interest in nuclear and particle physics. The fellowship covers the full cost of lodging and includes a stipend for meals and incidental expenses. For more information about the program visit https://www.jlab.org/hugs/.

Gayanath Fernando's Pedagogical Manuscript Advances

From: Jessica Barrows, Commissioning Editor, World Scientific Publishing Company

I am pleased to inform you again, Professor Fernando, that our editorial board has approved your proposal entitled *Essential Mathematics and Physics for STEM Majors: With Problems and Solutions*. I look forward to continuing to work with you on this excellent project. (You will receive a draft contract.)

Connecticut Invention Convention

Dave Markowitz and **Cynthia Peterson** participated in the Connecticut Invention Convention as judges in their respective judging circles for the CIC competition on May 3, 2014. 2014 marks the 31st Connecticut Invention Convention (CIC) competition, hosting more than 700 young inventors from grades k-8, with more than 370 Judges from UConn faculty and staff, local industry and educators, entrepreneurs, marketing and other professionals participating from across the state. More than 100 state-wide schools are currently involved.

CIC had its official start in 1983, originating with teachers looking for an integrated school unit of instruction that would benefit many different kinds of learners. It has been co-hosted by UConn's School of Engineering since 1998, with major support by United Technologies Corporation and other industries and museums across CT. CIC has recently received support from the Connecticut General Assembly for important expansion efforts, with the goal of every child in CT being involved at some level of their education. Participants have already won awards at the local level in their home schools. Among other outcomes, as far back as CIC records show, girls have always outnumbered boys as participants, an interesting contribution to gender equality in science.

CIC is the largest event of its kind in the nation, and the longest continuously-operating program serving young inventors and entrepreneurs. To date more than 250,000 kids have completed the CIC curriculum and more than 25,000 kids have attended the state's annual convention.

Editors-in-Chief Thank Gerald Dunne

We are delighted to inform you, Professor Dunne, that your EPJD paper *New Strong-Field QED Effects at extreme light infrastructure. Nonperturbative vacuum pair production* has been one of the most highly-cited articles in the journal over the past 5 years, and is one of a select group with over 50 citations in that period.

High-impact articles like this contribute significantly to the visibility of the journal, and we thank you for your part in raising the profile of EPJD within the ATMOP community. European Physical Journal celebrated its 15th anniversary last year, and the series continues to grow stronger through the range of core titles (A-E) and recently launched open access journals such as EPJ Techniques and Instrumentation.

In recognition of the impact of your earlier article, we will make your next published paper in EPJD freely available for a period of two months. The paper will also be included in the EPJ Highlights section; a professional science writer will summarize the key results in a short article for a wider audience, thus increasing the overall visibility of the paper.

IARD/PT Conference Report

The Department of Physics at the University of Connecticut hosted a joint interdisciplinary conference devoted to relativistic dynamics (IARD) and PT (parity time reversal) symmetry that was held in Storrs from June 9 to June 13, 2014. Conferences in both areas of research have taken place regularly over the last 15 years, with this being the first time the two have been brought together in a single framework.

On the International Association of Relativistic Dynamics (IARD) side, the conference was the ninth in a series of international meetings, with the previous eight having taken place at the University of Houston (Texas) in 1998, Bar Ilan University (Israel) in 2000, Howard University (Washington DC) in 2002, Saas Fee (Switzerland) in 2004, University of Connecticut in 2006, Aristotle University (Thessaloniki, Greece) in 2008, National Dong Hwa University (Huallen, Taiwan) in 2010, and the Gallileo Galilei Institute (Florence, Italy) in 2012.

Conferences on PT Symmetry have been held regularly since 2003 with previous meetings having been held at Villa Lanna (Prague) in 2003 and 2004, Koc University (Istanbul) in 2005, Stellenbosch University (Cape Town) 2006, Universita di Bologna (Italy) 2006, City University (London) 2007, Benasque Centre for Science (Spain) 2008, Tata Institute (Mumbai, India) in 2009, Zhejiang University (Hangzhou, China) in 2010, Max Planck Institute (Dresden, Germany) in 2011, University of Paris (France) in 2012, and Koc University (Istanbul) in 2013.

The Storrs meeting was attended by 40 registrants from the United States, Canada, United Kingdom, Austria, Germany, Italy, Spain, Czech Republic, Israel, India, Singapore and Japan. The informal nature of the conference, including catered lunches, coffee breaks, and an evening banquet for the participants, greatly contributed to its success. The developer of PT symmetry, Professor Carl Bender of Washington University St. Louis, participated and addressed the other attendees. Over the 5 days 35 talks were presented and they will be featured in the upcoming conference proceedings. The local organizing committee was Professor **Philip Mannheim**, UConn (chair), Professor **Ronald Mallett**, UConn, and Professor **James O'Brien** (Wentworth Institute of Technology), one of UConn's former Ph.D. students.

We Hear That …

- **James O'Brien** (Ph.D. 2010) just received tenure at Wentworth Institute of Technology in Boston.
- **Daniel Violette** received the James B Willett Educational Memorial Scholarship Award from the Universities Space Research Association for this past academic year in addition to being a University and an Honors Scholar. He received his bachelor's in Engineering Physics in May.

New Arrivals

Michelle (Micki) Bellamy has accepted the program assistant position vacated by Barbara Styrczula this past winter. Micki lives in Stafford Springs with her husband Dennis, beagle Elijah and Siamese

cat Radish. In addition to being animal lovers, they enjoy cheering on the Red Sox and the Bruins. Their three children, Dennis, AJ and Kaitlin have left the nest but all enjoy family time and rooting for their Boston teams whenever possible. Micki received her B.A. at the University of Hartford while working as the office coordinator of music education in the Hartt School of Music and as an accounts payable specialist, both at the University of Hartford. She then went on to receive her masters and Ph.D. degrees in Judaic studies at the Yale Divinity School and Boston University, respectively. Micki was an industrious honor student and currently enjoys teaching adult education classes at her synagogue. Her organizational skills and exuberance for education are evident as she becomes more familiar with the undergraduate and graduate programs here at UConn. We are delighted to welcome her into the department.

We recently welcomed **Thomas Dodge** to the physics department teaching labs. Tom joined us as a teaching laboratory technician in May, coming to UConn from Las Positas College, CA, where he held a similar position.

Tom was raised in Kentucky, where he obtained a bachelor's degree in mechanical engineering. The summer after his graduation, he worked at the Culham Center through the University of Nottingham, England. "That was a really great summer, that got me hooked on travel." Later, he worked for the Army Corps of Engineers.

Tom moved to California to take graduate classes at UC Davis. In the summers, he taught English as a Second Language (ESL) classes in southern China near Guilin, and (relatively) near Auytthaya in Thailand. "In Thailand, I was in the middle of nowhere, just rice paddies all around, some of the students even slept at the school, but everyone was so friendly and welcoming; it was great." His most vivid memories of his time in Thailand are the time he spent in Khao Yai National Park and his scuba-diving lessons off the coast of a small island.

Eventually, Tom joined Las Positas College in the San Francisco bay area. He worked as a teaching laboratory technician for the physics, engineering, astronomy, and geography classes. He left Las Positas to join our department in May.

Tom's hobbies are hiking, programmable electronics, and basketball. "It's only half-court, and we're looking for more players." He also enjoys taking walks with his dog, Niko (named for Nikola Tesla). Tom and his wife of two years, Nurcan, are expecting their first child. His friends and colleagues also enjoy his great sense of humor. Please join us as we welcome Tom to our department!

After a successful open search, The Physics Department welcomed its new head, Professor **Nora Berrah** to UConn in January of this year. Berrah brings an international reputation as an accomplished atomic, molecular and optical physicist, along with a passion for showing students of all ages, especially women and minorities, that physics is an accessible and exciting field for anyone.

Nora receiving the Davisson-Germer prize from APS President Malcolm Beasley.

Berrah's research focuses on probing and understanding the interactions of matter with light. Using the Linac Coherent Light Source (LCLS) at Stanford University, the most powerful x-ray laser in the world, or synchrotron radiation from the Lawrence Berkeley National Laboratory, Berrah explores what happens deep inside molecules and nano-scale systems when exposed to ultra-intense beams of light. The way the constituents of matter, atoms and molecules react, at a quadrillionth of

a second, can help scientists understand how other fundamental dynamical processes work in larger systems such as biological molecules. Berrah was awarded the prestigious Davisson-Germer Prize in Atomic Physics from the American Physical Society (APS) this year "*For pioneering experiments on the interaction of atoms, molecules, negative ions and clusters with ionizing vacuum ultraviolet and soft x-ray photons*."

From a young age, Berrah, who grew up in Algeria and attended the Université d'Alger, had a keen curiosity for the sciences. In her school system, students were exposed to specific disciplines like physics as early as middle school. Because of this experience, and because of the early 20th-century physicist Marie Curie's influence as a Nobel-prize-winning scientist, Berrah says that French-speaking countries have one of the highest percentages of women in physics in the world. Matching these outcomes in the U.S. is one of Berrah's lifelong career goals. The most crucial first step, Berrah says, is exposing girls to physics and STEM fields from a young age. Berrah herself has spoken in US high schools and mentored women across the world, in Sweden, North Africa (Morocco, Algeria, Tunisia) and the U.S. "How are you going to know if you like physics if you've never been exposed to it?" she says.

As a teacher, Berrah impresses upon her students that physics is a gateway to an exciting, fulfilling, and successful career. People who study physics in college and major or pursue a Ph.D. in physics can work not only in industry and education, but also in health care and financial and business fields such as investment banking.

Berrah came to UConn because she was inspired by a state that had invested so many resources in higher education, in initiatives such as Next Generation Connecticut. "I wanted to be part of the university in a state that values education and excellence in advancing the STEM fields and that is funding the university at the level it promised," she says. "They don't just pay lip service to education. They really believe in it since they are doing it."

As department head, she plans to expand and strengthen UConn's physics programs. "We want to continue to recruit excellent students and hire excellent faculty who do excellent science," she says.

Berrah will collaborate with the group of atomic and molecular physicists at UConn, and also with researchers in chemistry, engineering and biology. But she admits that no matter how much work scientists do, it will never be enough to understand so many puzzles nature has for us, and this is why we need to keep training the next generation that will in turn push the frontiers of science forward. "The more I know about physics, the more I realize that a lifetime isn't enough to learn all there is to know about it, but it is an exciting field that keeps us happy. Faculty in physics departments often never really retire because they just love it" Berrah says.

College of Liberal Arts and Sciences Dean Jeremy Teitelbaum is especially proud to have Berrah at UConn. "Nora is a national expert in laser physics and has been an effective advocate for women in physics and in science more broadly," he says, "I look forward to working with her to build a stronger and more diverse physics department at UConn."

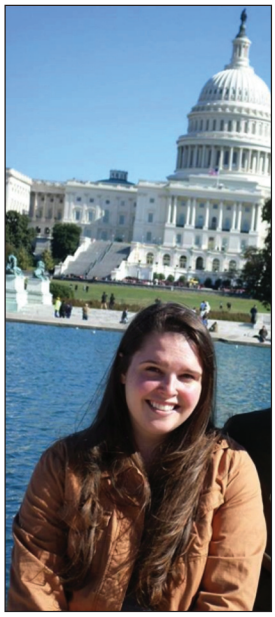
Alan Wuosmaa joined the Physics Department in January 2014 as Professor of Physics. Prior to that, he was Professor of Physics at Western Michigan University, and before that, Physicist at Argonne National Lab. Alan obtained his B.A. and Ph.D. degrees in physics from the University of Pennsylvania in 1983 and 1988, respectively.

Alan's research is in the field of experimental low energy nuclear physics. He is especially interested in the structure and properties of atomic nuclei and, in addition, how nuclei interact with each other. Such knowledge is important in understanding how elements were created in the early universe, as well as in the stars and supernovae that are observed today. He performs experiments at two major national user facilities in low energy nuclear physics such as ATLAS (Argonne Tandem Linac Accelerator System) at Argonne, and the National Superconducting Cyclotron Lab at Michigan State University. He also plays a major role in developing the Facility for Rare Isotope Beams

(FRIB) now being constructed at MSU. He is currently a spokesperson for HELIOS (The Helical Orbit Spectrometer) collaboration and Chair of the ATLAS Users Executive Committee at Argonne.

We are very excited to have Alan Wuosmaa join us, and look forward to the contributions he will make to the Physics Department and the University in coming years.

Staruch wins NRC Fellowship



Margo Staruch joined the Physics department in 2006 and received her master's degree in 2009. She joined Professor **Menka Jain's** research group and worked on her Ph.D. dissertation titled "*Magnetotransport and Multiferroic Properties of Perovskite Rare-earth Manganites*." Under Dr. Jain's supervision, she published 12 papers as first author and 6 other papers as coauthor in international scientific journals. She defended her dissertation in July 2013 and won the prestigious National Research Council postdoctoral fellowship last summer. Through a national competition only a limited number of these fellowships are awarded for research to be conducted at the selected federal laboratories and affiliated institutions. In September 2013 Margo started her postdoctoral position at the Naval Research Laboratory in Washington, DC in the Materials Science and Technology Division. Her current research focuses on both single-phase multiferroic and magnetoelectric composite thin films. She is also involved in exploring the potential of these materials for applications in vibrational energy harvesting and magnetic field sensing.

Super-Student

Michael Cantara '16 was awarded the 2014 national Barry M. Goldwater Scholarship for Excellence in Education this past year. A native of Rhode Island, Michael studies engineering and physics. Being a sophomore, he receives the Goldwater scholarship for two years. The prestigious prize was awarded for his research in theoretical particle physics with **Peter Schweitzer,** which he began in his freshman year. The research deals with Q-balls, extended particle-like field-configurations which can be stable or exhibit instabilities, depending on the parameters of the theory. Michael reported the first results of his research at the 2014 APS April Meeting in Savannah, GA for which he received a UConn undergraduate (OUR) travel award. Michael's multifacetedness and enthusiasm for physics are documented by the fact that besides conducting theoretical research, he received a SURF award for his project with **William Stwalley**, "Formation of Ultracold Rb3 Molecules" for summer 2014. Michael's remarkable award year is rounded up by his induction into the Physics Sigma Pi Sigma Honors Society, the John Tanaka award from the UConn chapter of Phi Kappa Phi, the Universities Space Research Association Educational Scholarship, and being named a 2014 Babbidge Scholar. We congratulate Michael, and wish him continued success in his young career.

In Memoriam

Leonid Azaroff
6/19/26 - 7/3/14

Leonid (Lee) V. Azaroff, an internationally known crystallographer and founding director of UConn's Institute of Materials Science, died in Naples, Florida early in July. Lee received his B.S. at Tufts College and his Ph.D. at MIT in 1954, followed by a position as a Senior Scientist at the Armour Research Foundation and then a Professor at the Illinois Institute of Technology. He was a guest professor at Brookhaven National Lab from 1961-64 and a visiting professor at the University of Massachusetts from 1978-79. In 1965, Lee was appointed director of UConn's newly opened Institute of Materials Science, and

he held the position until he retired from UConn in 1992. After the unanimous agreement of the 12 other members at that time, Acting Department Head Marshall Walker invited him to become a member of the Department of Physics. Lee Azaroff was most recognized for his expertise in Xray diffraction and for his administrative abilities in organizing scientific efforts. Abundantly cited were his 60 research articles and his monograph "The Powder Method in Xray Crystallography" (McGraw Hill, 1958). He was instrumental in beginning the Department of Metallurgy and in expanding relations of UConn with industrial research laboratories, including United Technologies and the Rogers Corporation. He oversaw the development of graduate-level interdisciplinary research programs in polymer science and crystal science, and in 1970 supported the establishment of an x-ray laboratory for the atomic-level definition of biomacromolecules, one of the early such facilities in the country. In his retirement, he continued writing and produced a small book entitled *Physics Over Easy: Breakfasts with Beth and Physics* (World Scientific Publishing, 1996), which relates the principal features of physics through easy-to-understand conversations with his wife. Chapter titles include "Breakfast of Hard-boiled Eggs with Inertia" and "Breakfast of Apple-gravity Pancakes." Lee received numerous awards over decades from UConn, from Connecticut agencies, and from national organizations. They all recognized his contributions to education, science and economic development.

David Bedding
May 27, 1941 - April 12, 2014

David Bedding received his Ph.D. from UConn in 1972 where he worked on experiments using atomic beams with his advisor, Tom Moran, for the next 20 years. Dave was born in Bridgeport, CT and earned his B.S. from Fairfield University and his M.S. from Clark University; his thesis for the latter was in solid state physics, which he turned back to studying later in his career. He was a physicist at the Woods Hole Oceanographic Institute and Underwater Sound Laboratory before returning to earn his Ph.D. He spent the remainder of his career at UConn, becoming Associate Professor of Physics. Dave was noted for his teaching ability; he had a broad understanding of physics and related areas, and was very approachable, earning him excellent ratings with his students. He was very engaged in professional and political activities that embraced all academic disciplines. He served as President of the UConn chapter of the American Association of University Professors (AAUP), the chief guardian of faculty rights. He was Vice President of the CT State Conference of AAUP chapters, and finally President of the Emeritus Assembly of CT AAUP after his retirement in 2003. Our community shares this great loss with his wife and family.

Fred A. Otter
September 9, 1920 - March 21, 2014

Fred Otter was Adjunct Professor with the Physics Department after spending the bulk of his career as a Research Scientist with United Technologies. He earned his B.S. at Lehigh, his Masters at Temple and his Ph.D. at the University of Illinois. His interest and knowledge of novel materials meshed well with those of our department, most notably with Joe Budnick with whom he had fruitful interactions over many years. His contributions to the Department of Physics and the Institute of Materials Science were numerous and beyond recompense. He was a valuable source of information for our students and a congenial collaborator. Our faculty knew him as the kindest of gentlemen and one who maintained his admirable disposition through the adversity of his illness. Fred and his wife established the Fred and Kathleen Otter Scholarship through the College of Liberal Arts and Sciences in 2003 for academically outstanding CLAS graduate or undergraduate students who demonstrate financial need. The fund number is 30873, should you wish to make a contribution in Fred's memory.

ENDOWMENT NEWS

The Department is grateful for your endowment contributions, which enable us to achieve our mission and that of the University. We will be hosting our seventeenth annual Katzenstein Distinguished Lecture to be presented by Nobel Laureate David Wineland on October 24, 2014, thanks to the endowment of Drs. Henry and Constance Katzenstein. The fund also provides a $250 prize and plaque for the best paper in physics by an undergraduate student. This year's winner was **Joshua Squires** for his honors thesis "Comparative Study of Classical and Quantum Scattering on Atomic and Molecular Scales." The Edward Pollack Endowment for Physics, initiated by Ed's family and friends, supports an annual distinguished lecture in Atomic, Molecular, and Optical Physics. See page 5 for the article on the Edward Pollack Distinguished Lecture presented by David Pritchard this past April.

We have several maturing funds intended to support graduate students doing research. Our most recent endowment is the "Kurt Haller Academic Opportunity Fellowship," initiated by Thomas J. Welsh (B.S. 1975) and acknowledged by Lottie S. Haller (wife of Kurt) in memory of Kurt Haller (Professor of Physics 1964-2004), which provides support for graduate students demonstrating academic achievement and financial need. The Georgiana and Marshall Walker Endowment rewards the student voted by the faculty as the best Teaching Assistant of the year. This year the award was shared by **Han Chen**, who was consistently praised by her students for her clarity of presentation, effective use of physics problems and ability to foster interest in the material, and **Bradford Snios**, who designed a new introductory astronomy course for the summer session and served as its course instructor last summer. Brad's students also praise his presentations and ability to inspire them. The Anne and Win Smith Fellowship (Win Smith is currently Emeritus Professor of Physics) is awarded to students demonstrating academic achievement. The Isaac S. and Lois W. Blonder Graduate Fellowship in Physics was named for Isaac Blonder, our first physics major, B.S., 1938, while the Nagavarapu Graduate Award in Physics was named after Nagavarapu S. Mohan (Ph.D. 1975). Other endowment accounts include the Ruth and Paul Klemens Endowment Award, named in honor of our distinguished Emeritus Professor Paul Klemens (a world expert on phonons and thermal conductivity in condensed matter physics) and his wife Ruth, which supports graduate students interested in solid state physics; the Dwight Hills Damon Graduate Fellowship in Experimental Physics (initiated in 2006 in his honor and memory); the Edward Frisius Memorial Fellowship (initiated by his family, which includes Mauricette (Frisius) Stwalley, wife of William Stwalley, former Head of the Department (1993-2011) and Professor of Physics) presented to **Brandon Clary** for this summer; and the Kurt Haller Endowment for Physics Research and Graduate Education, which provides research awards to our best graduate students (initiated in 2004 in his honor and memory). In order to attract the most talented and deserving graduate students, we have begun to offer fellowships to our incoming classes. We expect to honor a number of gifted recipients next year.

We are grateful to all of you who contribute to these funds and the continued support and education of our students. Many of you respond to the general solicitations sent out by the University; please use the fund numbers on the next page to direct such contributions to the Physics Department. Your assistance in helping us achieve our mission is invaluable.

Jessica Brown, physics major advisee of Professor **Philip Mannheim**, has been offered a paid internship with NASA! She will spend the entire fall semester in Maryland at the Goddard Space Flight Center working on her project entitled "Cosmic Microwave Background Polarimetry." A description of the internship can be found at https://intern.nasa.gov/ossi/web/public/guest/searchOpps/index.cfm.

Making a Gift

There are many ways of making a gift including checks; marketable securities; planned or estate gifts; and through payroll deduction for University employees. Checks should be made payable to The University of Connecticut Foundation, with a cover note directing your gift. All gifts are eligible for tax deductions as The University of Connecticut Foundation, Inc., is recognized as a 501(c)(3) non-profit organization. Donors have the option of remaining anonymous if they wish.

STILL ELECTRIC

We received many positive responses about sending the newsletter electronically so we will continue to do our part to save trees and other resources. We are still printing hard copies of the newsletter so if you would like to change your preferences, please let us know. You may reach us at physics@uconn.edu.

I/we would like to support the Physics Department programs.
Please direct my gift of $_____ to:

- Kurt Haller Academic Opportunity Fellowship (31224-2014)
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Do you have any news about yourself that you are interested in sharing? We enjoy the unsolicited mail we receive as a result of our newsletters so now we're actively soliciting. We happily accept articles or tidbits for 'we hear that…' Please send suggestions to: David Markowitz, Editor, at the Department address or to dmarkowitz0324@gmail.com.

SAVE THE DATE October 24, 2014

Invitations for the Katzenstein dinner have been mailed. If you are interested in attending but do not receive your invitation by the beginning of October, please contact Kim Giard at 860-486-4924, email: kim.giard@uconn.edu.