

For alumni, friends, faculty, and staff of the MSM-UMR-Missouri S&T Physics Department

Hale Named S&T's Woman of the Year

Dr. **Barbara Hale**, Professor of Physics at Missouri S&T, has been named S&T's 2013 Woman of the Year. She was honored during a ceremony in Leach Theatre on April 17, 2013.

The Woman of the Year award is given annually in recognition of efforts to improve the campus environment for women and minorities. As part of the award, Hale received a \$2,000 stipend funded by Missouri S&T graduate Cynthia Tang, founder and former chair of Insight Industries Inc.

"Dr. Hale is an outstanding educator," wrote one of her nominators. "She has been an outspoken advocate for the faculty and for her students." The nominator also noted that Barbara has received both the Faculty Excellence Award and the Outstanding Teacher Award numerous times.

Barbara, pictured below with Chancellor **Cheryl B. Schrader**, is a senior investigator in the Cloud and Aerosol Science Laboratory



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Jentschura Elected APS Fellow

Ulrich **Jentschura**, Associate Professor of Physics at Missouri S&T, has been named a fellow of the American Physical Society.



Jentschura was selected for his "groundbreaking calculations of quantum electrodynamic energy shifts in simple atomic systems." Fellowship is limited to no more than one half of one percent of APS membership, and is a recognition by peers of outstanding contributions to physics.

Ulrich joined the Missouri S&T faculty in 2008. The list of honors he has received since then is remarkable. In 2009, he received a \$100,000 grant from the National Science Foundation to study quantum electrodynamics, a theory that describes the interaction of atoms and atomic processes. Ulrich was selected by the editors of the journals Physical Review and Physical Review Letters as one of their Outstanding Referees for 2010. Only about 0.3% of active referees receive this honor.

Ulrich was awarded a NIST Precision Measurement Grant in 2010. He was featured on the front page of the January 7, 2011 issue of Physical Review Letters with an article about novel states of the light field known as "twisted photons," and was selected to be a member of the Editorial Board of the Physical Review A for 2011-2013. In September 2011, he was awarded a \$264,000 NSF grant for "Advanced computational physics in atomic and laser

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Memo from the Chair

This past year was one of change and accomplishment for the Physics Department. Long time faculty members **John Schmitt** and **Ron Bieniek** retired, with Ron taking the position of Dean of the Honors College at Marshall University. We wish them all the best in their future endeavors. Prof. **Ulrich Jentschura** was promoted to Associate Professor with tenure, and was elected a Fellow of the American Physical Society. In addition Profs. **Greg Story** and **Thomas Vojta** won Outstanding Teacher Awards, and **Paul Parris**, **Dan Waddill**, and **Gerry Wilemski** received Outstanding Teaching Commendations.

Over 80% of our undergraduate majors graduated with honors. Graduate students **Hari Chaluvadi**, **Hatem Barghathi**, and **Rabi Khanal** won first, second, and fourth respectively in the 2013 Missouri S&T Council of Graduate Students Research Showcase. They work for Profs. **Don Madison**, **Thomas Vojta**, and **Julia Medvedeva**.

Hari Chaluvadi and Prof. Madison also teamed together on an article entitled "Experimental and theoretical investigation of the triple differential cross section for electron impact ionization of pyrimidine molecules." This paper was one of the top-most cited articles in the Journal of Chemical Physics. These and other stories of student and faculty accomplishments can be found elsewhere in this newsletter.

The coming year promises many changes for the department and the campus. After seven years without Colleges or Deans we are returning to them. The University will have a College of Engineering & Computing and a College of Arts, Sciences, & Business in the Fall, and a Vice Provost and Dean will preside over each College. In addition, the University has started on an aggressive program to add 100 new faculty positions by 2020.

Our department also has an opportunity to receive considerable funds from the University for teaching laboratory improvements. In order to qualify for the funds we need your assistance in raising matching funds to support our laboratory teaching efforts. Please consider designating some or all of your phonathon or departmental contributions to this laboratory fund so that our students can benefit from an improved laboratory environment.

I will close as I have the past several years. I thank all of you for your continued support. The department remains a vital and thriving unit. This is primarily due to the quality and dedication of our faculty, students, staff, and alumni. I hope that we can continue to count on the generous support of our alumni. It is clear that the department's ability to provide a quality education to our students would be hampered without your dedication and support.

– Dan Waddill



Dan Waddill

To Contact S&T Physics

If you would like to contact us for any reason, you can reach us by phone at (573) 341-4781 and by e-mail at physics@mst.edu. You might also be interested in checking out our web page, <http://physics.mst.edu>.

Endowments: Gifts that Continue to Give

Many generous donors have found that creating an endowment, a fund established with cash, securities or other assets which provides income in perpetuity, offers a significant, long-term impact on Missouri S&T. Endowments can be unrestricted or restricted for a specific purpose such as scholarships, department programs, faculty support, etc. Endowments can be started with as little as \$15,000 and additional funds can be added at any time in the future.

The Missouri S&T Physics Department has several donors that have been adding to their endowment for several years, including endowments established by **Ed** and **Mary Sue Sickafus**, and by the estates of **Richard Anderson** and **Richard Hannum**. Our most recent endowment came from **John** and **Patty Rogers**.

The ongoing nature of an endowment provides a way to support your alma mater and give them the financial strength to do things that might not otherwise be possible. If you want to learn more about the Missouri S&T endowment program and how you can participate, please call 1-800-392-4112, or e-mail giving@mst.edu.

Physics Department Awards 2013-2014 Scholarships and Fellowships

The following scholarships have been endowed through the generous gifts of the friends of the Missouri S&T Physics Department. Please contact the Physics Department if you would like to add to the endowment fund of these scholarships or would like to establish a new one.

The *Dr. John R. and Patty Rogers Endowed Scholarship* provides scholarships to academically proficient physics majors who demonstrate financial need. The 2013-2014 Rogers scholarship was awarded to **Robert Branson** from Butler, Missouri, **Austin McCoy** from Lynchburg, Missouri, and **Sawyer Scheer** from Hamilton, Ohio.

Recipients of the *Harold Q Fuller Scholarship-Loan* were **Derek Anderson** from Blue Springs, Missouri and **Alexander Mark** from Manchester, Missouri. The \$1,300 scholarship-loan was endowed by the late Dr. **Harold Q Fuller**, chair of the Physics Department from 1948 to 1970 and former Dean of the College of Arts and Sciences, to recognize outstanding achievements among juniors and seniors in physics. One quarter of the scholarship is an interest-free loan that students begin to repay when they start their first jobs.

The recipient of the *Burke H. Miller Memorial Scholarship* was **Christian Dzurny** from Sikeston, Missouri. This \$1000 endowed scholarship was established by the Miller family to commemorate the academic achievements of their son, **Burke**, who graduated with a bachelor's degree in physics in 1969 and later died during the Vietnam War. The award is for promising and dedicated students in physics.

Patricia Huestis from Abilene, Texas, was awarded the \$1000 *Ed and Mary Sue Sickafus Endowed Scholarship/Fellowship*, established by **Ed** (BS '55, MS '56) and **Mary Sue Sickafus** in conjunction with the Ford Motor Company and awarded to physics students on the basis of their performance at Missouri S&T.

Stephen Kraus from Jefferson City, Missouri and **Nelson Shreve** from Waynesville, Missouri received the *Leon E. Woodman Memorial Scholarship*. This \$500 or \$1000 scholarship was established by the Woodman family in honor of Dr. **L. E. Woodman**, Chair of the Physics Department from 1919 to 1948. It is offered to students in physics who are of good moral character, maintain a satisfactory grade point average, and are in financial need.

The *Richard W. Hannum Endowed Development Fund* was established through a bequest by **Richard Hannum** (PhD '66). The fund is currently used to provide scholarships for outstanding students in Physics. **Andrew Cudd** from Overland Park, Kansas received the \$500 Hannum Scholarship for 2013-2014.

The *Richard Anderson Scholarship Fund* is an endowment established in memory of Dr. **Richard Anderson**. **Andrew Cudd** from Overland Park, Kansas received the \$500 Anderson Scholarship for 2013-2014.

The *Stephen P. Reed Scholarship Fund*, an endowment, provides scholarships to US citizens enrolled in mathematics or physics who are sensitive to a peaceful and humane search for knowledge and solutions to technical problems of mankind. **Jason Summers** of Rolla, Missouri received the \$500 Reed Scholarship for 2013-2014.

In addition to endowed scholarships, which are usually awarded to juniors and seniors, the department awards special *Physics Department Scholarships*, funded from the annual phonathon, to students who earn a grade point average of 3.5 or higher. This past year, department scholarships of \$2000 each were awarded to **Timofey Golubev** from Chesterfield, Missouri, **Paul Somers** from Springfield, Missouri, **Juan Remolina** from Saint Charles, Missouri, **David Owen** from Saint Louis, Missouri, **Nocona Sanders** from Poplar Bluff, Missouri, and **Josey Stevens** from Wooldridge, Missouri.

Departmental scholarships of \$1000 each were awarded to **Clayton Craig** from Manchester, Missouri, **Alyson Smith** from Belleville, Illinois, **Giannino Lusciic** from Ballwin, Missouri, **David Wilkerson** from Winfield, Missouri, **Matthew Pollard** from Fenton, Missouri, **Rachel McCormick** from Maryland Heights, Missouri, **Nikita Gahr** from Cuba, Missouri, **Dawson Huth** from Ballwin, Missouri, **Katherine Overend** from Lansing, Kansas, and **Brock Hinton** from Parkville, Missouri.

Report from the SPS

If 2012 was the most active SPS year ever (see last year's, newsletter), then it had a repeat performance in 2013.

The year began with election of new officers for the semester. **Nelson Shreve** was elected President, **Frank Marshall** Vice President, **Andrew Cudd** returned as treasurer, and **Alyssa Castro** became secretary. **Mike Christopher** remained SPS StuCo rep.

Spring 2013 activities included an informal question and answer session with Lockheed Martin recruiters, games nights, movie nights, and GRE review sessions. SPS heard talks by Professor **Chen Hou** of the Biological Sciences Department, and Professors **Julia Medvedeva**, **Gerry Wilemski**, and **Michael Schulz** of the Physics Department. SPS ran several events at the regional Science Olympiad competition in February, and students toured the Research Reactor Facility at Missouri University in Columbia. Of course, the semester closed with the mandatory liquid nitrogen ice cream celebration.

Josey Stevens took over as secretary at the beginning of the fall 2013 semester. In addition to more games, movie, and GRE review nights, SPS heard from Professor **Dan Waddill** on "How to get into graduate school." A large number of students made the annual trek to Argonne National Laboratory for the undergraduate research conference, and seem to have returned in one piece.

Frank Marshall, a member of the Mars Rover Design team, spearheaded a presentation during SpaceWeek 2013, a series of programs designed to educate the public about the wonders of space exploration, engineering and astronomy. As you might imagine, the presentation focused on the wonders of liquid nitrogen. And of course, the fall semester closed with the now-mandatory liquid nitrogen ice cream party.

The membership of SPS would like to thank alumni who have made events like the Argonne trip possible through their donations at the annual Physics phonathon.



Outstanding GTA's



Sumudu Herath

This past year we again presented graduate teaching awards to honor the outstanding accomplishments of our graduate teaching assistants. The awards are determined by a combination of student evaluations and teaching performance assessed by the faculty overseeing the teaching laboratories. The 2013 winners were **Sumudu Herath** (PhD '13), **Seng Huat (Sam) Lee**, and **Aaron Viets**. Congratulations to all the winners for helping to advance the department's commitment to excellence in teaching.

Jentschura APS Fellow

(continued from page 1)

science." In 2013 he was one of six winners of a competition by the Hungarian Academy of Sciences to invite internationally-recognized scientists to join research in Hungary, and was called "one of the most prolific scientists in quantum theory" by the Academy.

Here at Missouri S&T, Ulrich received a Faculty Excellence Award in 2011 and a Faculty Research Award in 2013. Also in 2013 he was promoted to Associate Professor.

The main focus of Ulrich's research group is the investigation of fundamental physics questions in the low-energy domain, using a combination of computational physics methods and field-theoretical tools. In addition, his group studies laser-physics related questions in the high-energy domain. These investigations are important because of the ongoing construction of high-power laser laboratories all around the world. His group has also been studying anharmonic oscillators and their physical properties, and the renormalization-group flow of theories with periodic self-interactions in two dimensions. A common and unifying theme of these investigations is the use of modern computers.

John Johnson Appointed Professor at Harvard

John Johnson (BS '99) accepted a tenured full professor position in the Astronomy Department at Harvard University in 2013. Prior to that, he was Assistant Professor of Astronomy at Cal Tech.

In the last few years, John received the American Astronomical Society's Pierce Prize, a Packard Fellowship, a Sloan Fellowship, a Princeton Lyman Spitzer Lectureship, a Vanderbilt Seifert Lectureship, and Cal Tech's coveted Feynman Teaching Award in 2013. The Feynman Award recognized Johnson for his dedication, passion, and innovation in teaching as well as his ability to inspire his students.

In a nomination letter for the Feynman Prize, one student wrote "Classroom experiences that are intellectually engaging, practical, and entertaining are incredibly rare...Professor Johnson provides just such an experience." Another called him "a remarkable teacher who can not only enlighten students in the classroom but also sculpt their spirits for their future careers," and A graduate student wrote, "He reminded me...why I wanted to be a scientist in the first place."



You can read an insightful discussion about John's move to Harvard at his blog <http://mahalonotrash.blogspot.com/2013/03/heading-east-harvard-here-we-come.html>, and at Harvard Magazine <http://harvardmagazine.com/2014/01/john-asher-johnson>.



Where is this building, and what does it have to do with **Rastko Skepnek** (PhD '04)? The first reader to email the answers to physics@mst.edu wins a free SPS T-shirt.

Congratulations to S&T's 2013 Physics Degree Recipients!

May 2013

Bachelor of Science

Shaun Michael Molder
Nathan Jett Morris
Nicholas James Otradovec
Dimitar M. Stoyanov
Spencer Braden Templeton

Master of Science

Jayesh Giri

Doctor of Philosophy

Thomas Franklin Creel Jr
Fawaz Yousef Hrahshesh
David Nozadze

December 2013

Bachelor of Science

Stephen Michael Kraus
Sam Ethan Stephens

Master of Science

Amrita Roy-Chowdhury

Doctor of Philosophy

Manal Mahmoud Al-Ali
Kristen Leilani Erickson
Nilanka Praveena Gurusinghe
Herath Mudiyansele Sumudu Herath
David E. Peaslee

Planned Giving:

Leaving a Legacy to Missouri S&T

Many alumni and friends have realized that a future gift – one arranged through their will or trust – allows them to give back to their alma mater more than they ever thought possible. With careful planning, charitable estate giving can reduce your estate tax liability or transfer assets to your family at a lower gift tax cost.

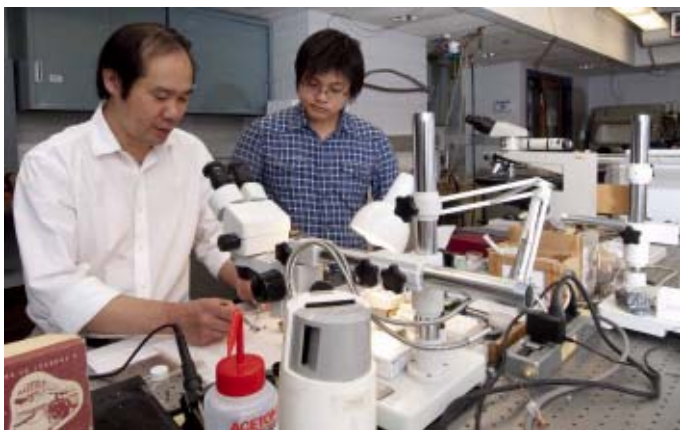
Making a planned gift shows your loyalty to Missouri S&T, an institution that played a significant role in shaping your future. For more information about giving a current or planned gift, contact the Office of Development at 1-800-392-4112 or e-mail giving@mst.edu.

John Schmitt Retires

Professor **John Schmitt** retired in 2013 after 39 years of service at Missouri S&T. He earned his Ph.D. in Astronomy in 1968 from the University of Michigan. In 1974 he joined the S&T (then UMR) faculty as a Visiting Assistant Professor of Physics. He became a Research Assistant Professor in 1976, was promoted to Research Associate Professor in 1985, and Associate Professor of Physics in 1990. His research specialty at Missouri S&T was cloud and aerosol research using cloud simulation facilities.



Dr. Schmitt is well-known throughout the community for his years of service at the Missouri S&T Observatory. Three times a semester he sponsored Visitors' Night at the observatory. The event was free of charge, and thousands of children and parents came in the dark (and often frigid cold) to view the Moon, the planets, and stars. We wish John the best in his retirement.



Yew San Hor, pictured above with undergraduate **Yunsheng Qiu**, received a \$538,000 NSF CAREER award in 2013. An in-depth article on Yew's research will appear in the 2015 newsletter.

From Alumnus Jeff Book (BS '96)

Alumnus **Jeff Book** (BS '96) writes "In 2011, I was very honored to have my work recognized by being awarded one of the 2010 Presidential Early Career Awards for Scientists and Engineers (PECASE), the highest honor bestowed by the U.S. government on scientists and engineering professionals in the early stages of their independent research careers. I currently work for the Naval Research Laboratory as a basic scientific researcher in the field of physical oceanography."

"The focus of my research is on understanding ocean dynamics through observations. My work has brought me around the world studying flow through the Korea/Tsushima Strait, coastal instabilities and eddies in the Adriatic Sea, renewable energy in the Gulf of Mexico, ocean mixing in the Agulhas Return Current, and internal tides on the Australian Northwest Shelf. I am very grateful for the great start in physics that I received from the physics department at UMR (now MST) and the time invested in me by the many professors that taught me when I was there earning a B.S. in physics."

PECASE awardees are selected for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service as demonstrated through scientific leadership, public education, or community outreach. You can read more about Jeff's award at <http://www.whitehouse.gov/the-press-office/2011/09/26/president-obama-honors-outstanding-early-career-scientists> and <http://www.nrl.navy.mil/media/news-releases/2011/dr-jeffrey-book-receives-presidential-award-for-career-achievements>. If you don't want to type all those characters, just go to <http://tinyurl.com/3wl6qkr> and <http://tinyurl.com/lp3kdoz>.

Editor's note: Jeff's report was one of the articles that morphed into dark matter last year (see page 7 of the 2013 newsletter). Amazingly, since then it has reappeared as normal matter and is published here.



Jeff Book

Best Ever

It really was the Best Ever in 2013!



Mark Herrera (left) and Jason Alexander (right)

Alumni Notes

Jason Alexander (PhD '09) is currently an Assistant Professor in the Department of Chemistry and Physics at The University of Tennessee–Martin. Jason is pictured below left with **Mark Herrera** (BS '08).

Kenneth E. Arnett (BS '80) writes “recovering nicely from cervical spinal surgery. Best wishes to my UMR friends, especially to my Theta Xi and Acacia friends!!”

Suzanna Jo Edwards (BS '90) reports “two girls in college and two in high school for the fall of 2013. **Kevin** (NucE '89) was called out of the Naval Reserves to active duty in Afghanistan. He returned in the fall of 2013. I continue to enjoy working for the Methodist Church.”

Mark Herrera (BS '08) defended his Ph.D. thesis “*Complex flows in granular and quantum systems*,” directed by Professor **Edward Ott** at the Department of Physics, University of Maryland. He then flew on his broomstick to a new job working for a private research and development group, Heron Systems, in Alexandria, VA. Mark worked with **Alexey Yamilov** on an undergraduate research project back in the old days.

Frank Salter (MST '74) retired from Continental Cement Company in 2010. He is currently teaching at Hannibal-LaGrange University and Moberly Area Community College as an Adjunct Instructor.

Sumudu Herath (PhD '13) is a postdoctoral fellow at University of Texas Austin.

John W. McGuire (MST '69) writes “**Mary Ann** and I are celebrating our 50th Wedding Anniversary on June 8th and are taking a Caribbean Cruise with our children and grandchildren.”



Mark Herrera catching a flight to his new job

Physics Graduate Students Score at Research Showcase

The 2013 Council of Graduate Students Graduate Research Showcase turned out to be a showcase for the talents of our Physics graduate students.

A total of 29 posters were entered in the morning poster competition held last year on April 10. Physics graduate students took three of the top four places in the competition. All posters were judged by faculty who were not in the presenter's department.

Hari Chaluvadi, advised by Professor **Don Madison**, won first place for his poster "*Low energy ($e,2e$) studies from ammonia (NH_3)*." Second place went to **Hatem Barghathi**, advised by Professor **Thomas Vojta**, for "*Random fields at an absorbing state transition*." Finally, **Rabi Khanal**, advised by Professor **Julia Medvedeva**, received an honorable mention for "*Structural and electronic properties of amorphous indium oxide*."

Congratulations to these three winners and all the other Physics graduate students who took part in the Showcase.



first place winner Hari Chaluvadi

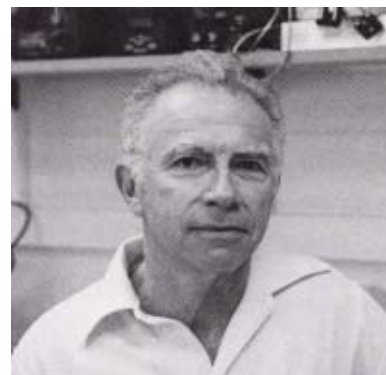
Bob Gerson Remembered

Robert (Bob) Gerson, Professor Emeritus of Physics at Missouri S&T, passed away on December 12, 2013.

Bob was born in New York City in 1923 but lived most of his life in Rolla. He married **Charlotte Wyle** in 1948, and is survived by his wife, three daughters, seven grandchildren, and three great-grandchildren.

Bob received his PhD in Physics from New York University in 1954. He came to Missouri S&T (then Missouri School of Mines) in 1962. During his career he worked in experimental studies of the dielectric and mechanical properties of oxides, particularly those with perovskite structure, and in ion implantation and characterization of the implanted surfaces using Hall Effect, Seebeck Effect and depth-profiling techniques.

After Bob retired in 1986, he traveled extensively with his wife Charlotte. His hobbies included poetry, writing short stories and plays, photography, painting, and even acting.



Congratulations to 2013 Physics Academic Scholars

Students who maintain at least a 3.50 GPA for twelve hours or more of coursework are honored for their outstanding accomplishment by being named Academic Scholars.

Spring Semester 2013

Derek Anderson, Matthew Callaway, Michael Christopher, Clayton Craig, Andrew Cudd, Christian Dzurny, Nikita Gahr, Timofey Golubev, Patricia Huestis, Dawson Huth, Stephen Kraus, Giannino Lusivic, Alexander Mark, Frank Marshall, Rachel McCormick, Shaun Molder, David Owen, Matthew Pollard, Yunsheng Qiu, Juan Remolina, Nocona Sanders,

Andy Sensavang, Nelson Shreve, Alyson Smith, Paul Somers, Josey Stevens, Spencer Templeton, David Wilkerson, and Kelcy Yunghans.

Fall Semester 2013

Derek Anderson, Nicholas Beebe, Robert Branson, Travis Connelly, Clayton Craig, Andrew Cudd, Christian Dzurny, Bradley Farley, Timofey Golubev, Patricia Huestis, Dawson Huth, Cory Karle, Stephen Kraus, Seth Kreher, Giannino Lusivic, Jason Mao, Alexander Mark, Seth McGinnis, Katherine Overend, David Owen, Wyatt Parsons, Yunsheng Qiu, Juan Remolina, Trevor Rucker, Anna Sakach, Nocona Sanders, Sawyer Scheer, Nelson Shreve, Paul Somers, Sam Stephens, Joshua Sutter, David Wilkerson, and Kelcy Yunghans.

Physics for the General Public

Professor **Greg Story** has begun a new project of giving physics lectures for the general public. His lecture “*Light and the study of all things great and small*” focuses on how scientists use light to understand nature. The lecture gives non-science people an idea of how scientists learn about the Universe in which we live. The lecture covers subjects ranging from quantum mechanics and atomic physics up to the evolution of the Universe.

Greg has given his lecture to a number of groups around the Rolla and St. James area, St. Louis, and as far away as Oregon. Although he only began giving the lectures in the last year, approximately two hundred people have attended so far. One attendee said of the lecture “Dr. Story removed the mystery and fear and presented us with an evening of enjoyable learning.”



Greg Story giving one of his public lectures

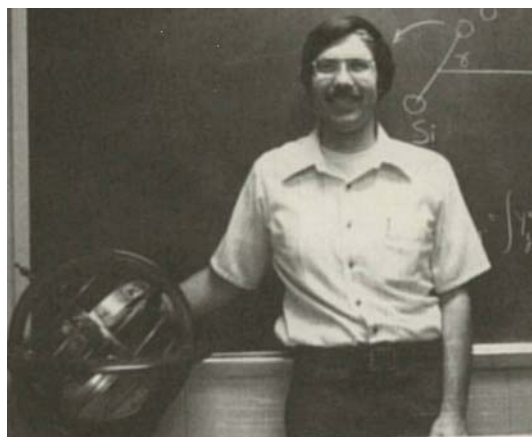
Ron Bieniek Retires

Professor **Ron Bieniek** retired in 2013 after 32 years of service at Missouri S&T. He earned his PhD in Physics from Harvard in 1975, and joined the S&T (then UMR) faculty in 1981. He was promoted to Associate Professor in 1984 and Professor in 2008. His research specialty is theoretical atomic and molecular physics.

Perhaps best known for teaching “the toughest course you'll ever love” (Physics 23), Ron also founded the New Faculty and

Learning Enhancement Across Disciplines (LEAD) Programs. Ron pioneered the use of student peer learning instructors to facilitate student learning in difficult courses, and LEAD sessions are now offered by many courses campuswide.

Although retired from S&T, Ron is currently Dean of Marshall University's Honors College.



The Physics Department gratefully acknowledges the support of the following alumni and friends.

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 General Mills Foundation
 GW Technology
 IBM
 Lockheed Martin Corporation
 Oracle Corporation
 Perdix, Inc.
 Raytheon Company

Missouri University of Science and Technology Students & Alumni: In Press

The following journal articles which appeared over the last year feature work by Missouri S&T undergraduate students,¹ graduate students,² or alumni³ under the supervision of Missouri S&T faculty.

"Picturing electron capture to the continuum in the transfer ionization of intermediate-energy He^{2+} collisions with argon," R. T. Zhang, X. Ma, S. F. Zhang, X. L. Zhu, Susmitha Akula,² D. H. Madison, B. Li, D. B. Qian, W. T. Feng, D. L. Guo, H. P. Liu, S. C. Yan, P. J. Zhang, S. Xu, and X. M. Chen, *Phys. Rev A* **87**, 012701 (2013).

Reply to 'Comment on "Four-body charge transfer processes in proton helium collisions,"' U. Chowdhury,³ A. L. Harris,³ J. L. Peacher and D. H. Madison, *J. Phys. B* **46**, 028002 (2013).

"Young's double-slit interference for quantum particles," Zehra Nur Ozer, Hari Chaluvadi,² Melike Ulu, Mevlut Dogan, Bekir Aktas, and Don Madison, *Phys. Rev. A* **87**, 042704 (2013).

"Dynamical ($e,2e$) investigations of tetrahydrofuran and tetrahydrofurfuryl alcohol as DNA analogues," Darryl Jones, Joseph D Builth-Williams, Susan M Bellm, Luca Chiari, Hari Chaluvadi,² Don Madison, Chuangang Ning, Birgit Lohmann, Oddur Ingólfsson, and Michael Brunger, *Chem. Phys. Lett.* **572**, 32 (2013).

"Low energy ($e,2e$) coincidence studies of NH_3 : Results from experiment and theory," Kate L. Nixon, Andrew James Murray, Hari Chaluvadi,² Chuangang Ning, James Colgan, and Don H. Madison, *J. Chem. Phys.* **138**, 174304 (2013).

"A dynamical ($e,2e$) investigation of the structurally related cyclic ethers tetrahydrofuran, tetrahydropyran and 1,4-dioxane," J. D. Builth-Williams, S. M. Bellm, L. Chiari, P. A. Thorn, D. B. Jones, H. Chaluvadi,² D. H. Madison, C. G. Ning, B. Lohmann, G. da Silva, and M. J. Brunger, *J. Chem. Phys.* **139**, 034306 (2013).

"Nonrelativistic limit of the Dirac-Schwarzschild Hamiltonian: gravitational zitterbewegung and gravitational spin-orbit coupling," U. D. Jentschura and J. H. Noble,² *Phys. Rev. A* **88**, 022121 (2013).

"Generalized Householder transformations for the complex symmetric eigenvalue problem," J. H. Noble,² M. Lubasch and U. D. Jentschura, *Eur. Phys. J. Plus* **128**, 93 (2013).

"From Generalized Dirac Equations to a Candidate for Dark Energy," U. D. Jentschura and B. J. Wundt,³ *ISRN High-Energy Physics 2013*, 374612 (2013).

"Carrier Generation in Multicomponent Wide-Bandgap Oxides: $InGaZnO_4$," A. Murat,³ A. Adler, T.O. Mason, and J.E. Medvedeva, *Journal of the American Chemical Society*, **135**, 5685 (2013).

"Interplay between localization and absorption in disordered waveguides," A. Yamilov and B. Payne,³ *Optics Express* **21**, 11688 (2013).

"Effect of evanescent channels on position-dependent diffusion in disordered waveguides," B. Payne,³ T. Mahler, and A. Yamilov, *Waves in Random and Complex Media* **23**, 43 (2013).

"Structural and Magnetic Properties of $La_{0.7}Sr_{0.3}Mn_{1-x}Ni_xO_3$ ($x = 0.4$)," T. F. Creel,³ J. B. Yang, M. Kahveci, S. K. Malik, S. Quezado, O. A. Pringle, W. B. Yelon, W. J. James, *J. Appl. Phys.* **114**, 013911 (2013).

Hale Named S&T's Woman of the Year

(continued from page 1)

at Missouri S&T. She also serves as the personal advisor for Chi Omega sorority, a position she has held since the chapter's founding in 1979.

"Dr. Hale understands the meaning of 'advisor,' which is something we appreciate as young women learning to make decisions that not only affect ourselves, but our sisters and future Chi Omegas," wrote another nominator. "Dr. Hale builds a close relationship with each member of the chapter. Each and every week she brings forth ideas filled with wisdom and experience for our chapter and everyday lives."

Barbara came to Missouri S&T in 1969 as a Visiting Assistant Professor of Mathematics. She became a Research Associate in the Graduate Center for Cloud Physics Research in 1971. In 1973,

Barbara became Assistant Professor of Physics and a Senior Investigator in the Graduate Center for Cloud Physics Research. She was named Associate Professor of Physics in 1977 and Professor of Physics in 1982.

Hale, who holds a Ph.D. from Purdue University and a bachelor of science degree from Syracuse University, both in physics, is a member of the American Physical Society, the American Association of Physics Teachers, the American Meteorological Society, Phi Beta Kappa, Sigma Xi, Sigma Pi Sigma and Phi Kappa Phi.

In addition to the Faculty Excellence and Outstanding Teaching awards, Hale received the Chi Omega National Advisor Award in 2000 and the Miner Alumni Association Faculty Advisor Award.

Vojta Teaches and Researches in Colorado

In July, 2013, faculty member **Thomas Vojta** gave a series of lectures on “*Phase transitions, disorder, and Griffiths singularities*” at the Boulder School 2013: Disorder and Dynamics in Quantum Systems. The Boulder School for Condensed Matter and Materials Physics, supported by the National Science Foundation, is an annual event that provides education for advanced graduate students and postdocs. The school enables students to work at the frontiers of science and technology by providing expert training beyond the traditional graduate education.

The four-week-long school brought together more than 60 students and postdocs from 4 continents and 12 countries. It combined lectures by 16 internationally-recognized experts, student presentations and ample opportunity for discussions. In addition, the schedule left time for exploring the stunning scenery around Boulder. Thomas climbed 14,259 ft high Longs Peak in



Thomas preparing to descend the Maroon Bell

Rocky Mountain National Park, and he spent several early mornings rock climbing on Boulder’s famous Flatirons.

In addition to teaching at the Boulder school, Thomas visited the Aspen Center for Physics to attend a workshop on “*Disorder, dynamics, frustration and topology in quantum condensed matter*.” There, he renewed his collaboration with **Jose Hoyos** who was a postdoc at S&T in 2006-07 and is now a professor at the University of Sao Paulo in Brazil. On the weekends, they continued their discussions while climbing two more fourteeners, La Plata Peak and the spectacular Maroon Bells.



*the Vojta family on La Plata Peak,
with Jose Hoyos in the back*

Phonathon 2014

The Phonathon this year presents a unique opportunity for the Physics Department to address a problem that we have with aging equipment in our teaching labs. The University will provide 1:1 matching money up to \$50,000 to improve our labs. Please consider targeting your donations for Physics lab funds this year to assist us in this effort. Your donations will go to modernizing the equipment used by our majors and by all students on campus in STEM disciplines. If you would prefer not to target lab funds, your assistance will help us to continue to grow the department with quality students through new scholarships. The department has been able to grow the combined

undergraduate and graduate enrollment to over 100, and every dollar you can give for scholarships and graduate fellowships will greatly assist the department in its aggressive recruitment plan, and will be greatly appreciated.

Alumni and other donors committed \$30,316 in donations to the MSM-UMR-Missouri S&T Physics Department last year. Last year’s fundraising Phonathon raised \$26,442 with an average gift of \$202 from 131 donors. The department greatly appreciates your generosity, which helps to support scholarships and student activities like the Society of Physics Students.

Frontiers in Physics Colloquium Series

The Spring 2013 *Frontiers in Physics Colloquium Series* was organized by Professor **Yew San Hor**. The series kicked off in February with a talk by **Haskell Taub** of the University of Missouri - Columbia, who presented “*Study of water diffusion on single-supported bilayer lipid membranes by neutron scattering.*” February continued with presentations by **Thomas Schuman**, of Missouri S&T's Chemistry Department, who spoke on “*A Hammett correlation for design of polymer-particle dielectric interfaces,*” **Weida Wu** of Rutgers University, who reviewed “*Topological defects in hexagonal manganites: from multiferroics to cosmology,*” and a report on “*Higher education and research in science and technology: a tool for diplomacy and facing together global challenges,*” by **Annick Suzor-Weiner** of the French Embassy, Washington, DC.

March, with Spring Recess for our St. Patrick's celebration, and a week of spring break, was a short month for colloquia. Our only speaker was **Nandini Trivedi** of the Ohio State University, who told us what happens when “*Cold atoms meet condensed matter physics.*”

The series heated up again in April, when **Robert Ehrlich** of George Mason University, who spoke about “*Climate for energy change: the urgent need to transition away from fossil fuels (plus 15 minutes on new evidence for tachyonic neutrinos).*” The following week, **William McComas** from the University of Arkansas - Fayetteville reflected on “*The nature of biology: a view of the life sciences through a philosophical lens.*” April continued with a lecture on “*Imaging and focusing through strongly scattering layers,*” by **Allard Mosk** of the University of Twente.

The Spring Colloquium Series concluded in May with poster presentations by undergraduate Physics majors at the Forty-Second Annual **Harold Q Fuller** Prize Colloquium. Details of the Fuller competition appear in a separate article on page 15.

Professor **Ulrich Jentschura** took charge of the *Frontiers in Physics* series for the Fall 2013 semester. On the last Thursday in August, **Justin Peatross** of Brigham Young University told us the story of “*An electron and its wave function.*” In September our colloquia continued with “*Freezing of nanodroplets*” by **Barbara Wyslouzil** of the Ohio State University, “*An electron, an atom, and its photon*” by **Bruno deHarak** from Illinois Wesleyan University, and “*Higgs portal dark matter*” by **Rainer Dick** of the University of Saskatchewan.

October was a busy month, with 5 colloquia. **Gordon Drake** from the University of Windsor began the month by discussing “*Shining atomic light on halo nuclei.*” Next, **Martin Bohner**, from Missouri S&T's Mathematics department described “*Dynamic equations on time scales: Laplace and z-transform.*” Our homecoming speaker was **Don Reago** (PhD '86), director of the Army's

Night Vision and Electronic Sensors lab. For his homecoming talk, Don reviewed “*Aspects of night vision.*” October concluded with talks on “*The fascinating world of electrons in flatland*” by **Ravindra Bhatt** of Princeton University and “*Ices, clathrates, quasicrystals and liquid crystals: unraveling the rich phase behavior of water*” by **Valeria Molinero** of the University of Utah.

In November, **Christopher Richardson** from the University of Maryland reported on “*Metamorphic materials for optoelectronic applications,*” and **Steven Rolston**, also from the University of Maryland, discussed “*Condensed matter physics with laser light and dilute gases.*”

Frontiers in Physics 2013 concluded in December with presentations by four finalists at the Twentieth Annual **Laird D. Schearer** Prize Colloquium. Schearer Prize details are in the article on page 14 of this newsletter.

McBee Receives Teaching Award

Amanda McBee (BS '12) recently received an Outstanding Beginning Teacher award from the Missouri Association of Colleges for Teacher Education. In 2013 Amanda completed her first year of teaching geometry and chemistry at Waynesville High School.

Amanda was one of 64 teachers who were recognized for their excellence in serving children during their first two years of service in school districts across Missouri. Award recipients were selected based on evaluations by their college or university and recommendations from the school district that employs them.

Amanda is pursuing a master's degree in physics from Missouri S&T. She is pictured below with Professors **Allan Pringle**, Physics Department advisor to S&T's Teacher Education Program, and **Jana Neiss**, Director of the program.



20th Annual Schearer Prize Competition

The Twentieth Annual *Laird D. Schearer Competition for Graduate Research*, established by the family of Dr. **Laird D. Schearer** to recognize research performed by a graduate student, was held on December 5, 2013.

Seven students submitted applications for the competition. The applications consisted a short description of their research, copies and lists of any publications and presentations they have made, plus a résumé. Based on these applications, the judges, Professors **Gerry Wilemski**, **Allan Pringle**, and committee chair **Alexey Yamilov**, selected four finalists who gave oral presentations of their work in a departmental colloquium. **Hatem Barghathi**, advised by Professor **Thomas Vojta**; **Rabi Khanal**, advised by Professor **Julia Medvedeva**; **Jonathan Noble**, advised by Professor **Ulrich Jentschura**; and **Amrita Roy-Chowdhury**, advised by Professor **Paul Parris**.

During the colloquium on December 5, Mr. Barghathi discussed “*Random fields at a nonequilibrium phase transition*,” Mr. Khanal talked on “*Structural properties of amorphous indium-based oxides*,” Mr. Noble described “*PT-symmetry, the indefinite inner product and matrix diagonalization*,” and Ms. Chowdhury presented “*Photo-injected charge transport in 30% DEH-doped polycarbonate, a direct comparison of experiment with predictions of disorder-based models*.” All students gave excellent talks.

During deliberation the judges took into consideration the extent of the student's contribution to the project, the student's knowledge of the subject area, and their presentation skills. Af-

ter much deliberation, the committee decided to award first prize and \$400 to Hatem Barghathi, second prize and \$300 to Rabi Khanal, and third prize and \$250 each to Jonathan Noble and Amrita Roy-Chowdhury. The committee would like to congratulate all participants and wishes them continued success in their graduate work. Thanks also go to all who participated in this year's competition. The cash awards were made possible by the generous donations of the Schearer family. Following the presentations, the finalists and numerous faculty members had a relaxing dinner at a local restaurant.

From Schearer Prize Winner Hatem Barghathi

It is a great pleasure and honor to be among the winners of the 20th Annual Schearer Prize. I am thankful to my advisor, Professor **Thomas Vojta** for his encouragement and continuous support. Also, I would like to thank the Prize Committee for providing me with the opportunity to present my research work. The greatest thanks and deepest appreciation goes out toward my wife, **Salwa**, for her continued help and kind patience.

I came to Missouri S&T in 2010 to pursue my graduate studies in the Physics Department. My PhD research area is about the effect of disorder on phase transitions; the talk I presented to the Schearer Prize Committee was about the effect of random field disorder on non-equilibrium phase transitions. Such a disorder causes either destruction or strong modification to equilibrium phase transitions. In this study, we illustrated how a non-equilibrium phase transition survives a random field disorder.

Being a member of the Physics family at Missouri S&T provides me with multiple opportunities to enrich my experience. I gained a lot of knowledge and many skills from faculty and colleagues in the Physics Department which I am looking forward to using in my future study and career.

Come Back for Homecoming

The Missouri S&T Physics Department warmly invites you to return to Rolla for **S&T Homecoming 2014** on **October 17-18, 2014**. On Friday afternoon, October 17, the department will hold an open house and special programs for its alumni and friends. Tours of laboratories and educational facilities will be offered and there will be opportunities for interaction with current Missouri S&T physics students. Come see what we have done since you received your degree.

In keeping with a long-standing tradition, an S&T alum will deliver the Homecoming 2014 Physics Colloquium at 4 PM. on Friday, October 17. Later that evening, Professors **Ed** and **Barbara Hale** will host a homecoming reception in their lovely home. Contact us at physics@mst.edu for specific information about physics department activities, or alumni@mst.edu for general homecoming information. Come home to your college roots, and help us celebrate our past as MSM-UMR, even as we work to shape our future as Missouri S&T!



Hatem Barghathi

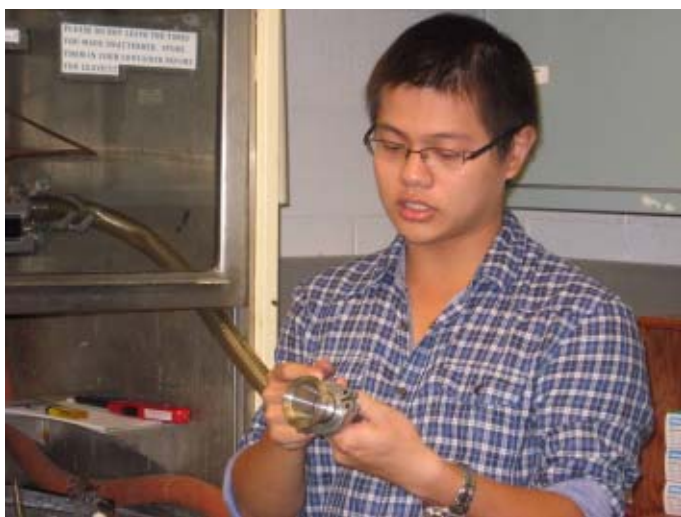
42nd Annual Fuller Research Seminar

The 42nd annual **Harold Q Fuller** Undergraduate Research Seminar was held on May 2, 2013. This competition promotes participation of undergraduates in research both in the department and in summer intern projects. The Seminar is presented by finalists selected by their peers, and the Harold Q Fuller Award is given to the student(s) whose project is judged to be the most outstanding on the basis of their accomplishment, their presentation, and their response to the questioning of the judges.

This year's participants were **Andrew Cudd**, **Derek Anderson**, and **Nicholas Hugenberg**, advised by Dr. **Dan Waddill**; **Timofey Golubev** and **Brock Hinton**, advised by Dr. **Alexey Yamilov**; **Stephen Kraus**, advised by Dr. **Yew San Hor**; **Mathew Pollard**, advised by Dr. **Julia Medvedeva**; and **Yunsheng Qiu**, advised by Dr. **Yew San Hor**. All of the students performed their research at Missouri University of Science and Technology.

The participants presented posters of their work to the entire department. The posters were judged by the Fuller Prize Committee, Dr. **Robert DuBois** and Dr. **Paul Parris**, who were very impressed with the research presented and the presentations by the student researchers. They awarded a tie for first-place to Yunsheng Qiu for his talk "*Superconductivity induced by Nb doping in Bi_2Se_3 topological insulator*," and the team of Timofey Golubev and Brock Hinton for their talk "*Co-existence of extended and localized states in Thue-Morse array of optical cavities*."

A 3-way tie for runner-up was awarded to Matthew Pollard, Stephen Kraus, and the team of Andrew Cudd, Derek Anderson and Nicholas Hugenberg.



Yunsheng Qiu

Faculty Notes

Congratulations to **Don Madison** and his student **Hari Chaluvadi**. Their article "*Experimental and theoretical investigation of the triple differential cross section for electron impact ionization of pyrimidine molecules*" was identified last year as one of the top-most cited articles published in 2012 in the Journal of Chemical Physics.

Ulrich Jentschura has been granted tenure and promoted to Associate Professor effective September 1, 2013. Ulrich also won a Missouri S&T Faculty Research Award, served as a member of the Editorial Board of Physical Review A, and refereed 23 papers in 2013. More about Ulrich's accomplishments can be found in the article on page 1 of this newsletter.

Thomas Vojta was an invited speaker at the International Conference on Disorder in Condensed Matter and Ultracold Atoms, in Varenna, Italy (June 2013); the International Conference on Frontiers of Quantum and Mesoscopic Thermodynamics, in Prague, Czech Republic (August 2013); and the International Conference on Recent Progress in Many-Body Theories 17, in Rostock, Germany (September 2013).

Don Madison was invited to give a plenary talk entitled "*Accuracy of theoretical calculations for electron-impact ionization of molecules*" at the International Symposium on (e,2e), Double Photoionization and Related Topics, Hefei, China, 1-3 August 2013. In addition, Don's student Hari Chaluvadi gave an invited talk at the 66th annual Gaseous Electronics Conference, Princeton, New Jersey, 31 September – 4 October, 2013.

Michael Schulz who was chosen as an Outstanding Referee for the Physical Review and Physical Review Letters for 2013.

Greg Story and Thomas Vojta received Outstanding Teaching Awards for 2012-2013. Also, **Paul Parris**, **Gerry Wilemski**, and **Dan Waddill** received Teaching Commendations for 2012-2013. This is the 11th consecutive year that Greg has won an Outstanding Teaching Award.

Yew San Hor was awarded an NSF CAREER award for the period from April 15, 2013 through March 31, 2018. He will receive a total of \$538,000 in funding to continue his research.

Allan Pringle is co-PI with Statistics Professor **V. A. Samaranayake** on the grant "*Science education and quantitative literacy: an integrated, inquiry-based approach*," funded for \$296,000 in 2013-2014 by the Missouri Department of Higher Education. This is the tenth consecutive year that Allan has been supported by grants from the DHE. With these grants, Drs. Pringle and Samaranayake have provided professional development for 300 K-12 teachers in the South Central Missouri region.

So What's News with You?

We hope you enjoyed this year's edition of **Matter 'n Motion**. We enjoy keeping you informed about what is going on at Missouri S&T, but we'd also like to know what's new with you, both personally and professionally. Any information you send will be circulated in the department and, if appropriate, inserted in the next physics newsletter unless you request otherwise.

Please print or type your information, and include your mailing address so that we can update our records. Mail to: **Physics Department, Missouri University of Science and Technology, 1315 N. Pine St., Rolla MO 65409-0640**. Or, if you would prefer, you can e-mail us your comments at **physics@mst.edu**. Thanks for keeping in touch. It's always good to hear from old friends.

Name: _____ Phone: _____ E-mail: _____

Mailing Address: _____

Job Title (if appropriate): _____

Business Phone: _____

Business Address: _____

News or Comments: _____

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