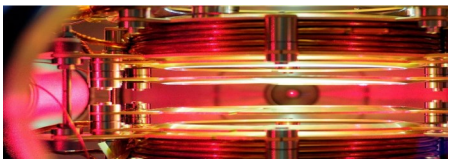
Matter 'n Motion

Missouri University of
Science and Technology
PHYSICS DEPARTMENT

January 2018



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

Photo : Sam O'Keefe, Missouri S&T

Medvedeva gets large grant

A team led by Dr. **Julia E. Medvedeva**, professor of physics at Missouri S&T, received a $1.6 million grant from the U.S. National Science Foundation to study the properties of amorphous oxide materials and to develop an open-access database for other researchers to use.

The four-year grant is part of an NSF program called Designing Materials to Revolutionize and Engineer our Future (DMREF) and also involves researchers from Northwestern University. The oxide semiconductors Medvedeva will study demonstrate seemingly contradictory properties, such as optical transparency and electrical conductivity. These properties make the semiconductors ideal for use in flat-panel displays that consume less power while creating brighter images.

"This is very fundamental research," Medvedeva says, but notes that the results could enable advances in flexible-panel displays and wearable electronics, smart windows for homes and cars, and solar panels that could wrap around a surface to capture as much sunlight as possible.

Through the NSF grant, Medvedeva will develop computer models to show how amorphous oxides act under certain conditions at the atomic level. "We want to start by looking at the way atoms are put together," she says, "because structure determines everything."

Medvedeva will develop simulations of structures under various conditions – such as melting, then rapidly cooling a structure, adjusting its composition or growth conditions – and record how these conditions affect the material's mechanical, electrical, optical and thermal properties. She will simulate both large experiments – "thousands of atoms" at a time – and small ones that involve fewer atoms but "a lot of unique configurations."

From these simulations, she will develop a database that will eventually be accessible to researchers worldwide. Medvedeva envisions creating an open-source software she calls the Amorphous Materials Analysis Database that other scientists could use and contribute to. Her hope is that this approach will "bring computer-aided design of amorphous materials to a new level."

Expanding Your Horizons with Dr. Julia Medvedeva

Thirty 7th and 8th grade girls participated in Dr. Julia Medvedeva's workshop "From cookies to computers" as part of the Expanding Your Horizons conference. They experimented with different concentrations of ingredients and baking temperatures for cookies and learned how scientists perfect a material recipe by mixing different chemical elements at different substrate temperatures to get powerful transistors for modern computers. Physics postdoc Laleh Avazpour, graduate student Jasmine Shen, and undergraduate Skye Tackkett helped to make the event a success.

CONTACT S&T PHYSICS

If you would like to contact us, you can reach us by phone at **(573) 341-4781** and be email at **physics@mst.edu**. You might also be interested in checking out our web page, *http://physics.mst.edu* and our facebook page, *SandT Physics.*

Memo from New Chair

Last year brought many changes to the physics department, some good and some bad. I am deeply saddened to report that Curators' Teaching Professor **Allan Pringle** passed away in March 2017. Allan touched the lives of so many people, and the roles he filled in the department and beyond are far too numerous to list. Faculty and students will remember his dedication and kindness, and hundreds of children his liquid nitrogen demonstrations. Allan's death leaves an enormous hole in the department. Read more about Allan elsewhere in this edition of Matter 'n Motion.

Thanks to the generosity of Allan's wife, Kathy, and other donors, the department has established the Allan Pringle Endowed Scholarship that will allow us to honor his memory for years to come. We would be extremely grateful for any additional donations in Allan's memory.

As you can see from the fact that I am writing this memo, there has been a transition in the Chair's office. **Dan Waddill** stepped down at the end of 2017 after more than 10 years of service. Dan was a great Chair; while he was in office, things just worked, like magic, leaving faculty, staff and students free to focus on research, teaching, and learning. Dan leaves big shoes to fill, and I can only hope to become as efficient a Chair as he was. Speaking of transitions, Dr. **Christopher G. Maples** became interim chancellor of Missouri S&T in May 2017. He succeeds Dr. **Cheryl B. Schrader**, who moved to Wright State University.

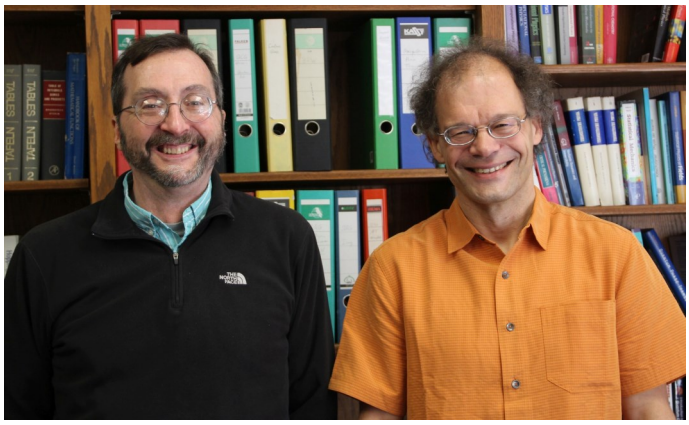
In August, we welcomed an addition to the faculty. Dr. **Jim Musser** joined us from Arkansas Tech where he headed the department of physical sciences. Read more about Jim elsewhere in this newsletter.

Our faculty continue to excel in their research and teaching endeavors. **Julia Medvedeva** was awarded a $1.6 million grant by the National Science foundation. She also won a 2017 Faculty Excellence Award. **Michael Schulz** received a major NSF grant as well, and **Ulrich Jentschura** published a text book on Advanced Electrodynamics. Moreover, **Greg Story** won yet another Outstanding Teaching Award.

I happy to report that our graduate and undergraduate programs continue to grow. In the current academic year, the department has almost 100 physics majors and 30 graduate students. Based on the number of admitted students, the incoming class for fall 2018 promises to become the largest one in recent memory, with an average ACT score above 30.

Let me close by emphasizing that the department's success in its teaching, research, and service missions would be impossible without the dedication and generous support of our alumni. Thank you very much! Please come and visit us in Rolla to see the exciting things happening in the physics department and to share with us what you have been doing since graduation.

Thomas Vojta



Chair Transition from Dr. Dan Waddill (left) to Dr. Thomas Vojta (right)

Dan Waddill Steps Down

Effective January 1, 2018, Dr. Dan Waddill stepped down after 21 semesters as department chair. He has guided the department through turbulent times. He served under four chancellors (Drs. Carney, Wray (interim), Schroeder, Maples) and saw the colleges abolished at the beginning of his tenure and reinstated later on. He steered the department through the budget crisis after the great recession and avoided lasting damage. The physics department has grown stronger under Dan's leadership. A number of excellent new faculty were hired who established successful research programs, the introductory courses remain well respected on campus despite the challenge of increasing enrollment, and the number of majors increased from less than 60 in 2006 to almost 100 in 2017. Thank you, Dan! Enjoy having more time for your outdoor pursuits.

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 email *giving@mst.edu.*

Physics Department Awards 2017-2018
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 recipient of the Rogers Scholarship, with values ranging from $1250 to $1950, were awarded to **Aaron Lemmermann** from Raytown, MO and **Luke Marut** from Moscow Mills, MO.

The recipients of the **Burke H. Miller Memorial Scholarship** were **Nicholas Parris** from Boonville, MO and **Kent Gorday** from Foristell, MO. This $500 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.

The **Ed and Mary Sue Sickafus Endowed Scholarship/Fellowship** was awarded to **Rachel Birchmier** from Kansas City, MO, **Skye Tackkett** from Kansas City, MO and **David Gillcrist** from Kansas City, MO. The scholarship/fellowship was established by Ed (BS '55, MS '56) and Mary Sue Sickafus in conjunction with the Ford Motor Company. The $500 to $1000 scholarship is awarded to physics students on the basis of their performance at Missouri S&T.

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. The recipients were **Joshua Maxwell** from Waynesville, MO and **Brendan Ramsey** from Festus, MO.

The recipients of the **Leon E. Woodman Memorial Scholarship** was **Rebecca Campbell** from Saint Charles, MO and **Raylynn Swift** from Saint James, MO. This scholarship was established by the Woodman family in honor of Dr. L.E. Woodman, Chair of 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 Anderson Scholarship Fund** is an endowment established in memory of Dr. Richard Anderson. The recipient was **Jacob Cook** from Willard, MO.

The **John R and Patty Rogers Scholarship** provides scholarships to full-time students enrolled at S&T who are in good standing and majoring in physics. The recipients were **Jacob Cook** from Rolla, MO, **Ashley Pruett** from Washington, MO and **Dominic Dalba** from Imperial, MO.

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 and development fund, to students who earn a grade point average of 3.5 or higher. This past year, these $500 to $2000 scholarships were awarded to **Travis Barry** from Eldon, MO; **Dylan Causbie** from Poplar Bluff, MO; **Jacob Cook** from Willard, MO; **Dominic Dalba** from Imperial, MO; **Joshua Dalton** from Saint Charles, MO; **Nicholas Ernst** from Bellville, IL; **David Gillcrist** from Kansas City, MO; **Kent Gorday** from Foristell, MO; **Jacob Hume** from Lake Saint Louis, MO; **Aaron Lemmermann** from Raytown, MO; **Cameron Lerch** from Lees Summit, MO; **Adem Malone** from Rolla, MO; **Brady Martin** from Lees Summit, MO; **Joshua Maxwell** from Waynesville, MO; **Sara Newman** from League City, TX; **Nicholas Parris** from Boonville, MO; **Austin Powell** from Highland Ranch, CO; **Brendan Ramsey** from Festus, MO; **Kevin Rose** from Saint Louis, MO; **Sean Sause** from Richmond, MO; **Sarah Skinner** from Bolivar, MO; **Matthew Small** from Independence, MO; **Logan Smith** from Barnhart, MO; **Raylynn Swift** from Saint James, MO; **Skye Tackkett** from Kansas City, MO; and **Alex Warhover** from Saint Charles, MO.

The department also awards **Physics Scholarships for Academic Access**, funded by a group of alumni and faculty donors. These are needs-based awards to Missouri resident students in Physics. This $500 scholarship was awarded to **Sarah Skinner** from Boliver, MO.

Report from the SPS

The 2017 year began with the installment of new officers: **Sarah Skinner** as President, **Alex Warhover** as Vice-President, **Jacob Hume** as Secretary, **Jeremy McCoy** as Treasurer, and **Kyle Foster** as Historian. Last semester SPS went to Fermilab Laboratories with the graces of Chris Polly (BS'1996) who is currently working on the Muon G-2 experiment (picture below). **Dr. Dan Waddill** gave a talk about graduate school. **Dr. Greg Story** gave a talk on physics and free will. We had GRE prep games, an observatory night, and scavenger hunt competitions. The semester closed with the election of officers.

The change-over in officers for the current semester took place: **Sarah Skinner** as President, **Nicholas Parris** as Vice-President, **David Scott** as Secretary, **Elizabeth Triller** as Treasurer, and **Kyle Foster** as Historian.

Sarah Skinner

PHONATHON 2018

Your continued generosity with Phonathon donations has allowed us to increase teaching laboratory capacity by up to 50% over the past three years.

In addition, your donations help make it possible to continue to attract quality undergraduate and graduate students in our department. Currently we have approximately 98 undergraduates and 30 graduate students, and we have a goal of growing these numbers in 2020. Every dollar you can give for scholarship and graduate fellowships will greatly assist the department in its aggressive recruitment plan, and will be greatly appreciated.

Last year's fundraising Phonathon raised $ 22,623 from 111 donors.

We greatly appreciate your generosity in helping us support scholarships and student activities such as the Society of Physics Students.

Come Back for Homecoming

The Missouri S&T Physics Department warmly invites you to return to Rolla for the **S&T Homecoming 2018** on **October 12-13, 2018**. On Friday afternoon, October 12th , 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, **Rastko Sknepnek** (PhD 2004) will deliver the Homecoming 2018 Physics Colloquium at 4PM on Friday, October 12th. Dr. Sknepnek currently is a faculty member of the University of Dundee in Scotland.

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 dig deeper into our future at Missouri S&T!

Observatory back in operation

The observatory is back in operation. Missouri S&T graduate student, Ken Goss, and the S&T Astronomical Society (STARS) will hold ten public viewing events this spring semester. For more information or to get on the email list, contact Ken Goss at ken.goss@mst.edu.

Congratulations to S&T's 2017 Physics Degree Recipients!

May 2017

Bachelor of Science

Robert James Branson

Jason Robert Hancock

Tyler Gene Jacquin

Seth Emerich Kreher

Jason Mao

Katherine Overend

Mathew B. Pollard

Ian M. Ramsey

Sawyer Andrew Scheer

Jason Robert Summers

Master of Science

Madhav Dhital

Ahmed Khalil Ibrahim

Krishna Prasad Koirala

Doctor of Philsophy

Esam Abobahr Ali

December 2017

Bachelor of Science

Abdulrahman Saad Alharbi

Phillip Austin Janowski

Brendan James Ramsey

Owen S. Smith

Skye Katherine Tackkett

Trevor Voss

Charlie William Winborn

Master of Science

Li Shen

Doctor of Philosophy

Chandra Mani Adhikari

Sadek Mohamed Fituri Amami

Seng Huat Lee

Congratulations to 2017 Physics Academic Scholars

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

Spring 2017

Vasanth Balakrishnan, Travis Barry, Alyssa Bennett, Rachel Birchmier, Rebecca Campbell, Albert Chua, Deni Cikota, Dominic Dalba, Nicholas Ernst, Brian Ford, Kent Gorday, Jacob Hume, Cameron Lerch, Adem Malone, Jason Mao, Brady Martin, Joshua Maxwell, Sara Newman, Katherine Overend, Nicholas Parris, Mathew Pollard, Brendan Ramsey, Kevin Renik, Kevin Rose, Sarah Skinner, Matthew Small, Owen Smith, Raylynn Swift, Skye Tackkett, and Alex Warhover.

Fall 2017

Noah Baden, Brett Ballard, Travis Barry, Joseph Billing, Rachel Birchmier, Rebecca Campbell, Anzumaan Chakraborty, Albert Chua, Deni Cikota, Katrina Compton, Jacob Cook, Dominic Dalba, Joshua Dalton, Zachary Driemeyer, Reagan Dugan, Nicholas Ernst, Brian Ford, Kyle Foster, Joseph Franz, Kent Gorday, Jacob Hume, Zenon Klok, Aaron Lemmermann, Cameron Lerch, Taylor Lindenbusch, Brady Martin, Luke Marut, Joshua Maxwell, Kyle McMillen, Daniel Money, Sara Newman, Andrew Niiro, Nicholas Parris, Austin Powell, Kevin Renick, Carson Ripple, Kevin Rose, Ravi Shastri, Sarah Skinner, Matthew Small, Seth Stubblefield, Skye Tackkett, Trevor Voss, Alex Warhover, and Charlie Winborn.

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 email *giving @mst.edu*.

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

Donations over $100:

Harro Ackermann
Farhad Akhavan
Kenneth E. Arnett
John R. Barcroft
Charlotte A. Bhasin
Kul Bhasin
Gary D. Bickel
Robert E. Caldwell
James P. Canner
Ross O. Carnes
Daniel Chitwood
David J. Cordes
Michael C. Cornell
Ralph J. Davis
Ronald C. Eps
Clayton E. Evans
Marsha S. Evans
Alissha Feeler PE
Courtney Feeler
Bernard Joseph Fendler
Gerrie Fletcher
Junfang Gao
Thomas K. Gaylord
John R. Glaese
William E. Haymes
Carol E. Henderson-Kuhn
Jon Holdman
Wayne E. Holland
Julie Huff
Robert Hufft Jr.
Jared F. Hund
Dennis C. Johnson
Harris C. Jones
Thomas M. Jordan
Timothy H. Kaiser
Lori E. Kennedy
Jerry Kiefer
Erika G. Kisvarsanyi
Gary S. Kovener
James I. Latham
Charles C. Limbaugh
Christopher Lloyd
Don Madison
Lina Madison
Ronald C. Maehl
Roger E. May
Thomas J. McMahon
Brian G. Millburn
Kevin Moll
Mark W. Morris
Amy Morriss
Casey Morriss
Elizabeth A.S. Munson
William F. Munson
Charles A. Myers
Jon Nance
Hung V. Nguyen
Arthur L. Nickless
Michael Noble
Frank L. Ollinger
Jerry L. Overbeck
Donald L. Packwood
Dorcas M. Park
John T. Park
John T. Parker
Paul Parris
Daniel Payton III
Jerry L. Peacher
Norman H. Pond
Nickey L. Prater
J. Scott Price
Andrew Richard Prideaux
Donnie W. Priest
Matthew Pritzker
Frederick Rambow
Nancy L. Ranek
Arthur J. Reichert
Harold V. Romero
Frank E. Salter
Thomas M. Schmit
Richard H. Shields
Richart E. Slusher
Bart Smith
James G. Smith
Robert T. Smith
Don M. Sparlin
Nancy Stepp
John Stevens
Robert M. Stovall
John L. Thompson
Robert E. Thurman
Joey Tuttle
Gregory E. Upchurch
Agnes Vojta
Thomas Vojta
George D. Waddill
Terrence R. Ward
August C. Weisler Jr.
Gerald Wilemski
James Willcutt
David J. Wolters
Samuel Woods

Donations under $100:

Kenneth C. Adam
Bruce C. Anderson
Derek Anderson
John Bosnak
Laura Bosnak
Bradley A. Brown
Charles E. Byvik
George Caudle
Melva Crocker
Vibhakar R. Dave
Kevin B. Edwards
Suzanna Edwards
Nicholas R. Hugenberg
J. Daniel Jones
John V. Knopp
Terrence A. Leigh
Havva Malone
Joel W. Mansell
Steven A. Mezines
Kathy A. Rages
Donald G. Rathbun
Emmett R. Redd
John Reiter
Gary S. Sammelmann
Richard Schwentker
Morgan P. Slusher
Kenneth M. Stephens
Michael X. Strebler
Dakshayaneeswar Tenneti
Terry R. Tucker
Christoper Van de Riet
Charles Williams
Gary K. Woodward
Gary G. Wooley

CORPORATE:

Baker Hughes Foundation
Boeing Company
Exelon Foundation
Experimental and Math Physics Consult
Express Scripts Foundation
General Electric
Proctor & Gamble Co.
Shell Oil Company Foundation
The Benevity Community Impact Fund

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

A.K. Ibrahim and **T. Vojta**: "Monte Carlo simulations of the disordered three-color quantum Ashkin-Teller chain", Phys. Rev. B-95, 054403 (2017)

A.K. Ibrahim and **T. Vojta**: "Emerging critical behavior at a first-order phase transition rounded by disorder", Fortschr. Phys. 65, 1600018 (2017)

H. Barghathi, **S. Tackkett** and **T. Vojta**: "Extinction phase transitions in a model of ecological and evolutionary dynamics", Eur. Phys. J. B 90, 129 (2017)

M. Puschmann and **T. Vojta**: "Superfluid-Mott glass quantum multicritical point on a percolating lattice", J. Phys. Conf. Series 905, 012038 (2017)

U.D. Jentschura, **C.M. Adhikari** and V. Debierre, "Virtual Resonant Emission and Oscillatory Long-Range Tails in van der Waals Interactions of Excited States: QED Treatment and Applications", Phys Rev. Lett. 118, 123001 (2017)

C.M. Adhikari, V. Debierre, A. Matveev, N. Kolachevsky and **U.D. Jentschura**, "Long-range interactions of hydrogen atoms in excited states. I. 2S-1S interactions and Dirac-δ perturbations", Phys. Rev. A 95, 022703 (2017)

U.D. Jentschura, V. Debierre, **C.M. Adhikari**, A. Matveev and N. Kolachevsky, "Long-range interactions of excited hydrogen atoms. II. Hyperfine-resolved 2S-2S system", Phys. Rev. A 95, 022704 (2017)

C.M. Adhikari, V. Debierre and **U.D. Jentschura** , "Long-range interactions of hydrogen atoms in excited states. III. nS-1S interactions for N≥ 3", Phys. Rev. A 96, 032702 (2017)

CM. .Adhikari, V. Debierre and **U.D. Jentschura**, "Long-range interactions of hydrogen atoms in excited states. III. nS-1S interactions for n≥ 3", Phys. Rev. A 96, 032702 (2017)

J.H. Noble, M. Lubasch , J. Stevens and **U.D. Jentschura**, "Diagonalization of Complex Symmetric Matrices: Generalized Householder Reflections, Iterative Deflation and Implicit Shifts", Comput. Phys. Commu, 221, 304-316 (2017)

C.M. Adhikari, V. Debierre and **U.D. Jentschura**, "Adjacency Graphs and Long-Range Interactions of Atoms in Quasi-Degenerate States: Applied Graph Theory", Appl. Phys. B 123, 13 (2017)

U.D. Jentschura and **C.M. Adhikari**, "Long-Range Interactions for Hydrogen: 6P-1S and 6P-2S", Atoms 5, 48 (2017)

"Electron-impact ionization of H2 O at low projectile energy: Internormalized triple-differential cross sections in three-dimensional kinematics", X. Ren. **S. Amami**, K. Hossen, E. Ali, C. Ning, J. Colgan, **D. Madison** and A. Dorn, Phys. Rev. A 95, 022701 (2 February 2017)

"Differential cross section measurement for ionization of N2 in coplanar geometry", A. Sakamini, M. Harvey, **S. Amami**, T. Saxton, **DH Madison**, J. Phys. B: At. Mol. Opt. Phys. 51 015203 (2017)

"(e,2e) Ionization Studies of N2 at Low to Intermediate Energies from a Coplanar Geometry to the Perpendicular Plane", Ahmad Sakaamini, Matthew Harvey, **Sadek Amami**, Andrew James Murray, **Don Madison**, Chuangang Ning, *Journal of Physics: Conference Series* 875 (7) 062006 (2017)

""Partial wave analysis of oriented collisions", AL Harris, **Sadek Amami**, Andrew James Murray, **Don Madison**, Chuangang Ning, Journal of Physics: Conference Series 875 (7) 062006 (2017)

Confined phase separation of aqueous-organic nanodroplets", **Fawaz Hrahsheh,** Yakubu Sani Wudil and **Gerald Wilemski**, Phys. Chem Chem Phys 2017 19, 26839-26845

"Inverse design of perfectly transmitting eigenchannels in scattering media", **M. Koirala**, R. Sarma, H.Cao, **A. Yamilov**, Phys. Rev. B 96, 054209 (2017)

Uncloaking difusive-light invisibility cloaks by speckle analysis", A. Niemeyer, F. Mayor, A. Naber, **M. Koirala**, **A. Yamilov**, M. Wegener, Opt. Lett. 42, 1998 (2017)

"Fully Differential Study of Capture with Vibrational Dissociation in p + H2 Collisions", **B.R. Lamichhane**, T. Arthanayaka, J. Remolina, A. Hasan, M.F. Ciappina, F. Navarrete, R.O. Barrachina, R.A. Lomsadze, and **M. Schulz**, Phys. Rev. Lett. 119, 083402 (2017)

"Fully Differential Study of Ionization in p + H2 Collisions near Electron—Projectile Velocity Matching", A. Rivarola and **M. Schulz**, J. Phys. B 49, Letter, 04LT01 (2016) was chosen as a "2016 Highlight by the journal editors.

Julia Medvedeva published a review paper on "Amorphous Oxide semiconductors" in Advanced Electronic Materials.

Oran Allan Pringle III obituary

The Physics Department lost a very special one-of-a-kind faculty member this year when Allan suddenly passed away. Allan truly loved working and dedicating his time to helping students and elementary teachers – it was his passion. He loved doing liquid nitrogen demonstrations and he is well known all over the area schools. He is a household name with students. Allan was a giver – constantly involved in something to help students and teachers and never asking anything in return. He never said "NO" to anyone. Students have said he was the one professor on campus that helped them and gave them the confidence and self-esteem to stay in school and not give up when they wanted to quit, he never got upset or frustrated with them when they asked for help time and time again. He was always there with a big smile no matter how busy and always kind and very helpful and he had as much fun doing the demonstrations as they did participating. Allan is definitely missed by all the faculty, staff, students, and community.

Oran Allan Pringle III, Ph.D., lost his battle to cancer on March 24, 2017 at 12:00 am, leaving behind his mother Billie Gene (Hansen) Pringle, wife Kathleen (Hartung) Pringle, stepson John DiRienzo, daughter Erin Stovall with husband Logan and unborn grandson, son Brian Pringle with fiancee Red Kulis, and son Steve Pringle. Dr. Pringle was preceded in death by his father Oran Allan Pringle Jr., sister Billie G. Pringle, brother James Pringle, sister Rebecca Pringle, and trusty Labradors - Cole and Tess.

Oran Allan Pringle III was born April 26, 1948 in Madison, WI. He attended West High School with Kathleen Hartung where they shared friends but never spoke with one another. Lt. Pringle served his US Navy commission between 1971 and 1974. He left to pursue his Doctorate in Physics at the University of Missouri-Columbia, graduating in 1981 and was wedded to Kathleen Hartung.

Dr. Pringle joined the faculty of the Missouri University of Science and Technology on August 19, 1985. During his tenure, Dr. Pringle was the Faculty Advisor for the Society of Physics Students (SPS) and Sigma Pi Sigma; Editor of the Physics Newsletter; Member on the Board of Directors-Missouri Science Olympiad, The American Physical Society**,** and the APS Division of Condensed Matter Physics and Science Teachers in Missouri; Research Investigator at the Graduate Center for Materials Research maintaining a research interest "Neutron Diffraction Studies of Magnetic Materials"; published several refereed journals and papers; and Advisor to six PhD physics graduates and two physics masters students. Dr. Pringle was the Coordinator for the Annual Regional Science Olympiad, Judge for several South-Central Missouri Science Fairs, Workshop Instructor for K-12 teachers in Fundamentals and Integration of Science and Mathematical Instruction, Science Demonstrator for K-12 classes throughout South-Central Missouri, Organizer and Presenter for Physics Day at Worlds of Fun in Kansas City; and recipient of numerous Outstanding Teaching Awards along with the 2006 Governor's Award for Excellence in Teaching and Curators' Distinguished Teaching Professor in Physics. Dr. Pringle officially retired on March 1, 2017.
A memorial service was held at the Missouri University of Science and Technology Havener Center in the Carver/Turner Rooms on Wednesday, March 29, 2017 at 2:00pm. Donations may be given to the Missouri S&T Physics Department's Pringle Scholarship Fund or the Cancer Research Institute (www.cancerresearch.org).

Allan Pringle Endowed Scholarship

The Physics Department would like to announce the Allan Pringle Endowed Scholarship that has been established by Kathy Pringle with the generous donations received at Allan's memorial service. The scholarship is funded to start awards Fall '18. If you are interested in donating to the Allan Pringle Endowed Scholarship, you may do so by sending donations through the Development Office indicating that they are for this scholarship.

Emeritus Faculty—Otto Hill

Otto Herman Hill (88) passed away March 7, 2017 in New Braunfels, Texas. Born in San Diego, California in 1928 to Otto Boyle Hill and his wife Linda, Otto moved to San Antonio, Texas as a young boy. Graduating in 1945 from Brackenridge High School in San Antonio, Otto continued his education at the University of Texas, Austin culminating with a PhD in Physics in 1957. "Hook 'em!" While attending the university, he met and married his beloved wife, Joyce Meyer in 1950. They shared a rich and full life together for 65 years.

Otto's career in Physics began with the Naval Defense Lab followed by several years at General Dynamics in Fort Worth, Texas. He found his true calling as a professor of Physics at the Missouri University of Science and Technology in Rolla, Missouri. His research and teaching skills led to opportunities to satisfy his curiosity of the world by teaching in many foreign countries, including an appointment as Fulbright Professor in Ankara, Turkey. Upon his retirement from University of Missouri at Rolla as Professor Emeritus, Otto and Joyce moved to New Braunfels, Texas in 2004. He served on the New Braunfels Art Council, was a member of the New Braunfels German American Society, Friends of the Library and attended the First Church of Christ Scientist. Otto enjoyed this past year making new friends at Elan Westpointe in New Braunfels. Ever charming, he was crowned Valentine's Day King this past February.

Otto was preceded in death by his wife, Joyce Ann Meyer and parents, Otto Boyle Hill and Linda Koepp Hill. Survivors include: son, Darrell and wife Shana; daughter, Kathleen Hill Butts and husband Bob; daughter, Janice Hill and husband John Garing; son, James and wife Ann McNamara. He was a loving Opa to his six grandchildren and three great-grandchildren. Otto was a generous and avid supporter of the arts, especially live theater and the symphony. If you wish, memorial donations may be made to Circle Arts Theater, New Braunfels; Mid-Texas Symphony; Ozark Actors Theatre, Rolla; the American Diabetes Association or a charity of your choice. A family graveside service was held at St. John Lutheran Cemetery in San Antonio.

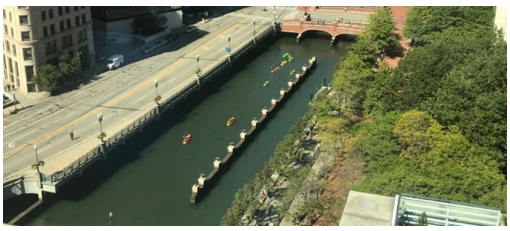
Yamilov invited as Fellow at ICERM at Brown

In Fall 2017, Alexey Yamilov, Associate Professor of Physics, spent a month at the Institute for Computational and Experimental Research in Mathematics (ICERM) at Brown University. The institute was founded in 2010 through a major grant from the National Science Foundation, Division of Mathematical Sciences. ICERM's mission is to expand the use of computational and experimental methods through mathematical tools, research and innovation.

Yamilov was invited to participate in the research cluster "*Wave Propagation and Imaging in Random Media*". This cluster brought together scientists with expertise in stochastic analysis and theoretical, numerical, and experimental wave propagation and imaging, random matrix theory, and compressed sensing with the goal of exchanging ideas and to mentor students and postdocs in the field.

Wave propagation and imaging in complex media is an interdisciplinary area in applied mathematics and physics, with roots in probability theory, statistics, optimization, and numerical analysis. It has a wide range of applications, including radar and seismic reconstruction, laser beam propagation through clouds, light propagation through the atmosphere in astronomy, secure communications in scattering media, medical imaging, and nondestructive testing of materials. Attending this workshop allowed Yamilov observe wave propagation in confined geometries (pictured below) from his office at 10th floor in downtown Providence. He lectured on "*Determinism of wave transport and eigenchannels of multiple scattering media*".

The visit to Brown was a part of a busy year for Yamilov – he gave invited talks "*Eigenchannels in scattering media: from manipulation to inverse design*" at Physics of Quantum Electronics conference in Utah and "*Custom-made eigenchannels, or how to choose the eigenchannel that's right for you*" at École Supérieure de Physique et de Chimie Industrielles (ESPCI) in Paris. Yamilov also continues to serve as the chair of "*Metamaterials and Complex Media*" committee at the Conference on Laser and Electro Optics (CLEO) – the largest conference organized by the Optical Society of America where he is a Senior Member.



Frontiers in Physics Colloquium Series

In 2017, the Frontiers in Physics Colloquium Series was opened up by Vadym Mochalin (Missouri S&T, Chemistry) who discussed his novel work in the area of nanomaterials in his talk titled "Nanodiamond and MXenes – Nanomaterials for Composites, Biomedical, and Energy Applications". In the second talk in the semester, Philip Allen from SUNY introduced his research on phonon thermal transport in the presentation: "Lattice Thermal Conductivity - History and New Developments". At the end of February, Richard Bowels from the University of Saskatchewan talked to us about "The Formation of Complex Structure in Confined Colloid Systems".

In the spring, Daniel Arovas from UCSD discussed the correspondence between solid state and high-energy physics in his talk: "The Amplitude Mode in Condensed Matter : Higgs Hunting on a Budget". In April, we heard from three speakers on a range of topics, starting from Lucas Lindsay from ORNL, "Phonon thermal transport: barriers and channels, challenges and insights". He was followed by Serena Eley from the LANL, "Resistance is Not Futile: Pinning Down Elusive Vortices in Superconductors" and Sahin Ozdemir from Washington University, "Whispering Gallery Resonators for controlling Light and Its Interactions". The spring series concluded in early May with the poster competition of the 46th Annual Harold Q. Fuller Prize Colloquium.

The colloquium series resumed in the fall with two talks in September. Jonathan Sapirstein from Notre-Dame University in his talk "Weighing the Electron" highlighted the latest achievements in quantum electrodynamics.

In the second talk, Guang Bian from the University of Missouri discussed topological solid state systems in his presentation: "Exploring Topological Phases of Condensed Matter by Angle-Resolved Photoemission Spectroscopy". In October, Peter Orth from Iowa State introduced his work on "Intertwined electronic states of matter: emergent order in frustrated antiferromagnets".

The highlight of the semester was a talk by Marco Cavaglia who visited us from the University of Mississippi. Marco is a member of LIGO Collaboration and talked to us about "Gravitational-wave astrophysics". The timing of the talk coincided with the announcement of the Nobel Prize awarded to the leaders of the LIGO collaboration for this ground-breaking work.

The November schedule included three visitors. First, Ladislau Nagy from the University of Cluj-Napoca, Romania presented in his talk "Projectile coherence effects in the ionization by ion impact" his results in ion-atom collisions. Emanuel Gull from University of Michigan presented his computational work in "Numerical Methods for the Many-Electron Problem". November concluded by Xinwen Ma who visited us from China Academy of Sciences and further discussed the few-body problems: "Electron-ion/cluster collisions: Spectroscopy and Dynamics".

The last talk in November was traditionally given by our own Thomas Vojta on "Cosmic Chirps: 2017 Physics Nobel Prize". We concluded the semester with the 24th Annual Laird D. Schearer Prize Competition.

Barbara Hale—2017 Honorary Knight St. Pat's Parade

Dr. Barbara Hale was an Honorary Knight in the St. Pat's 2017 Parade. She enjoyed riding in a Corvette and throwing beads to the children.

24th Annual Schearer Prize Competition

The Twenty-Fourth Annual *Laird D. Schearer Competition for Graduate Research,* established by the family of Dr. **Laird S. Schearer** to recognize research performed by a graduate student, was held on December 7, 2017.

The annual competition is held in memory of Laird D. Schearer, the department's first Curators' Professor of Physics. In keeping with Professor Schearer's longtime interest in enhancing the quality of research performed at the university, the Schearer Prize rewards graduate students of the Department of Physics for outstanding research performed during the course of their graduate study.

The 2017 Schearer Prize Committee, **Dr. Daniel Fischer** (Chairman), **Dr. Julia Medvedeva** and **Dr. Jim Musser** (Judges) selected three finalists who gave oral presentations about their work in a departmental colloquium. The finalist this year were **Chandra Adhikari**, advised by **Dr. Ulrich D. Jentschura**; **Ahmed K. Ibrahim**, advised by **Dr, Thomas Vojta**; and **Basu R. Lamichhane**, advised by **Dr. Michael Schulz**.

During the colloquium on December 7th, Mr. Adhikari talked about "*Long-Range Interaction of Hydrogen Atoms and Oscillatory Tails"*; Mr. Ibrahim talked about "*Three-Color Quantum Ashkin-Teller Chain";* and Mr. Lamichhane talked about *"Fully Differential Study of Capture with Vibrational Dissociation in p + H2 Collisions"*. All students gave excellent talks.

After considering the finalists' contribution to the research, knowledge of the area and presentation effectiveness, the committee awarded first prize and $1000 to Basu Lamichhane, second prize and $300 to Chandra Adhikari, and third prize and $200 to Ahmed Ibrahim. The Schearer Prize committee would like to congratulate Basu, Chandra and Ibrahim on the excellent quality of their oral presentations and thank all three finalists for participating in the Schearer Prize competition. The cash awards were made possible by the generous donations of the Schearer family. Following presentations, the finalists and numerous faculty members had a wonderful dinner at a local restaurant.

Ahmed Ibrahim, Chandra Adhikara, Basu Lamichhane

From Schearer Prize Winner Basu Lamichhane

It is my great honor to be the winner of the 24th Annual Schearer Prize for Graduate Research. I am very thankful to my research advisor Dr. Michael Schulz, for his continuous support and guidance towards my Ph.D. research. Also, I would like to thank the Prize Committee for providing the opportunity to present my research work. Last but not least, let me thank the Schearer family for making this competition possible.

In my Ph.D. research, fully differential capture cross sections accompanied by vibrational dissociation of the hydrogen molecule was measured. A novel approach was used to analyze interference effects in fragmentation processes. The observed cross-sections were measured for projectiles with a small and a large coherence length simultaneously under otherwise identical experimental conditions. By looking at the interference patterns occurring in the two-center interference, unexpected shifts in the interference pattern were identified. However, the origin of this shift is not currently understood. Thus further investigation is needed to understand this important outcome.

Visit us on facebook

We are moving in a new direction to get our news out to the public. Check out our new Physics facebook page at ***SandT Physics***. Dr. Agnes Vojta is working hard to keep the facebook page up to date with current news from the Physics Department. If you would like to contribute information, please send it to us. We would love to hear from you.

46th Annual Fuller Research Seminar

Five undergraduate students presented posters about their research projects at the 4th *Annual Harold Q Fuller Undergraduate Research Competition*, held on May 4, 2017.

The posters were judged by the Fuller Prize Committee: **Dr. Barbara Hale** (Chairman), **Dr. Paul Parris** and **Dr. Alexey Yamilov** (Judges).

The Fuller Awards are given to students whose projects are judged to be the most outstanding on the basis of accomplishment, presentation, and response to the questioning of the judges. The presenters were **Nicholas Parris, Sawyer Scheer, Trevor Voss, Sarah Skinner** and **Skye Tackkett**.

The five research projects were *"Absorption Imaging of a Li6 Quantum Gas" by* **Nicholas Parris**, advised by Dr. Daniel Fischer; *"Characterization of Corona Discharge in Air and Other Gases" by* **Sawyer Scheer**, advised by Dr. Daniel Fischer; *"Measurement of Differential Double Electron Capture Cross Section in 75 keV p+Ar Collisions"* by **Trevor Voss**, advised by Dr. Michael Schulz; *"Atomic Surface of Graphite by Scanning Tunneling Microscope"* by **Sarah Skinner**, advised by Dr. Yew San Hor; and *"Nonequilibrium Phase Transitions in a Model of Ecological and Evolutionary Dynamics"* by **Skye Tackkett**, advised by Dr. Thomas Vojta. The judges commented "We have been extremely impressed by your work…..we applaud your efforts!"

Skye Tackkett was awarded first place and received $600 prize and second place was awarded to **Trevor Voss** receiving $400 prize.

Congratulations to the winners!!

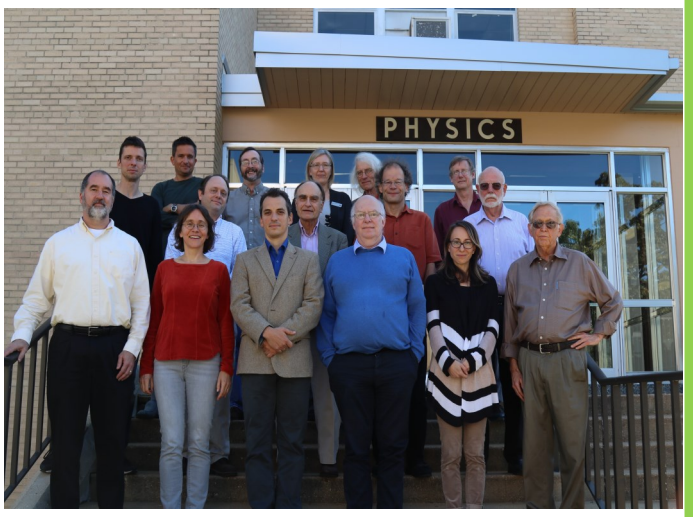
We need your stories to liven up our newsletter!!!! We would like to know what is happening in the lives of our alumni!! Please send us your stories, pictures, and musings for our 2019 newsletter. The best way to send information to us is by email to *physics@mst.edu.*

Dr. Greg Story—The Author and Playwright

Dr. Greg Story published five of his novels: Bohemian Wind, On the Banks of the Socota, Turtles, Vanishing Indiscretions, and Colors of the Mind. There is something for everyone: comedy, drama, love, adventure, and science fiction. If you can't find something you like in one of these books, the author will write another for you!!

Since 2014, Dr. Greg Story has been the playwright in residence at the Lyric Live Theater in Newburg, Missouri. His plays, "Bridge", "Gum Shoe Diaries", "Honeymoon on Mars", "Desperate Measures", and "The Incredible Roscoe's Boxes of Mystery" have been performed over the last four years.

Physics Faculty



Front row: Jim Musser, Agnes Vojta, Aleksandr Chernatynskiy, Michael Schulz, Cihan Kurter, Jerry Peacher

Middle row: Daniel Fischer, Joel Peacher, Gerald Wilemski, Thomas Vojta, Don Madison

Back row: Ulrich Jentschura, Dan Waddill, Julia Medvedeva, Greg Gelles (guest and physics fan), Greg Story

Meet New Faculty Member—Dr. Jim Musser

Jim Musser was born in Alexandria, VA, but grew up in rural northern Illinois, near the town of Union, population 600. After graduating from Marengo High School in 1983, Jim attended West Texas State University, where he ran Track and Cross-country and earned a B.S. in Mathematics in 1987. Following graduation, Jim took a year of graduate mathematics courses at WT and taught college algebra courses.

Moving to Fort Worth, TX, Jim earned a teaching certificate in secondary mathematics from Texas Christian University and began teaching and coaching at Carter-Riverside High School in Fort Worth. While in Fort Worth, Jim married Kristen Walker, whom he had known since their days at WT. The first two of their children, Karissa and Nathan, were born while they lived in Fort Worth.

Jim and his family moved to the College Station area so he could attend graduate school in physics at Texas A&M University. He taught one year of mathematics at Madisonville High School before studying full time. While at A&M Jim and Kristen had two more children, Sarah and Hope. One of Jim's TA assignments was to work with Dr. Robert Beck Clark, former AAPT president, in the training of physics teachers using strategies developed by Physics Education Research. Jim conducted his dissertation research at the Tri-University Meson Facility in Vancouver, British Columbia. He studied the distribution of the outgoing positrons from normal muon decay, producing the then world-leading measurement of the Michel parameter, rho.

In 2005, Jim earned his Ph.D. at A&M and joined the faculty of Arkansas Tech University. Jim became the Department Head of Physical Sciences at ATU in 2011 and held the position until resigning to join the faculty of S&T. The department included Chemistry, Geology and Physics. While at ATU, Jim served on several committees and working groups for the Arkansas Department of Education, writing secondary physics teacher candidate competency requirements, selecting licensure exams, creating secondary science standards and providing professional development for secondary teachers, science specialists and administrators. In his spare time, Jim helped with the Pottsville track and cross-country teams.

Jim's wife, Kristen, is a teacher of English as a second language, having taught both children and adults. Their children are grown. They have two granddaughters, courtesy of their daughter and son-in-law, Karissa and Jon Huffman.

Jim and his family have run and hiked in all the places he has lived, covering many miles in Palo Duro Canyon, Pacific Spirit Regional Park, Ozark National Forest, Mt. Nebo and Petit Jean Mountain.

Jim joined the faculty of Missouri S&T in Fall ‘2017. He and his wife are enjoying Rolla, where Jim is getting to know the local trails.

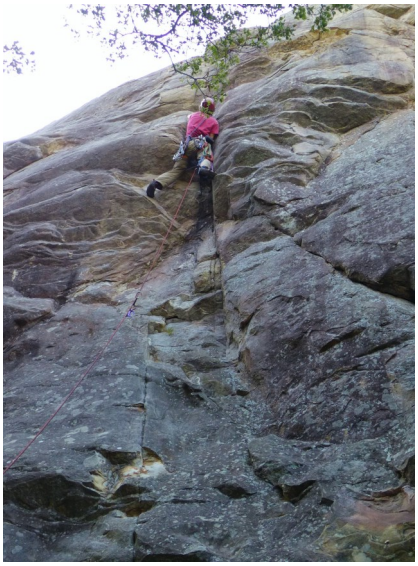
Vojta Visits Kavli Institute for Theoretical Phyics

Last summer, Thomas Vojta spent eight weeks at the Kavli Institute for Theoretical Physics (KITP) in Santa Barbara. He participated in the program "*Intertwined Order and Fluctuations in Quantum Materials"* which focused on the dazzling complexity of many strongly interacting quantum systems.

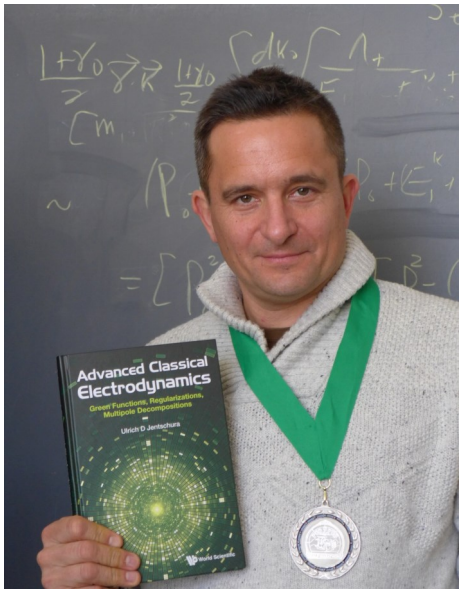
The KITP is a national center for theoretical physics located on the campus of the University of California Santa Barbara. Generously supported by the Kavli Foundation, the institute has become a world-wide model for facilitating scientific collaborations. Each year, hundreds of scientists come from all over the world for varying periods of time to work, to meet with other experts, and to participate in programs and conferences.

During his visit, Thomas gave a talk on *"Amplitude (Higgs) Mode and the super fluid-Mott glass quantum phase transition,"* which summarized recent work with graduate student Jack Crewse, exchange student Martin Puschmann, and Daniel Arovas from UCSD. As a result of the stimulating discussions with other scientists, Thomas also started working on several new research projects.

In addition to the scientific activities, the schedule left some time for hiking in the mountains near Santa Barbara and for rock climbing on the local sandstone cliffs.



Jentschura -Text Book Published



Ulrich Jentschura has published a textbook. The book with the title *Advanced Classical Electrodynamics: Green Functions, Regularizations, Multipole Decompositions* (World Scientific Publishers, Singapore 2017) is now available in print and as ebook. The book introduces classical electrodynamics using modern mathematical techniques with an emphasis on physical concepts. Connections to field theory and general relativity are highlighted. Being of advanced nature, the book still serves as a basis for a one– or two-semester course on electrodynamics within the graduate curriculum. The intended audience are students of electrodynamics, but the book should also be useful as a reference for professional researchers.

The medal around Ulrich's neck stems from the Pub-2-Pub Rolla-to-St. James Half Marathon, which Ulrich won in a time of 1:39 hours.

Faculty Notes

Dr. Oran Allan Pringle, advisor for the Society of Students and Curators' Distinguished Teaching Professor of Physics was nominated by students to receive an award for being a great advisor. Allan received an award at a breakfast ceremony with student life on Feb. 16th.

Dr. Ulrich Jentschura contributed a focus article "Radius and Interference" in the German Physik Journal where he discussed the puzzle of the proton radius.

Dr. Ulrich Jentschura received NSF grant funding.

Dr. Ulrich Jentschura gave an invited talk at the International QED Conference in Cargèse, Corsica, France, in May 2017.

Dr. Julia Medvedeva received a 2017 Faculty Excellence Award.

Dr. Julia Medvedeva gave an invited talk at the International Conference on Advanced Materials in Kyoto, Japan.

Dr. Julia Medvedeva received DMREF grant and new funding from National Science Foundation to study mixed-metal chalcogenides for water-splitting catalysis in collaboration with Dr. Manashi Nath from Chemistry department at Missouri S&T.

Dr. Greg Story received a 2017 Outstanding Teaching Award.

Dr. Thomas Vojta gave an invited talk at the "Workshop on Disorder in Condensed Matter and Black Holes" in Leiden, (Holland) which focused on connections between solid-state and gravitational physics. He also lectured at the "International Conference on Frontiers of Quantum and Mesoscopic Thermodynamics" in Prague (Czechia).

Dr. Thomas Vojta received continued funding from the National Science Foundation for his work on "Unconventional Quantum Phase Transitions".

Dr. Barbara Hale and **Dr. Gerald Wilemski** each gave oral presentations at the 20th International Conference on Nucleation and Atmospheric Aerosols in Helsinki, Finland, June 2017.

Dr. Michael Schulz gave an invited talk "Fully Differential Study of Dissociative Capture in p + H2 Collisions", International Symposium on (e,2e) Double Photoionization and Related Topics, Cairns, Australia (2017)

Dr. Michael Schulz gave an invited talk "Fully Differential Study of Molecular Fragmentation in p + H2 Collisions", Institute for Modern Physics of the Chinese Academy of Sciences, Lanzhou, China (2017)

Dr. Michael Schulz received a new NSF grant entitled "Few-Body Dynamics in Simple Atomic Systems"

Dr. Michael Schulz received the "Chinese Academy of Sciences President's International Fellowship for Visiting Scientists" and visited the CAS for one month last summer in Lanzhou.

Physics Graduate Students Receive Postdoc positions

Seng Huat "Sam" Lee My current position is that of a post-doctoral scholar at 2-Dimensional Crystal Consortium – Materials Innovation Platform (2DCC-MIP), a national facility at Penn State University that is directly supported by the National Science Foundation (NSF). The platform is focused on the development of 2D films and crystals that provides individuals at universities, federal laboratories and industry with the equipment, infrastructure and human capital to conceive, research, and develop the next generation of materials system to maintain the United States' preeminence in electronic material, device and component technology. My main responsibility is performing world-leading 2D materials synthesis research aligned to the goals of the 2DCC-MIP, including both in-house research and the support of research projects by the external user community from diverse backgrounds. More information is available at https://www.mri.psu.edu/mip and https://nsf.gov/news/news_summ.jsp?cntn_id=137877&org=NSF&from=news.

Basu Lamichhane will start as a postdoc at Temple University in March 2018. He will use his experience on COLTRIMS acquired during his Ph.D. to study sterile neutrinos.

Alumni News

Alan Koch ('71) - Retired after 35 yrs. in Applications Engr. and Metallurgical R & D. Had great and rewarding career thanks to S&T. Just received 8th patent, US9, 574, 826 B2 semi-liquid metal process and control. Keep up the good work, have fun doing science. I tutor high school Math & Science—Love it!!!

John R. Barcroft—received from his widow Jean Barcroft. I received this magazine today Apr 8, 2017. It happens to be John's birthday. He would have been 94. John retired from U.S. Dept. of Energy (formerly AEC) in 1986. He went home to be with the Lord and Savior Jesus Christ on December 18, 2016. She sent $200 toward the Physics Scholarship fund in his memory.

Physics Department

Missouri University of Science and Technology

102 Physics, 1315 N Pine Street

Rolla, MO 65409-0640

First Class

U.S. Postage

PAID

Permit No. 170

Rolla, MO

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: _____

_____ ____

_____