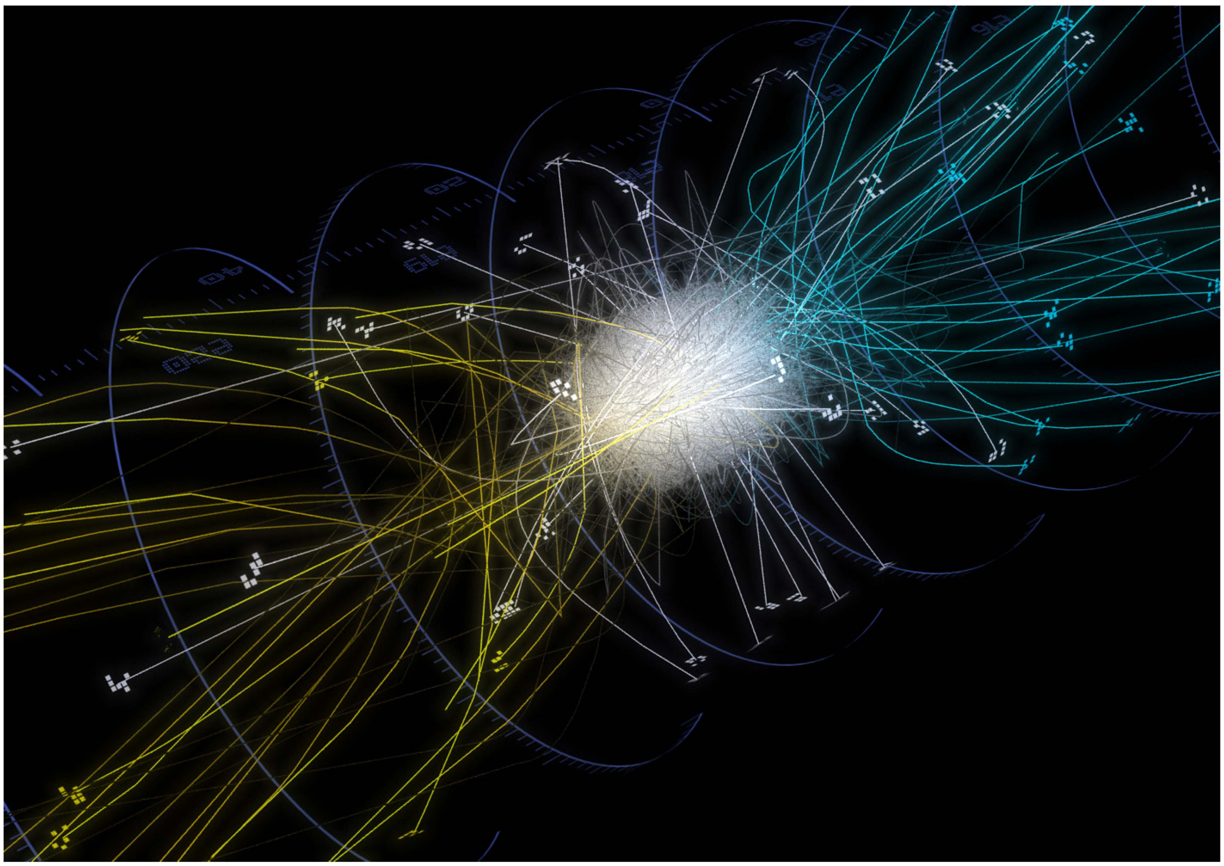
Physics INTERACTIONS

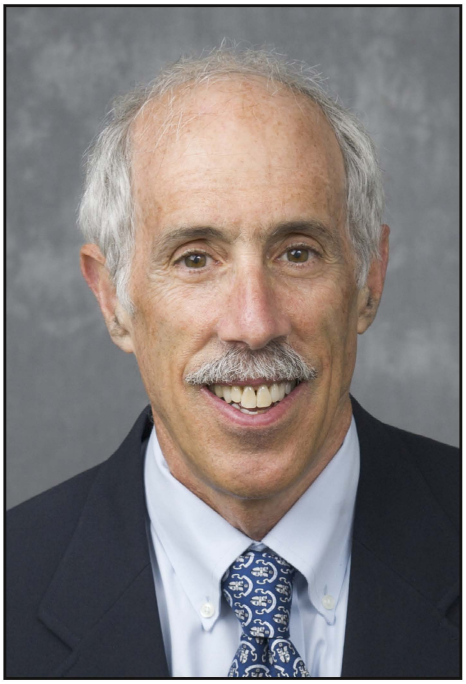
A NEWSLETTER HIGHLIGHTING THE DEPARTMENT OF PHYSICS AND ASTRONOMY AT PURDUE UNIVERSITY

2014

Charting a New Path in Atomic, Molecular, and Optical Physics



Trajectories of antihydrogen atoms from the ALPHA experiment



From the Head

As friends and alumnae and alumni of the department of Physics and Astronomy (yes, we changed our name), it should come as no surprise that Purdue University is an "R1" institution. This terminology derives from the Carnegie Classification of Institutions of Higher Education created in 1973 by the Carnegie Foundation. R1 institutions are characterized by very high research activity. In these pages, past and present, we highlight the exciting forefront science our faculty and students have been and are engaged in. In these few paragraphs, however, I would also like you to recognize that our faculty, graduate and undergraduate students and staff are deeply committed to the educational mission of the university. I will share a few examples of the innovations made that have advanced the learning of undergraduate students, whether they be physics majors or not.

Professor Erica Carlson has video-recorded her lectures so that they can be used as an online course supplement for students taking PHYS 272, Electric and Magnetic Interactions. These will also be made publicly available on iTunes U. I highly recommend that you give them a listen! In addition, over the course of the past two years, graduate student David Blasing has developed clicker questions for use in PHYS 272 recitations. These sequenced questions are designed to probe at ever-deeper levels students' conceptual understanding of the topic relevant to each week's recitation problem. Students who were exposed to these questions performed significantly better on the final exam. These results were recently presented at the 2014 summer meeting of the American Association of Physics Teachers.

Professor Ron Reifenberger has "flipped" PHYS 342, Modern Physics taken by engineering students. Ron has video-taped his lectures in order to allow more discussion and problem solving during class time. The course now provides in-depth discussions of many relevant topics in quantum physics with an eye towards applications

Professor Paul Muzikar is offering a course for junior and senior physics majors on Sustainable Energy Sources for the 21st Century. The course examines the science behind important technologies including oil, gas, coal, wind, solar, geothermal, fission, and fusion. A quantitative understanding of each energy source is developed as well as the various uses of each such as transportation, home heating and cooling, manufacturing and agriculture.

Lastly, Professors Steve Durbin and Ken Ritchie are offering an innovative new sequence of introductory calculus-based physics courses for biology students, PHYS 233 and 234. These courses have been developed in collaboration with Purdue's biology department and with physics education research faculty at the University of Maryland and elsewhere. See page 10 for the exciting details.

Credits

Physics Interactions is published annually by the Department of Physics and Astronomy at Purdue University.

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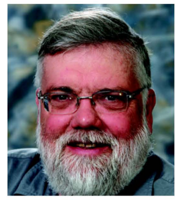
Faculty Honors

Marc Caffee received the Ruth and Joel Spira Award for Outstanding Undergraduate Teaching and was named a Fellow of the Geological Society of America.



Jay Melosh was named the recipient of the 2014 Herbert Newby McCoy Award.

Martin Kruczenski received the Ruth and Joel Spira Award for Outstanding Graduate Teaching.

Norbert Neumeister was promoted to Professor.

Oana Malis was promoted to Associate Professor.

Yulia Pushkar was promoted to Associate Professor and received and NSF CAREER Award.

Michael Manfra was named a University Faculty Scholar.

Chen Yang received the Physics Graduate Student Associate Outstanding Advisor Award.

Staff Recognitions

College of Science Customer Service Award
Emjai Gregory
Marsha Grider
Carla Redding
Randy Schnepp

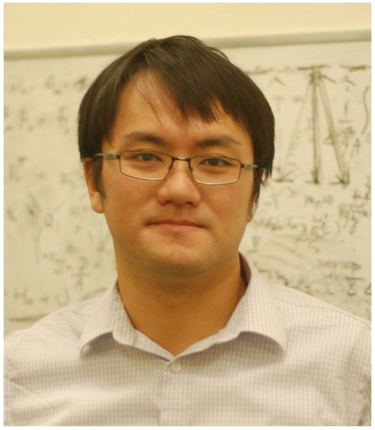
College of Science Leadership Award
Carol Buuck

College of Science Professional Achievement Award
Nancy Schnepp

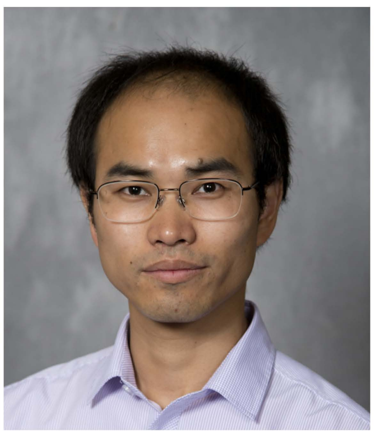
College of Science Undergraduate Advising Award
Janice Thomaz

Staff Awardees (from left to right): Dept. Head Andrew Hirsch, Nancy Schnepp, Randy Schnepp, Carla Redding, Emjai Gregory, Marsha Grider, Janice Thomaz, College of Science Dean Jeff Roberts, and Carol Buuck.

New Faculty



Chen-Lung Hung, Assistant Professor, specializes in experimental atomic, molecular, and optical physics. His specific research interests include quantum simulations using atomic quantum gases and atom-light interactions in nanophotonic circuits and sub-wavelength optical trapping. Prof. Hung holds a B.S. from National Taiwan University and an M.S. and Ph.D. from the University of Chicago. He comes to Purdue from the California Institute of Technology where he was an Institute for Quantum Information and Material postdoctoral scholar in quantum optics.



Tongcang Li, Assistant Professor, is an experiment atomic, molecular, and optical physicist whose research interests include laser cooling of solids and atoms, using ultracold matter to test fundamental laws of physics, and creating ultrasensitive detectors and novel microscopes. Prof. Li holds a B.S. from the University of Science and Technology of China and a Ph.D. from the University of Texas. He also has a joint appointment with the School of Electrical and Computer Engineering.

Andrew Mugler, Assistant Professor, is a theoretical biological physicist interested in how the cellular environment shapes cellular sensing. In particular, he investigates how the physical properties of cell sensory networks – their structure, their spatiotemporal dynamics, their energies – are connected to the features of the environment they send. Prof. Mugler comes to Purdue from Emory University where he was a postdoctoral fellow. After earning a B.S. at Harvey Mudd College, he received an M.A, M.Phil, and Ph.D from Columbia University.

Did You Know?

Purdue will host an APS Conference for Undergraduate Women in Physics on January 16-18, 2015.

Graduate Student Awards

Outstanding Graduate Student Teacher
David Blasing
Haoyu Wang

AAPT Outstanding Teaching Assistant
Ian Arnold
Kelsie Niffenegger

Akeley-Mandler Award for Teaching Excellence
Gregory Robison

Edward S. Akeley Award
Shuo Liu

Gabriele F. Giuliani Award
Ian Christie
Zachary Mitchell

George W. Tautfest Award
Li Yi

H.Y. Fan Award
Colin Edmunds
Nianpei Deng

Karl Lark-Horovitz Award
Sourav Dutta

Lijuan Wang Award
Brianna Dillon
Vineetha Mukundan

Bilsland Dissertation Fellowship
Shuo Liu
Li Yi

Undergraduate Student Awards

Bottorff Physics Scholarship
Benjamin Fasig

Shalim and Paul Sargis Memorial Scholarship
Jonathan Stelzeni

David G. Seiler Physics Scholarship
Jennifer Larson

Kenneth S. and Paula D. Krane Scholarship
Nicholas Cinko
Samuel Higginbotham

AAPT Outstanding Learning Assistant
Kyle Isch

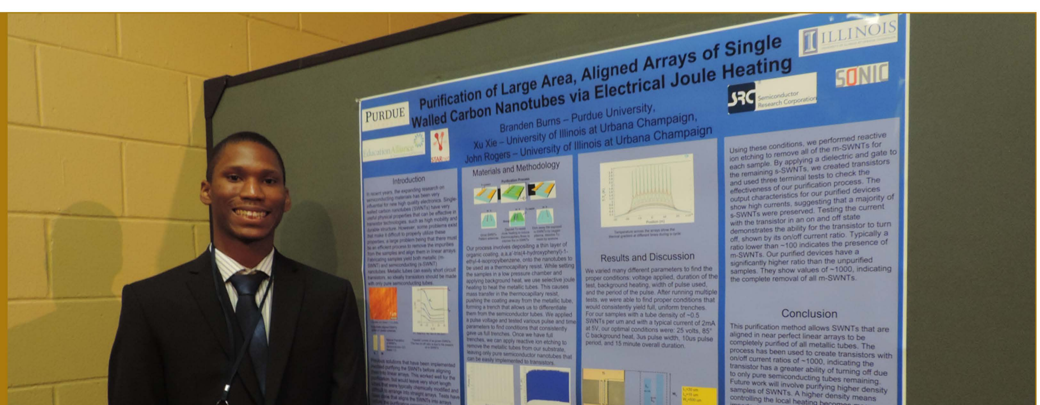
College of Science Outstanding Student Award
Nicholas Cinko (Fr)
Samuel Higginbotham (So)
Bennett Marsh (Jr)
Joshua Knobloch (Sr)

Richard W. King Award
Bennett Marsh (Jr)
Joshua Knobloch (Sr)

Judith Peters Humnicky Memorial Award
Lauren Hucek

Spira Summer Research Award
Benjamin Fasig

Physics major Branden Burns won third place in the undergraduate research poster competition at the 16th annual TECHCON conference, held September 7-9 in Austin, Texas, for his research poster on "Removing Metallic Samples to Yield Pure Semiconductor Carbon Nanotubes and Test Their Effectiveness."



Physics INTERACTIONS

Graduate Research Focus

Multiplicity Selection Effect on Ridge in deuteron + Gold Collisions

Li Yi

The High Energy Nuclear Physics (HENP) group at Purdue participates in the STAR experiment at Brookhaven National Laboratory where they collect data from proton-proton, deuteron-gold, copper-copper, and gold-gold collisions at extremely high temperatures and energy densities to investigate the formation of Quark-Gluon Plasma (QGP), a state of matter that only existed in the first few microseconds after the Big Bang. Collisions between deuterons, nuclei from deuterium atoms that contain one proton and one neutron, and gold ions are particularly intriguing because of findings from an earlier experiment at Brookhaven, PHENIX.

The PHENIX experiment displayed a characteristic, the double-ridge, thought to be possible only in QGP. This was surprising because a deuteron-gold (d+Au) system is considered too small for a collision to produce QGP. In obtaining the double-ridge, the PHENIX experiment used a technique based on the subtraction of the low-multiplicity (collisions with small numbers of particles created) from high-multiplicity (collisions with large numbers of particles created) correlations. The subtraction is based on the assumption that jet correlations (groups of particles highly correlated in energy and space) are the same in high- and low-multiplicity collisions and thus the effects from jets are canceled out. Subsequent HENP group research at the STAR detector investigated jet correlations in different multiplicity classes and found the methodology used by PHENIX removes only partially the jet correlations. This questioned the conclusion of the existence of double-ridge in d+Au collisions.

The two-particle $\Delta\eta$- $\Delta\phi$ correlation is the opening angular distribution of particle pair density; $\Delta\phi$ is the difference between each pair's azimuthal angle (perpendicular to the collision direction), and $\Delta\eta$ is the longitudinal pseudo-rapidity separation (along the beam direction - $\Delta\eta=0$ corresponds to particles traveling in the same direction, while $\Delta\eta=1$ corresponds to an angle about 45 degrees between the two particles)). The low-multiplicity collision is not expected to contain QGP, therefore most of these correlations originate from jet fragmentation. A jet is a cluster of particles originating from an energetic quark/gluon produced by hard scattering with large momentum transferred from the longitudinal to transverse direction. Most of the particles in the same jet are distributed within a cone. As Fig. 1 (a) shows, for the low-multiplicity collisions, there is a jet peak on the near side ($\Delta\phi=0$), which is composed of particles in the same jet. Due to momentum conservation, there is generally a recoil jet found at the away side ($\Delta\phi=\pi$), which is $\Delta\eta$ independent.

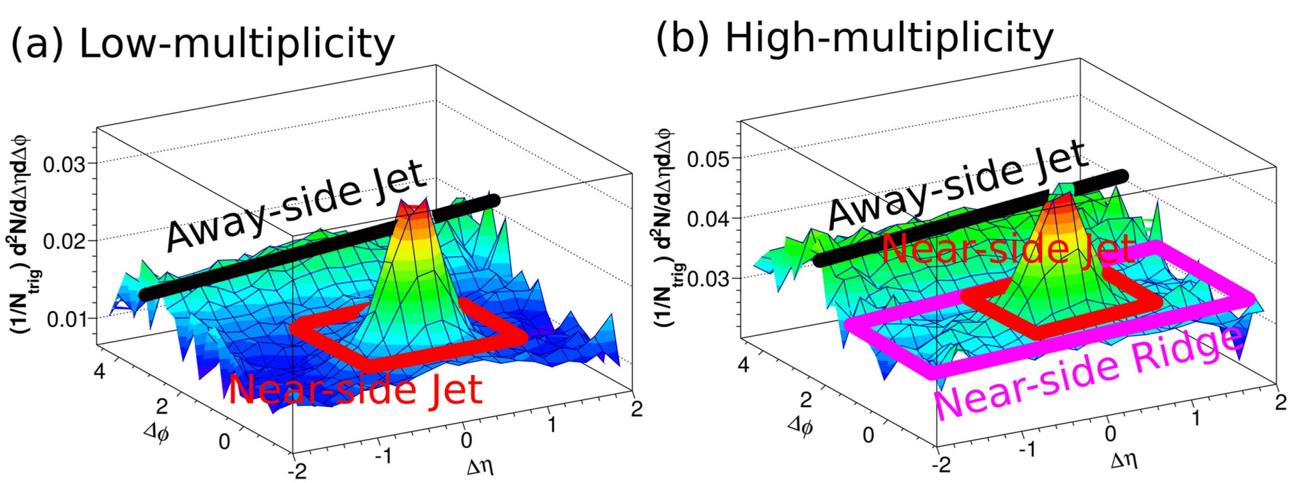


Figure 1: Two-particle $\Delta\eta$ - $\Delta\phi$ correlation for (a) low- and (b) high-multiplicity collisions.

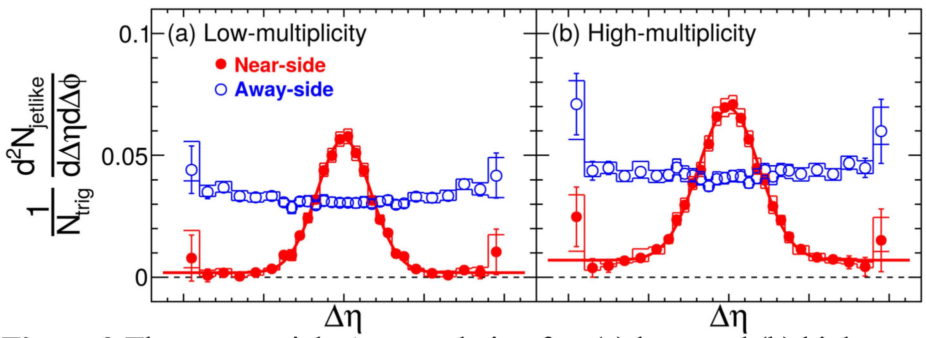


Figure 2:The two-particle Δη correlation for (a) low- and (b) high-multiplicity collisions. The red dots are the near-side yield, while the blue circles are the away-side yield.

While low-multiplicity correlations primarily consist of jet correlations, the high-multiplicity collisions contain more than the jet correlations. As Fig. 1(b) shows, on the near-side, there is a small ridge structure below the jet peak above an overall pedestal or background. The near-side ridge is uniform in Δη, which appears similar to the ridge first observed in Au+Au heavy ion collisions. If the d+Au ridge also originates from QGP collective flow effects, as is believed to be the case for the Au+Au ridge, it should be a double-ridge, both on the near-side and the away-side. However, the away-side, dominated by jet correlation in d+Au collision, is also uniform in Δη. One needs to remove jet correlations in order to measure the possible ridge on the away-side.

The away-side jet yield can be estimated by the near-side jet yield, since they are constrained by momentum conservation. The near-side jet yield can be measured from its Δη distribution. The near-side jet yield is localized in small Δη, while the near-side ridge is uniform in Δη. The jet yield can be separated from the ridge on the near-side from the Δη distribution.

We find the near-side jets in low- and high-multiplicity collisions are in fact different, as per the red dots shown in Fig. 2 (a) (b). The jet difference is possibly due to multiplicity selection bias. The multiplicity in d+Au collisions is dominated by particles produced in the jets, so events with more jet fragmentation tend to be selected as high-multiplicity collision, and vice-versa. Therefore, a different multiplicity effectively selects jets with a different fragmentation and the naive subtraction of jet correlations in low-multiplicity from high-multiplicity events fails.

This study attempts to address this issue of multiplicity bias by scaling the near-side jet yield in low-multiplicity collisions to have the same near-side jet yield as the high-multiplicity collisions. The new assumption is that the ratio of the away-side and the near-side jet yields is independent of the collision multiplicity. In other words, the scaled away-side jet yield in low-multiplicity events is assumed to be the same as the away-side jet yield in high-multiplicity. This assumption is based on the fact that away-side and near-side jets yields generally obey momentum conservation so it is a much weaker assumption. Since the near-side jet yields are different in high- and low-multiplicity collisions (before scaling), it is more realistic to remove the away-side jet contribution with the first order scaling rather than ignore the jet difference.

The red dots in Fig. 3 represent the subtraction of the correlations in the scaled low-multiplicity events from the high-multiplicity events. For comparison, the simple subtraction of the correlations in the (non-scaled) low-multiplicity events from the high-multiplicity events is also shown in Fig. 3 as the black open circles. This simple subtraction gives a clear double-ridge structure, which is consistent with the result from the PHENIX experiment. However, the result from the scaled low-multiplicity subtraction shows that the away-side is largely diminished. This suggests that the away-side 'ridge' is strongly influenced by jet correlations and, the double-ridge claim is implausible. This study, therefore, calls into question the claim of the creation of QGP in d+Au collisions.

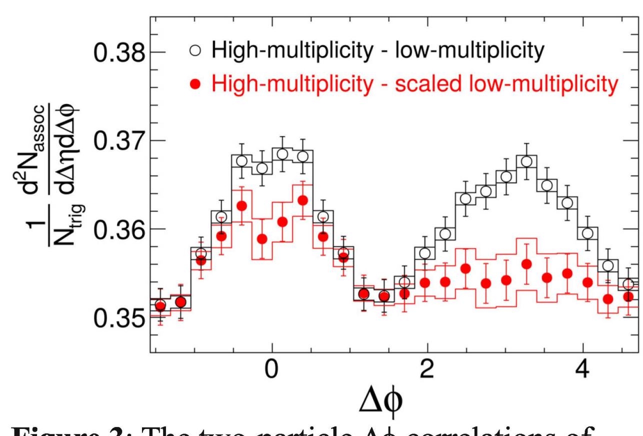


Figure 3: The two-particle Δφ correlations of high-multiplicity – (non-scaled) low-multiplicity (black circles) and high-multiplicity – scaled low-multiplicity (red dots).

Ms. Yi is advised by Prof. Fuqiang Wang. This work is supported by the Department of Energy.

Rapid Growth Curve for Atomic, Molecular, and Optical Physics at Purdue

The onset of another beautiful autumn in West Lafayette is also showcasing a new era in the Department of Physics and Astronomy, with the building up of a new research group in atomic, molecular, and optical (AMO) physics.

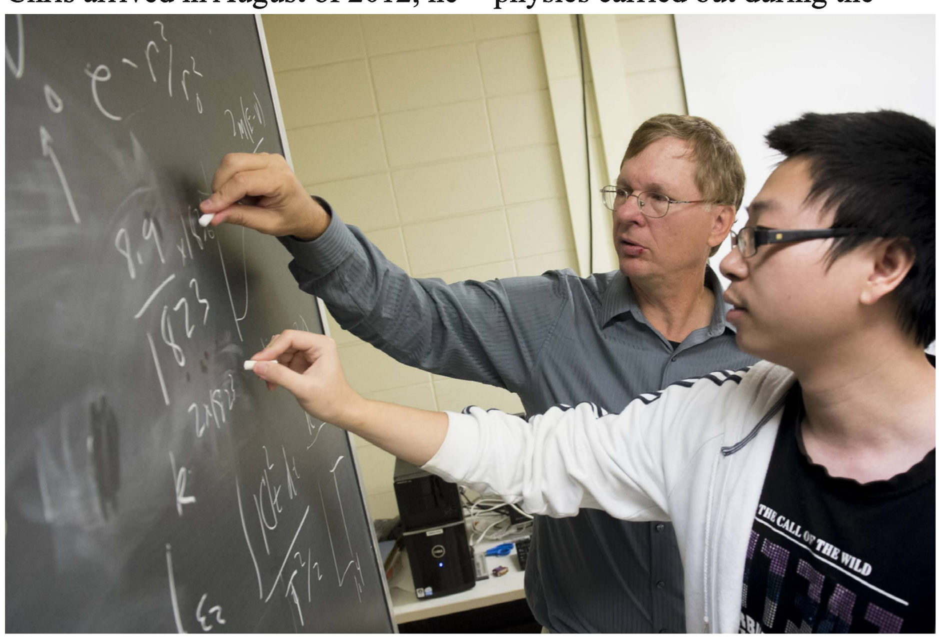
Nationally and internationally, AMO Physics has been one of the most vibrant areas of physics research during the past two decades, but until recently there was little representation in this research area at Purdue. Prior to 2012, Associate Professor Yong Chen had dedicated around 50% of his effort in that area, with a dynamic experimental effort that includes a Bose-Einstein condensation apparatus and innovative studies of ultracold molecules in collaboration with a joint ECE/Physics faculty member, Professor Dan Elliott. Dan's research group has also published actively over the years in precision atomic spectroscopy and in the interference of one- and two-photon absorption processes.

A specialist in few-body AMO systems such as ultracold atoms and molecules and their collisions as well as Rydberg atoms and molecules, Chris Greene accepted Purdue's offer to join the Department as a Professor of Physics in 2012. He moved to Purdue from the top AMO institution in the U.S., namely the University of Colorado and the renowned institute JILA where he was Chair during 2005-2006. A theoretical physicist now holding the title of the Albert Overhauser Distinguished Professor of Physics, Greene has led a hiring burst in AMO Physics. This burst has already brought three additional faculty working in AMO and related subjects, and it is slated to recruit at least 2 more positions dedicated to that subfield.

As part of the AMO initiative to bring new faculty to Purdue, the University funded a major renovation of the departmental space where theorists are concentrated on the second floor, a renovation that was just recently completed in the fall of 2014. The newly available space increases the number of graduate student desks available in the Department, and it also boasts an attractive collaboration area and a renovated conference room.

In the first two years since Chris arrived in August of 2012, he has chaired two search committees and been a member of a third, all of which have landed strong hires in AMO physics and related areas. The first search, for a senior level theoretical physicist, took place during the academic year 2012-2013. Professor Francis Robicheaux accepted Purdue's offer and moved to Purdue in the summer of 2013, after 20 years on the faculty of Auburn University. Francis' work focuses on Rydberg systems, quantum control, ultracold plasmas, and time-dependent external field effects. He has also played a crucial theoretical role in the high profile CERN experiment by the ALPHA collaboration that was the first to demonstrate trapping of ground state anti-hydrogen atoms.

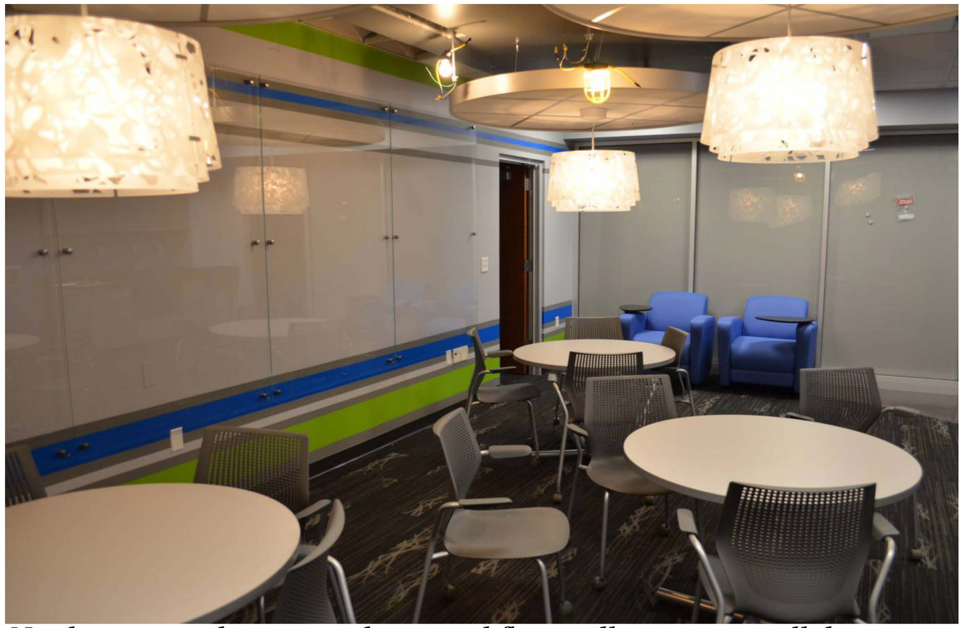
A search in experimental AMO physics carried out during the



Prof. Chris Greene and graduate student Yijue Deng go over a few calculations.

2013-2014 academic year produced another hire with excellent credentials, namely Chen-Lung Hung, a 2011 PhD from Professor Cheng Chin's group at the University of Chicago, who did postdoctoral work with Professor Jeff Kimble at Caltech. When he arrives at Purdue in January of 2015, his research will concentrate on developing quantum simulations of phenomena such as Hawking radiation and the creation of entangled phonon pairs using ultracold atoms in a Bose-Einstein condensate cooled down to a mere whisper above absolute zero temperature.

A related field for research growth at Purdue is quantum photonics. In 2013, there was a Provost level initiative to identify a handful of research areas targeted for growth, especially those on a steep growth curve on the national and international scene. One such proposal submitted by Vlad Shalaev and Andy Weiner from the ECE Department along with Chris Greene was to have a hiring initiative in quantum photonics, the field that focuses on controlling photons through their quantum mechanical properties. This hiring initiative is designed to be multi-disciplinary, with a footprint both in the College of Engineering and the College of Science. Assistant Professor Tongcang Li was the first hire under that initiative, with an appointment 75% in Physics and Astronomy and 25% in the ECE Department. Tongcang received his doctoral degree in experimental AMO physics, working with Professor Mark Raizen at the University of Texas in Austin. He came to Purdue following a postdoctoral stint at Berkeley with Professor Xiang Zhang. At Purdue, the Li group is particularly interested in the interaction of light and matter for applications in both fundamental and applied physics.



Newly renovated space on the second floor will serve as a collaborative research area for AMO and other theory groups.

Among the projects to be tackled are the laser cooling of atoms and solids, and the use of ultracold matter to test fundamental laws of physics and to create ultrasensitive detectors and novel microscopes. His group will explore the quantum spin-optomechanics of levitated nanodiamonds, which has the potential to enable the development of an ultrasensitive scanning force microscope.

The Purdue AMO group has quickly established itself as a force in the AMO research field nationally, with 24 presented papers at the annual meeting of the American Physical Society's Division of Atomic, Molecular, and Optical Physics in 2014, up from just 3 papers in 2012. The group also sponsors a well-attended weekly AMO journal club, with typical attendance of 15-18 faculty, students, and postdocs. Since the buildup of the group began in 2012, a number of collaborations have already been spawned, with several theory-experiment collaborative papers that have already been published or submitted. Based on the recent successful recruitment of several talented faculty in AMO Physics, and with additional hires planned, Purdue is clearly poised to take advantage of recent opportunities in this vibrant and rapidly expanding subfield.

Did You Know?

Research in the department generated over 11.6 million dollars in 2013-14.

Faculty Teaching Focus

Physics for Life Sciences

Prof. Stephen Durbin

Sights and sounds not often seen in physics labs fill a newly outfitted Room 154 in the Physics Building – students peering through microscopes at subcellular vesicles, tracking flows of micron-sized beads versus viscosity with powerful video analysis software, comparing fluid flow at high and low Reynolds number, working out whiteboard challenges involving intercellular signaling molecules, jumping trap-jaw ant dynamics, woodpecker beak acceleration, and many other non-traditional physics applications. This is not an advanced course in biophysics, however. Instead, it is the beginning of a new introductory physics sequence that heralds a better way to teach physics to life science students that directly connects to authentic problems in biology, and demonstrating how key insights arise from physics (Figure 1).

Figure 1 *- The inaugural "selfie" taken by Professor Durbin on the very first day of class!*

"Physics for Life Sciences I & II" is a new sequence (PHYS 233/234) that meets the introductory physics requirements for students in biology, biochemistry, health science, pharmacy, veterinary medicine, etc., including all students who typically apply to medical school. This is intended to replace the traditional sequence for algebra-based physics, PHYS 220/221, which has served this population for many decades. Faculty in the life science disciplines all recognize that their students require new skills today, in part because biology has become a much more analytical and computationally-driven field than in the past, and the need for students who can apply physical principles for modeling biological phenomena is greater than ever.

In response to this growing recognition of the need to modernize the way life science majors are taught, a team of faculty from Purdue joined up with the University of Maryland - College Park (UMCP) and two other institutions to obtain funding from the Howard Hughes Medical Institute for NEXUS: the National Experiment in Undergraduate Science Education. In particular the group at UMCP led by physics professor Edward (Joe) Redish took responsibility for developing and testing a new physics curriculum, which Purdue has now implemented as of this Fall 2014. This curriculum was guided by years of close interaction between physicists and biologists at UMCP, which provided a chance to really consider how physics plays a fundamental role in modern biology. It quickly became clear that the physics needed by life science students was not being successfully taught within the traditional courses.

***Figure 2** - A) Shelby Farmer and Justin Kryshak observing the computer video image while adjusting the microscope during the lab comparing coherent and random motion of silica beads in water. B) Morgan Sprecher and Katy Cook getting great video of their silica beads undergoing Brownian motion. C) Daniel LaReaux making fine adjustments to his microscope, which is tilted to allow simultaneous observation of Brownian motion and downward drift of silica beads in water.*

What is different about this physics curriculum? The first semester is dedicated to understanding motion, and it is based of course on Newton's Laws and the essential aspects of momentum and energy. There's not much need in biology, however, for projectile motion, blocks sliding down inclined planes, or analyzing the angular momentum of comets. On the other hand, in the biological world it is important to understand random Brownian motion, the role of viscosity and drag in fluids and their effect on fluid flow, the emergence of diffusion from the random motion of molecules, and the profound connections between energy, heat, temperature, and entropy embodied in the laws of thermodynamics.

Students also learn how physicists apply mathematical models to better understand realistic questions in biology. In their first recitation they are asked to think about the growth of worms: why do worms grow longer, but don't grow much fatter? They consider the rate that oxygen is consumed per unit volume of worm body tissue, and the rate that oxygen can diffuse through the skin. By creating a mathematical model on a spreadsheet, they can then evaluate whether oxygen needs can be better met by growing longer versus fatter, and even invited to consider how other creatures have evolved to overcome this limitation.

We have long been used to telling students to ignore air resistance when studying projectile motion, for example, but here the students use web cameras to take videos of various coffee filters falling through air, and spheres of different sizes and densities dropping through water/glycerol mixtures in tall graduated cylinders. They learn to use the same video analysis software used by professionals around the world (Figures 2 and 3) to track the motion on these objects, then import these data into Excel spreadsheets for extracting terminal

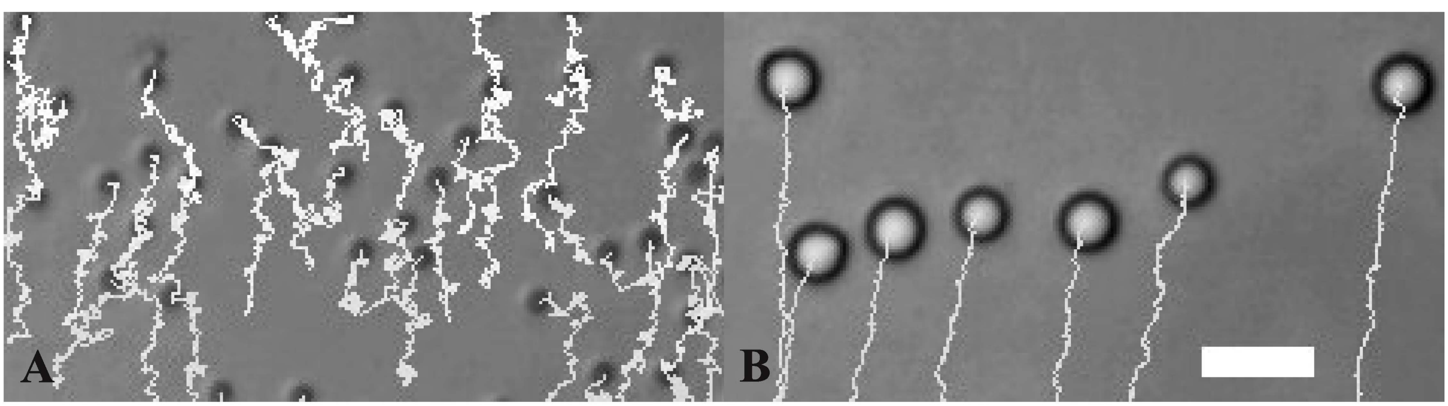


***Figure** 3 - A) Tracks for 2 micron beads on a tilted microscope stage also show directed motion due to gravity, but a much larger contribution from Brownian motion (due to the smaller size). B) Silica bead trajectories after tilting the microscope. This motion has both a random (Brownian) component as well as directed (coherent) motion due to gravity.*

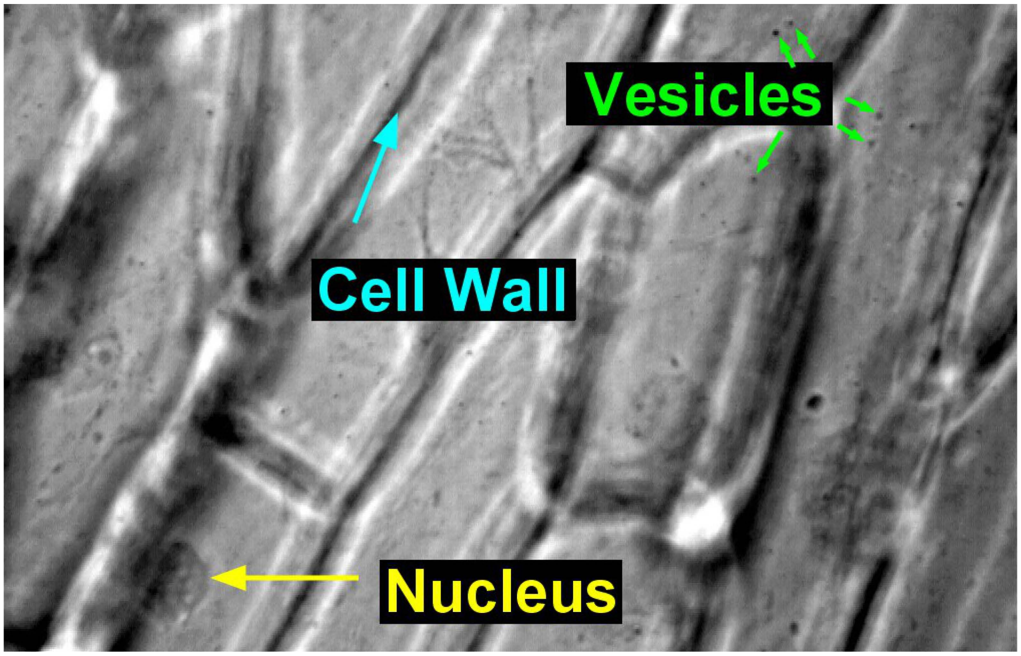


***Figure** 4 - Still image from video of live onion cells. Appearing as dark spots are the vesicles, which transport materials within the cells. Some of the time the vesicles "walk" along microtubules and exhibit directed motion. At other times the vesicles are detached and move randomly within a cell. Students use their tracking skills, honed through their experiments on silica beads, to track the motion of many vesicles, acquire and analyze the data on log-log plots to characterize these two important kinds of motion.*

velocities and other physical properties and fit these to models. They quickly progress to using video-enabled optical microscopes for capturing the motion of suspended microbeads, where they get to see with their own eyes their intrinsic Brownian motion. Subsequent analysis of random versus directed motion of these beads prepares them for the capstone experiment in this course: the direct observation and tracking of vesicles in live onion cells (Figure 4). Looking a lot like beads, these vesicles function by walking along microtubule highways inside the cell, but often break off and execute random motion. Log-log plots of tracking data reveal contrasting dynamics of random and directed motion for intracellular functions in a live cell.

This is a very challenging physics course. Other introductory physics courses have no real prerequisites except high school algebra and co-registration in calculus for engineering physics. This course is totally different: each student must have two semesters of university-level biology, one semester of chemistry, and two semesters of calculus and other mathematics before being admitted into Physics for Life Sciences I. This physics curriculum can then take advantage of each student's acquired knowledge in the life sciences, an essential step for the constant engagement with authentic biological issues. Examinations are very different also, with no computer-graded, bubbled-in scantron sheets. Students have to think a lot on exams, they write essays, and they are confronted with a surprisingly unfamiliar challenge: how do scientists make estimates? They might be asked to estimate how long all the DNA in one human cell might be if strung end-to-end (about two meters), or how long would it take for a certain disease to infect every person on the planet at a given rate of contagion? This certainly forces many students out of their comfort zone, but leads them in the direction of what professionals do on a regular basis.

PHYS 233 – Physics for Life Sciences I is being taught together by Professors Steve Durbin and Ken Ritchie, who has taken on the critical responsibility for developing the labs. This Spring (2015) it will be joined by PHYS 234, the second semester which includes more topics on thermodynamics, fluid flow, E&M, waves, optics and their connections with important tools in biology as well as issues involving such topics as biological polymers and membrane potentials. This unique curriculum represents the future of physics for life science students at Purdue University, and will likely influence similar efforts around the country.

2014 Distinguished Alumni Award

The Department of Physics and the College of Science honored Debra Guillemaud as its 2014 Distinguished Alumna on April 11, 2014.

Debra D. Guillemaud (BS 1979, MS 1980)

When Debra Dolby Guillemaud was an undergraduate in the Department of Physics, she was nervous about enrolling into the Electronics for Research course. It took a lot of persuading from her advisor — former Physics Professor Paul C. Simms — to get her to try the class out. While it was one of the toughest experiences she had at Purdue, the class helped set Guillemaud onto a decades-long career in one of the nation's top electronics companies, Texas Instruments. At TI, Guillemaud developed six patents, became director of quality for the company's Application Specific Products Division after becoming director of Mixed Signal Controllers business. In 2013, she climbed her way to the director of customer quality position. Along with tech, diversity has become an important part of Guillemaud's career at Texas Instruments. She has been an advocate and leader in recognizing the potential of a diverse workforce and creating an atmosphere where the contributions of people of different backgrounds, experiences and perspectives are recognized and valued. Guillemaud has been chairwoman of TI's Diversity Network and she is a founding member of the Dallas Women's Initiative steering team. Guillemaud is on the Board of Directors for North Texas Women in Technology International and she led programs for the Women's Center of Dallas supporting leadership development.

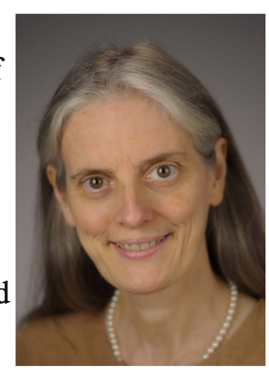
2014 Outstanding Alumni Awards

The Department and the College of Science hosted the 2014 Outstanding Alumni on October 10, 2014.

Robert Brunner (BS 1990, MS 1992)

A native of Indiana, Robert Brunner received his Ph.D. from the Johns Hopkins University where he led the development of the data archive for the Sloan Digital Sky Survey and helped develop the virtual observatory concept. In 1997, he moved to Caltech where he was a postdoc and served as Project Scientist for the Digital Sky project. Robert joined the University of Illinois at Urbana-Champaign Astronomy department in 2002 and is currently an associate professor. He led the Illinois effort to join the Large Synoptic Survey Telescope project and is a co-founder of the Dark Energy Survey. Robert is also a faculty affiliate in the Computational Science and Engineering program and in the Beckman Institute, and is currently an Associate at the Center for Advanced Study at Illinois.

Lynn Young (MS 1985, PhD 1988)



In her role as a bioinformatics scientist in the National Insitututes of Health Library for Bioinformatics Support Program, Lynn Young educates young researchers in the analysis of data from high-throughput biological experiments such as those using next generation sequencing and microarray technologies. She received her Ph.D. in physics from Purdue University where she studied vibrational modes of DNA with Prof. Earl Prohofsky. A postdoctoral research position in the Purdue Department of Medicinal Chemistry and Pharmacology led to a position in structure-based drug design at the National Cancer Institute - Frederick Lab. In the Division of Computational Bioscience at the Center for Information Technology at NIH, she led the development of the genomics component of and coordinated ontology development for the National Database for Autism Research.

From the Director of Development

It's hard to believe another year has passed. In the last 22 months I've met so many of you – but not enough! I hope to create some Physics events "on the road" in 2015, highlighting different faculty members and research. Some cities we are considering include Chicago, Boston, Washington DC and San Francisco. Feedback from you would be helpful as we start to make plans – let us know what you would find interesting.

From the fundraising front, the same demand for excellence seen in your college years remains today and we continue to try to recruit the best and brightest students. To do this, we need scholarships, fellowships and professorships. Annual giving helps as well, because these funds are unrestricted and can be used at the discretion of the department head. No matter the size or designation of your gift, please be assured that it is appreciated and will be used to continue the legacy of excellence that is Physics at Purdue!

Hail Purdue,
Christy Harrison, '90
Director of Development
csharrison@prf.org

Physics Degrees

December 2013 - August 2014

Bachelor of Science

Zachary Babyak
Lora Beard
Weijie Chen
Joshua Farrow
Paul Fitzgerald
Nicholas Gerjol
Alan Hicks
Harvey Kaplan
Nathan Kelsey
Timothy Klamo
Joshua Knobloch
Alexander Koch
Abi Komanduru
Abigaul Krueger
Sicong Li
Cordero Magana
Brian Mason
Joshua McBride
Julian Merkison
Gregory Neeser
Kevin Nejman
Mateusz Polek
Vatsal Purohit
Jacob Rimmel
Alison Roth
Ryan Senkpeil
Trevor Settles
Michael Thompson
Clive Townsend
Rebecca Weirauch
Andrew Wightman
Christian Wilson
Xifan Wu
Rui Zhang

Master of Science

Jason Boomsma
Richard Brosius
Mridula Damodaran
John Doyle
Alex Krzywda
Xing Liu
Jonathan Nistor
Cassie Reuter
Melih Solmaz

Doctor of Philosophy

Adeel Altaf
Ran An
Dionysios Antypas
Suprem Das
Katherine Davis
Sourav Dutta
Colin Edmunds
Karen Hayrapetyan
Brandon Johnson
Shigeharu Kihara
Matthew Kress
John Lorenz
Matyas Matolcsi
Sumit Mondal
Mark Palenik
Gregory Robison
David Silvers
Chetan Sood
Angelo Varlotta
Jakub Zablocki
Shunyuan Zhang
Yunlong Zi

Congratulations to our newest alumni!

Recognizing Our Donors

We recognize and thank our alumni and friends who made gifts to the Department of Physics and Astronomy in fiscal year 2013 (July 1, 2013 - June 30, 2014).

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