

A publication for alumni, friends, faculty, and staff of the MSM-UMR Physics Department

Schulz Named Fellow of American Physical Society

Professor **Michael Schulz** was elected in 2004 to Fellowship in the American Physical Society for his “fundamental experiments on atomic break-up processes.” Each year, no more than 0.5% of the members of the APS are elected to fellowship. Michael joins UMR Physics professors **Ron Olson**, **Don Madison**, and **Bob DuBois** in this honor.

Michael was hired as an assistant professor in the fall of 1990 to assume the leadership responsibility for **John Park’s** accelerator laboratory and the laboratory has flourished under his guidance. During the time he has been here, Michael has averaged five publications a year and he has been responsible for grants totaling \$2.2 million. He has given over 123 contributed conference papers, has been invited to present 29 seminars at institutions in 4 countries, and he has given 23 invited talks at national and international meetings. In recent years, he has been invited to speak at every major international meeting for his area of work. This research has led to the training of 8 Ph.D. students and two postdoctoral associates. In the fall of 2003, he was elected by the members of UMR’s Laboratory for Atomic, Optical, and Molecular Research (LAMOR) to serve as the new director of that Laboratory.



In addition to his impressive research record, Dr. Schulz is an excellent educator and is able to communicate the exciting developments of his research to undergraduate students in the courses that he teaches.

Michael was also recently awarded a Mercator Scholarship by the Deutsche Forschungsgemeinschaft (German counterpart to NSF) to spend a year as a Visiting Professor in Germany. He spends most of the time at the Max-Planck-Institut (MPI) für Kernphysik in Heidelberg. He will return to Rolla in summer of 2005.

His collaboration with the Atomic Physics group at the MPI has led to the publication of one *Nature* and numerous *Physical Review Letters* articles as well as many papers in other journals.

A particularly noteworthy result of this collaboration (which also involves UMR Professor **Don Madison**) is the first measured three-dimensional images of ionizing collisions for fully determined kinematics, which was reported in *Nature*. This work made it abundantly clear that even the most simple processes occurring in atomic collisions (like single ionization) are not nearly as well understood as was hoped based on successes of earlier (but less detailed) studies. During his current year in Heidelberg, Michael and his colleagues in Germany are performing experiments to extend the initial work reported in *Nature* to systematic

studies of such three-dimensional images. These investigations are potentially relevant for a broad range of research fields in science as they directly address the fundamentally important few-body problem. Two experiments on single ionization have been completed and another one on double ionization is underway. Recently, UMR graduate student **Nataliya Maydanyuk** spent two weeks in Heidelberg to join these efforts.

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Memo from the Chair

In addition to the many activities that we all go through at the end of the year, as chair of the UMR physics department I get to record my reflections on the past year, in this “Comments from the Chair” section of the department’s annual newsletter. It’s a great opportunity, and one of the aspects of the job that I really look forward to. This year, however, my authority to pen this column is more suspect than usual, since I was on research leave for the first eight months of the year, and participated in the department’s activities during that time only through the electronic medium of e-mail. In my absence, Curators’ Professor **Don Madison** took over as interim chair, and by all accounts did a bang-up job, guiding the department through the ongoing challenges and opportunities it faces. So it is a pleasure to thank Don for the great job that he did while I was off in France, New Mexico, and Brazil, performing research on organic electronic materials, microscopic chaos in classical models of polaron dynamics, and transport in complex systems. I did ask Don if wanted to write half of this column with me, but he declined with a big grin on his face.

I will note two events that occurred during Don’s chairmanship, that are among the many that I was sorry to have missed while I was away on research leave. The first event was the official retirement party held in February for long-time UMR Physics laboratory supervisor **Ted Deskin** (see the photo of Ted and Interim Chair Don Madison below). An employee of the campus since 1965, Ted has been an enormous help and resource to generations of physics students and faculty during the nearly forty years he has worked here. I am sure many alumni of the department remember him—he certainly seems to remember everyone who ever passed through the department, and has stories about most of them. Ted continues to work as a part-time employee for the department until we can figure out a way to replace him in September. The department wishes him, and his wife Mary Ann, a very happy, and well-deserved retirement.



Ted Deskin and Don Madison

The second event that I regret having missed while on leave was the Spring Commencement, at which the department awarded a Professional Degree in Physics to UMR alum **Mack Breazeale** (MS '54). Mack is currently a distinguished Professor of Physics at the National Center for Physical Acoustics, at the University of Mississippi.



He is a great example of the quality of the students that UMR has produced in the past, and continues to produce today (see the article and more details about Mack’s career on p. 7).

Indeed, it seems obvious that the reputation of an academic department rests on the quality of the students that it produces, which in turn rests on the quality of the faculty who teach and supervise them. The hiring of new faculty of exceptional quality is therefore one of the most important undertakings that the department collectively engages in, and at the moment we are engaged in a search for a new faculty member in the area of condensed matter physics. A faculty search is a time-consuming, but rewarding activity, since it means screening over a hundred applications in order to bring in a select group of young, energetic scientists working at the forefront of their field. It is important to get it right, since the choices one makes in such a search can affect the future of the department for a long time. It is reassuring, therefore, to find that the sometimes-grueling search process we go through has led to our having made some pretty good hires in the recent past.

It is extremely gratifying, for example, to have members of the Physics faculty, hired as Assistant Professors as recently as 1990, elected as Fellows of the American Physical Society, as Professor **Michael Schulz** was elected this past year (see the article on p.1 of this issue). The department offers its heartfelt congratulations to Michael on this well-deserved recognition of his research achievements. It is also reassuring when even more recent hires, such as Assistant Professor **Thomas Vojta**, show clear signs of following a similar path in their own careers. The department was extremely pleased this past year when Thomas was awarded an NSF CAREER grant, the most prestigious research grant awarded to young science faculty. You can read more about Thomas’s award, as well as his development of the Pegasus computer cluster in other articles in this issue of Matter 'n Motion.

So, although I was not here for some of it, it has been another great year for the department, as we continue to try and become the best Physics department we can, to recruit and produce the highest quality undergraduate physics majors in the state and the country, and to expand the research opportunities for our graduate and undergraduate students through increases in nationally funded scientific research. We continue to make progress on all of these goals, and I am sure that with the continued support of great alumni, and the hard work of the UMR physics faculty and staff, we will continue to do so in the coming year as well. – Paul Parris.

Physics Department Awards 2004-2005 Scholarships and Fellowships

The following scholarships have been endowed through the generous gifts of the friends of the UMR 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.

Recipients of the *Harold Q Fuller Scholarship-Loan* were **Samuel Woods** of Smithville, Missouri, **Clayton Weidinger** of Vienna, Missouri, and **Joshua Carey** of Fredricktown, Missouri. The \$1,300 scholarship-loan was endowed by the late Dr. **Harold Q Fuller**, chair of the physics department from 1948 to 1970 and former Dean of the College of Arts and Sciences, to recognize outstanding achievements among juniors and seniors in physics. One quarter of the scholarship is an interest-free loan that students begin to repay when they start their first jobs. "I am thankful for the support provided by those who ensure that the knowledge they prize is extended to the next generation of scientists," said Weidinger.

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

Matthew Krems, of St. Louis, Missouri, was awarded the \$1000 *Ed and Mary Sue Sickafus Endowed Scholarship/Fellowship*, established by **Ed** (BS '55, MS '56) and **Mary Sue Sickafus** in conjunction with the Ford Motor Company and awarded to physics students on the basis of their performance at UMR. "This scholarship has allowed me to focus on what really matters, my future in physics," said Krems.

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. **Sara Whitbeck** received the \$600 Hannum Scholarship for 2004-2005.

Ryan Kinney of Gladstone, Missouri, and **Joshua Carey** of Fredricktown, MO received the *Leon E. Woodman Memorial Scholarship*. This scholarship was established by the Woodman family in honor of Dr. **L. E. Woodman**, Chair of the Physics Department from 1919 to 1948. It is offered to students in physics who are of good moral character, maintain a satisfactory grade point average, and are in financial need.

In addition to endowed scholarships, which are usually awarded to juniors and seniors, the department awards special *Physics Department Scholarships*, funded from the annual phonathon, to students who earn a grade point average of 3.5 or higher. This past year, department scholarships ranging from \$500 to \$1000 were awarded to **Benjamin Bethge**, of Webster Groves, Missouri, **Kevin Roberts**, of Fair Grove, Missouri, **Zachary Stegen** of St. Charles, Missouri, **Zechariah Thrailkill**, of St. Charles, Missouri, **Garrett Diemler**, of Jefferson City, Missouri, **Kevin Johnson** of West Plains, Missouri, **Christopher Owen**, of St. Louis, Missouri, **Taige Hou**, of Webb City, Missouri, **Andrew Walters**, of Omaha, Nebraska, **Kpompoli Sesay** of St. Louis, Missouri, **Scott Zigrye**, of Prospect, Kentucky, and **Sara Yeganeh** of St. Louis, Missouri. Finally, *Robert T. Hufft Freshman Scholarships* ranging from \$500 to \$1000 were awarded to **Christopher Van de Riet**, of Eureka, Missouri, **Bradley Towery**, of St. Charles, Missouri, **Lane Martin**, of Rogersville, Missouri, **Samantha Matthews**, of Cape Girardeau, Missouri, and **Ryan Hupe**, of Troy, Missouri. "The scholarship that I received has allowed me to attend UMR," said Hupe. "For this opportunity I am eternally grateful."

Endowments: Gifts that Keep on Giving

Through the generosity of friends and alumni, the Department of Physics has been very successful in raising annual support for scholarships, student travel funds, and program enrichment. As you make your annual commitment to the department, however, you might want to consider starting an endowment in your name or in the name of a loved one, so that your gift will still be making a difference when your great-grandchildren enroll at UMR. An endowment to the university will bear the name that you designate *in perpetuity*.

Consider the impact of leaving an endowed scholarship or lecture series in your name. With an initial gift of \$10,000 (which may be started with \$2,000 and a pledge of \$2,000 annually over the next five years) you can start a fund from which generations of students will benefit. The fund will generate approximately \$500 per year initially,

and will continue to grow as the principal increases each year. The UMR physics department has several donors that have been adding to their endowment for several years, including endowments recently established by **Ed** and **Mary Sue Sickafus**, and by the estate of **Richard Hannum**.

Endowments may be established with cash or readily marketable securities. Regardless of the amount of the endowment you wish to establish or the methods used to establish it, your investment will have a significant and long-term impact on the Physics Department and on the University of Missouri-Rolla. Please call **Joanne Zap** at 1-800-392-4112 or e-mail her at jzap@umr.edu if you have any questions or wish to discuss options available to you for giving to the department.

Report from the SPS

From Andrew Walters, President of SPS

It's hard to believe that another year has come and gone here at Rolla, another batch of graduates has bid farewell to Rolla and a new group of freshmen have settled in. The Society of Physics Students continues to grow with the addition of our two newest members **Lauren Rich** and **Samantha Matthews** are eager to get involved and are great additions to our membership.

This year we saw three of our members **Kevin Johnson**, **Ryan Kinney**, and **Matt Krems** inducted into Sigma Pi Sigma, the Physics Honor Society, for their outstanding scholastic achievements.



This fall we had the opportunity to return to Argonne National Labs and see some of our own present what they have been doing in the field of physics at the undergraduate research symposium outside of Chicago. Argonne was a great opportunity to meet physics, chemical and engineering majors from around the country and find out what's going on in the dynamic world of undergraduate research. But the real fun comes on the last night in Chicago when we all board a train and go into the city to experience the nightlife, see the sites and visit Navy Pier. Every year Argonne proves to be a great balance of education and fun that never disappoints.

This fall we also had our traditional picnic where the students still fondly remember their victory over Dr. **Greg Story** in the biannual "students versus Dr. Story" volleyball game, knowing full well that we'll probably never be able to pull it off again (unless we can delay it until he has to leave again).

This semester our officers are working together to make this an exciting semester for SPS, from getting Dr. **Paul Worsey** "The Rock Mechanics Dude" back so we can watch him detonate more explosives in the physics building to having a presenter come to talk on the subject of Medical Physics.

I would like to thank all the officers for their hard work this semester and the ex-officers for helping us out whenever we got stuck. Everyone has been a big help this semester and I'm looking forward to a great semester.

UMR Physics Faculty Receive Teaching Awards

This past year, three physics faculty members were honored with teaching awards. **Allan Pringle** and **Greg Story**, received the UMR *Outstanding Teaching Award*, which honors the top 10 percent of teachers campus-wide. In addition, **Ron Bieniek** and Allan Pringle received the College of Arts and Sciences *Excellence in Teaching Awards* for their outstanding effectiveness in large-enrollment courses. According to Dean **Paula Lutz**, "The award is designed to honor a group of faculty who make a special contribution to student retention."



SPS Students at Argonne

The Pegasus Cluster

Computational Physics Takes off at UMR

Since June 2004 the Physics department has been home to a 64-node high-performance parallel computer cluster named after the winged horse of Greek mythology. The Pegasus cluster was designed and built by faculty member **Thomas Vojta** together with students **Rastko Sknepnek**, **Mark Dickison**, **John Chaloupek**, and **Bernard Fendler** and staff members **Brian Swift**, **Russ Summers**, and **Ted Deskin**.

Pegasus is designed to follow the so-called Beowulf concept. It consists of 64 regular Pentium 4 personal computers (the nodes) and 2 servers. All machines are connected via a high-speed private network. They run the free Linux operating system and software packages to support distributed parallel computing. These packages allow the cluster nodes to work together as a single machine. The result is supercomputer power for a fraction of the price of a traditional supercomputer.

Pegasus cluster is used by Vojta's research group for their studies of magnetism, superconductivity and quantum phase transitions (see article and cluster layout diagram, page 9). These complex problems require high computational power. Even using the full cluster, some programs run for several weeks to complete a calculation.



For more information see: <http://web.umn.edu/~vojta/pegasus/home.htm>.



Congratulations to UMR's 2004 Physics Degree Recipients!

May 2004

Bachelor of Science

Timothy Ivancic
Cameron Johnson
Rebecca Merrill
John Zirbel

Master of Science

Bernard Fendler

Doctor of Philosophy

Abdalla Obeidat
Rastko Sknepnek

Professional Degree

Mack Breazeale

August 2004

Master of Science

Alexandre Frohlich

December 2004

Master of Science

Matthew Foster

Doctor of Philosophy

Jared Hund

Leaving a Legacy Through Your Will

A planned gift makes a perpetual statement about your dedication to MSM-UMR. While many may not be able to establish an endowment today, they find that they are able to leave a significant legacy to the university through a planned gift, such as a bequest, life income gift, or life insurance. By making a planned gift, you show your loyalty to an institution that has played a significant role in shaping your future. For more information about giving a planned gift, contact **Lynn Bennett** at 573-341-4508 or e-mail her at lbennett@umn.edu.

Matt Foster Selected to Attend Nobel Laureate's Meeting

Matt Foster, of Paragould, Arkansas was one of nearly 60 physics Ph.D. students across the country chosen to attend a week-long conference of winners of the Nobel Prize in physics. Since 1951, Nobel Laureates in chemistry, physics and physiology/medicine have convened annually in Lindau, Germany, to hold open and informal meetings with students and young researchers. The 54th such meeting, which Foster attended, was held June 27 – July 2, 2004 with a focus on physics.

All US universities are asked to nominate one student to attend the meeting and the invited students are selected from these nominations. This program is funded by the U.S. Department of Energy's Office of Science, the National Science Foundation Directorate for Mathematical and Physical Sciences, and Oak Ridge Associated Universities. It is open to graduate students in their second or third year of work toward a Ph.D. These students' advisors must be involved in research funded either by the DOE or NSF to be considered and each university has an internal competition to determine their nomination. The Nobel meeting allowed Matt to discuss physics one-on-one with the greatest minds in the world. Foster says that "It was truly the most wonderful experience of my life, to listen to such great men discuss physics with such passion." More information about the 54th meeting of Nobel Laureates is available online at <http://www.orau.gov/lindau2004/>.

After attending the Nobel Laureates meeting in Lindau, Matt visited the Max-Planck-Institute in Heidelberg, Germany. Much of his research work has been in collaboration with

the experimental group in Heidelberg. This was the first time that Matt had the opportunity to visit Heidelberg and see the lab there.

Foster works with his advisor, **Don Madison** and his co-advisor, **Jerry Peacher**. His research is directed at trying to understand how fundamental particles interact with each other. This problem is called the few-body problem and its solution has eluded scientists for several decades. "It's basically an elaborate game of billiard balls on an atomic scale," Foster explains. To study this problem, experimentalists shoot a particle at an atom and watch to see what happens. As a theorist, Foster develops mathematical models of the collisions and then calculates the prediction of the model to see if it agrees with the experimental measurements.

So far, Matt's calculations have led to a much better understanding of the collision between heavy highly charged ions and helium. He has been a co-author on 5 refereed research papers, 3 chapters in books and 16 papers presented at national and international meetings. Matt was also a finalist and 3rd place finisher in the 10th Annual Scheerer prize competition for outstanding graduate physics research in only his second year as a graduate student. The Scheerer competition is normally dominated by students nearing completion of their degrees. Foster also competed and won 1st place in the first annual UMR Sigma Xi Winter 2003 Graduation Jubilee Scientific & Engineering Research Poster Competition. In the fall of 2004, Matt was selected as a finalist in the GEC Student Award for Excellence Competition held at the 57th Annual Gaseous Electronics Conference which took place in Bunratty, Ireland.

Physics Department Acknowledges Corporate Support

The Physics Department gratefully acknowledges the support of the following corporations:

3M Foundation
Ameren Charitable Trust
Boeing/McDonnell Douglas Foundation
Conoco Phillips
EOG Resources, Inc.
Ford Motor Company
General Electric
Honeywell Foundation
Shell Oil Company Foundation
Storagetek Foundation



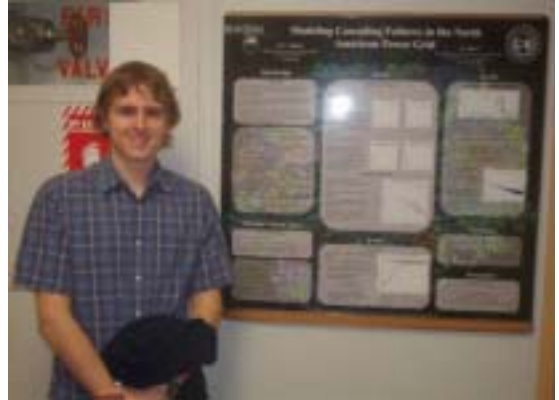
*Matt Foster and Nicolaas Bloembergen
(1981 Physics Nobel Laureate)*

Ryan Kinney Wins Sigma Xi Poster Competition

Physics undergraduate student **Ryan Kinney** was awarded first place in the campus-wide Sigma Xi Engineering and Scientific Poster Competition, held during the Winter 2004 Graduation Jubilee. This marks the second consecutive year that a physics student won the competition. Also participating in the competition were physics students **Clayton Weidinger**, **Sam Woods**, **Matt Krems**, and **Micah Burgdorf**.

As a freshman in 2002, Ryan entered the research environment by working under **Michael Schulz**, studying the many-body problem. Continuing his quest to gain experience, Ryan spent the summer of 2004 at Pennsylvania State University under **Dr. Réka Albert**, studying cascading failures of the North American power grid. This research generated the poster used in the competition, as well as presentations for a physics department colloquium, the upcoming March American Physical Society meeting,

and a letter in the *Physical Review E*. While at Penn State, Ryan was supported by the National Science Foundation Research Experience for Undergraduates (NSF REU) program. This program allows undergraduates to enhance their education experience by funding research they perform at universities across the nation. According to Ryan, "My REU experience was amazing because it combined rigorous research with new personal experiences. I believe that an REU is vital for any undergraduate who is thinking about graduate school because it tests their ability and desire." Ryan is currently working with UMR Assistant Professor **Thomas Vojta** studying phase transitions and plans on spending the summer at the California Institute of Technology on another REU.



Breazeale Receives Professional Degree at Spring Commencement

Dr. Mack A. Breazeale of Oxford, Miss., was honored with a UMR Professional Degree at the spring 2004 commencement ceremonies. Mack received his bachelor's degree in physics from Berea College in Kentucky in 1953, his master's degree in physics from the University of Missouri-Rolla in 1954, and then his Ph.D. in 1957 from Michigan State University.

Mack began his academic career in 1954 as an assistant professor of research at Michigan State University. He then became an associate professor of physics at the University of Tennessee, and in 1967, he became a full professor at the University of Tennessee. He is currently a Distinguished Research Professor of Physics at the National Center for Physical Acoustics, University of Mississippi.

Breazeale has served as a consultant to Oak Ridge National Laboratory, the Naval Research Laboratory, Leeds and Northrup Corp., McDonnell-Douglas Corp., Applications Research Corp., and Alcon Corp. Professionally, Breazeale is a fellow of the Acoustical Society of America, the Institute of Acoustics (Great Britain), and the Institute of Electrical and Electronics Engineers. He is a member of the American Physical Society, Phi Kappa Phi, Sigma Pi Sigma, Sigma Xi, and the American Association of University Professors. Among other awards, Breazeale received the Silver Medal in Physical Acoustics in 1988 from the Acoustical Society of America in Honolulu, Hawaii.



To Contact UMR Physics

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

Nano-Scale Laser Writing Method May Help Scientists "Connect" the Quantum Dots

Imagine if your office laser printer could print text the size of atoms, then embed that ink into a writing surface as light as air. That, in a sense, is what researchers at the University of Missouri-Rolla have done with a new "laser writing" technique they have developed. But with this process, the "ink" is a semiconductor that could write a new chapter in the field of micro-computing.

Basing their work on photolithography, a technique commonly used by microchip makers to print circuitry on silicon wafers, the UMR researchers zapped isolated spots of a silica gel with a laser. In the process, they discovered that they could create tiny semiconducting materials known as quantum dots, which could lead to new advances in electronics, computing and materials science.

The UMR researchers, led by **Max Bertino**, an assistant professor of physics, reported on their method in the Dec. 20 issue of the American Institute of Physics journal *Applied Physics Letters*. According to Bertino, this is the first time researchers have created quantum dots via photolithography.

The technique involves embedding tiny particles of semiconducting materials -- the "ink" in this printing process -- into the writing surface. Bertino and his team used cadmium sulfide as the semiconductor. Semiconductors are materials that have properties between metals, which can conduct electricity, and insulators, and are widely used in the electronics industry.

The "paper" in this case was a silica gel which, after further treatment, was turned into an aerogel, one of the lightest known materials. When isolated portions of the gel were zapped by an infrared laser, the result was the creation of particles so small they must be measured in "nanometers," or billionths of a meter.

"These particles are so small that the electrons are in the quantum confinement regime," says Bertino. That means the substances are "quantum dots" -- specks that are only a few nanometers in size, says Bertino.

These nanoscale structures are of interest to the scientific community because they hold tiny puddles of electrons, which possess unusual optical properties. The cadmium sulfide dots Bertino and his team developed have interesting properties.

"Our cadmium sulfide quantum dots not only absorb light but they also emit light," he says. "By tuning the size of the particle, you can change the emission range."

While interesting from a theoretical and scientific viewpoint, such properties could also be of interest to scientists who hope to develop quantum computers, quantum-dot lasers or molecular-scale integrated circuits, Bertino says.

The UMR team originally set out to improve upon existing photolithographic methods, Bertino explains. More conventional photolithography, which involves a combination of chemical deposition and etching to apply materials to a surface, has been used with a few, mostly expensive, materials, such as silver and gold, Bertino says. But he and his colleagues wanted to find a way to use a broader palette of nanoscale semiconducting materials.

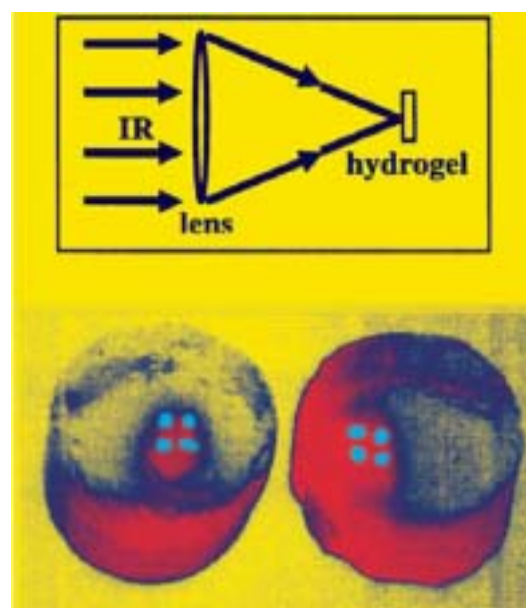
The researchers mixed cadmium nitrate and thiourea in a silica gel, which would later form the aerogel. The materials, mixed at room temperature, form the semiconductor cadmium sulfide.

After cooling the mixture to halt the chemical reaction, Bertino and his team placed the silica gel in front of the infrared laser. By honing the laser's beam to a few microns, they heated tiny, isolated sections of the silica gel. The chemical reaction caused by the heat formed the semiconductor particles only in the heated regions.

The researchers plan to conduct similar experiments using ultraviolet laser beams and other materials, including a honeycomb structure that can be made with holes as small as two nanometers in diameter. "Using an ultraviolet laser would allow us to work on materials that are sensitive to heat, such as polymers," Bertino says.

The researchers have also applied for a patent for their process, he adds.

Working with Bertino on this research are **Greg Story**, associate professor of physics at UMR; **Chariklia Sotiriou-Leventis**, associate professor of chemistry at UMR; **Akira Tokuhito**, assistant professor of nuclear engineering at UMR; **Raghuveer Gadipalli**, a UMR graduate student in physics; **Chuck Williams** of St. Louis, a senior in physics; **G. Zhang**, who recently received his Ph.D. in chemistry from UMR; **Suchismita Guha**, a professor of physics at the University of Missouri-Columbia; and UMR assistant professor of Chemistry **Nicholas Leventis** who also works at NASA's Glenn Research Center in Cleveland.



CdS Spots Photolithographed in two Aerogel Monoliths

NSF Awards CAREER Grant to UMR's Thomas Vojta

UMR physics faculty member **Thomas Vojta** has been awarded a CAREER grant from the National Science Foundation for his research into superconductivity and magnetism at low temperatures. Vojta will receive \$400,000 from NSF over a five-year period to study "Quantum Phase Transitions in Electronic Systems."

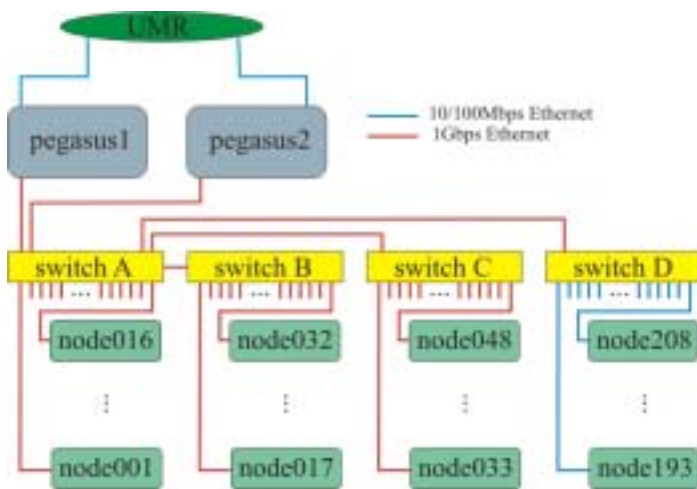
The CAREER award is the NSF's most prestigious award for new faculty members. The CAREER program recognizes and supports the early career development of teacher-scholars who are most likely to become the academic leaders of the 21st century. Recipients of the CAREER award are selected on the basis of creative career development plans that effectively integrate research and education.

Together with graduate student **Mark Dickison** and several undergraduate students, Vojta investigates a new type of phase transition which has become a central paradigm in modern solid state and statistical physics. These new transitions, which are dominated by quantum mechanics and thus called quantum phase transitions, occur at extremely low temperatures when a parameter like pressure, magnetic field or chemical composition is changed. Important applications of this research are quantum magnetism and superconductivity, the ability to transport electricity without any loss.

Vojta tries to understand how quantum phase transitions can induce or enhance superconductivity in certain materials, a question of great technological potential.

To explore these questions, Vojta's group performs not only traditional pencil-and-paper calculations but also massive computer simulations. Part of the NSF grant funds have been used to build a state-of-the-art 64-node parallel computer cluster, called the Pegasus cluster (for more see the article on page 5). Since July 2004, it has been running round the clock performing Monte-Carlo and other calculations for the project.

A very important part of the CAREER program is the teaching plan and its integration with the research program. Vojta is developing a series of computational physics courses where upper level undergraduates and beginning graduate students can gain hands-on experience in solving physics problems by computer simulations. Students who successfully finish these courses will be well prepared to participate in Vojta's research or one of the many other computational projects in the department. In addition, they acquire valuable interdisciplinary skills for today's job market.



UMR Pegasus Cluster Layout

Congratulations to 2004 Physics Dean's List Recipients

Winter Semester 2004

Benjamin Bethge, Joshua Carey, Christopher Chandler, Kevin Day, Timothy Ivancic, Jeffrey Jau, Ryan Kinney, Matthew Krems, Zachary Stegen, Brett Sweeney, Zechariah Thraikill, Andrew Walters, Clayton Weidinger.

Fall Semester 2004

Benjamin Bethge, Joshua Carey, Christopher Chandler, Kevin Day, Timothy Ivancic, Jeffrey Jau, Ryan Kinney, Matthew Krems, Zachary Stegen, Brett Sweeney, Zechariah Thraikill, Andrew Walters, Clayton Weidinger.

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

Donations over \$100:

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Olson, Ronald E
Packwood, Donald L
Palmerton, John B
Park, John T
Parris, Paul E
Payton, Daniel N
Perez, James Andrew
Peterson, Jay A
Pickett, Robert C
Pimmel, Kathryn Masterman
Priest, Donnie W
Rauh, David E
Reagan, Roger L

Reago, Donald A
Reetz, Arthur J
Schowengerdt, Franklin D
Schroeder, Jeffrey Paul
Schulz, Michael
Sehlin, Scott Richard
Shields, Richard H
Shull, Dale R
Sickafus, Edward N
Sigler, Carl B
Siriwardane, Haresh Gnaninda
Soellner, Arthur M
Sommerer, Timothy J
Sonnad, Kiran Girish
Sparlin, Don M
Spratt, Robert E
Stein, Michael S
Stephens, Edward Franklin
Tai, Chiu-Ying
Thompson, John L
Thornton, Christopher Allen
Underwood, Millard K
Van Nostrand, Robert G
Van Pelt, Lee Gordon
Vojta, Agnes and Thomas
Ward, Terrence R
Waters, Jonathan Hale
Webster, David W
Wilemski, Gerald
Yallaly, Stephen Paul
Zahn, Choon Bee

Donations up to \$100:

Abayarathna, Dharmalatha
Adams, Bert B
Alexander, Ralph W
Arnett, Kenneth E
Bosnak, John S
Bross, David K
Caldwell, Robert E
Canner, James P
Carmichael, Dwight E
Carstens, John C
Church, Charles H
Cole, Patrick L
Coleman, Fred J
Cordes, David J
Darr, David S
Davis, Ralph J
Doelling, Richard A
Elchinger, Gilbert M
Feeler, Courtney Ryan
Flick, Robert M
Frederick, Dennis M
Gettemeyer, Glen R
Glascok, Michael D
Goroch, Andreas K
Guinn, Harvey C
Harrison, Terrance Rich
Hatfield, Daryl C

Holland, Wayne E
Hughes, William M
Hukku, Suman K
Johnson, Jerry G
Jones, John Daniel
Kisvarsanyi, Erika Gabriella
Knopp, John V
Kone, Franklin W
Kuhn, Carol E
Lawler, James E
Limbaugh, Charles C
Lindgren, William A
Link, Bennett Karl
Loepp, Arthur R
Luetjen, Hulen H
Mattlage, Raymond F
May, Roger E
McClure, Donald A
McDaniels, John L
McGuire, John W
McMahon, Thomas J
Meier, David L
Meyer, William Vernon
Moore, David Patrick
Mulanax, Rebecca Erin
Myers, Charles A
Nance, Jon R
Neumann, Charles J
Newquist, Lawrence A
Nichols, Charles S
Nickless, Arthur L
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Okonek, Terry Allen
Oppliger, Larry D
Paul, Raymond E
Peery, Larry J
Rages, Kathy A
Rambow, Frederick H K
Randoll, Rodney O
Ranek, Nancy L
Rathbun, Donald G
Redd, Emmett R
Reiter, John R
Rusche, Edmund W
Salter, Frank E
Sammelmann, Gary S
Schricker, Don
Schultz, David Robert
Schwentker, Richard S
Shiells, James
Slusher, Morgan P
Smith, Robert T
Strebler, Michael X
Stringfellow, Blair C
Strohmeier, James J
Tappmeyer, John Lester
Thom, Richard D
Thurman, Robert E
Ullrich, Carsten



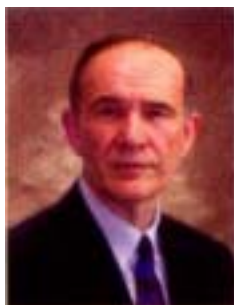
Phonathon 2005

More than 180 alumni gave \$15,075 in donations to the MSM-UMR Physics Department during last year's Fund-raising Phonathon with an average gift of \$82. The department greatly appreciates your generosity, which helps to support scholarships and student activities like the Society of Physics Students. "Your support makes such a difference to our department," says **Dr. Paul Parris**, Chair of Physics, "especially in times of reduced budgets. Scholarships are extremely important, and so are the student activities that your gifts support." Your support this year will be more important than ever in helping us attract great students to our department. This year, we will be calling our alumni **February 27-March 3**. When the phone rings, please take a moment to share some of your Rolla experiences with a current UMR student, and say, "Yes," when asked for a pledge. Taxpayer support accounts for only one-third of the university's revenue, so your contribution makes up an important part of the department's total income. Private funding also helps distinguish UMR from other universities, increasing the value of your education. Any amount you give will be appreciated. It will help make UMR a leader in alumni giving among public universities, and will help the Physics department fulfill its educational mission.

Vietti, Michael A
Waddill, George D
West, Jerry Doug
Willcutt, James T
Wilmont, David A
Wolters, David J
Woodward, F Matthew
Woodward, Gary K

Upchurch Appointed to CBHE

The Physics Department is delighted to learn that UMR Physics Alum **Gregory Upchurch** (BS '72) is the newest member appointed to the Coordinating Board for Higher Education. "We are very excited to have Gregory join the Coordinating Board for Higher Education," said **Lowell C. Kruse**, CBHE chair. "We have some very important issues to address in the coming months, such as affordability of higher education for Missouri's citizens, and we welcome his insight and leadership."



Upchurch practices in the General Business Litigation and

Intellectual Property & Technology Practice Groups in the St. Louis, Missouri, office of Husch & Eppenberger, LLC. He concentrates his practice in the areas of intellectual property litigation and licensing, as well as patent application involving the electrical, mechanical, biomedical, and software fields. He is an adjunct professor at Washington University School of Law, where he teaches intellectual property litigation and technology licensing.

"Higher education is critical to the economic future of Missouri," said Upchurch. "Improving the quality and accessibility of our higher education programs will be my first priority."

Upchurch is replacing Dudley Grove of St. Louis. His term will expire in June 2010. Upchurch is also a member of UMR's College of Arts and Sciences Dean's Advisory Council.

UMR Students & Alumni: In Press

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

"Fully Differential Cross Sections for C6+ Single Ionization of Helium," M. Foster,^{2,3} D.H. Madison, J.L. Peacher, M. Schulz, S. Jones,³ D. Fischer, R. Moshhammer, and J Ullrich, J. Phys. B 37, 1-16 (2004).

"Second Order Distorted Wave Calculation for Electron Impact Ionization of Hydrogen," Z. Chen,² D.H. Madison, C.T. Whelan and H.R.J. Walters, J. Phys. B 37, 981-95 (2004).

"Integral Cross Section for Electron Impact Excitation of the 3p53d States of Argon," D.H. Madison, A. DasGupta, K. Bartschat, and D. Vaid,³ J. Phys. B 37, 1073-82 (2004).

"Highly Charged Particle Impact Ionization of Helium," M. Foster,^{2,3} D.H. Madison, J.L. Peacher and J. Ullrich, J. Phys. B 37, 3797-807 (2004).

"Doubly Differential Cross Sections for Ionization of Xenon by Spin Polarized Electrons," A. Prideaux² and D.H. Madison, J. Phys. B 37, 4423-33 (2004)

"Synthesis of homogeneous alloy metal clusters in silica aerogels," J. F. Hund,³ M. F. Bertino, G. Zhang, C. Sotiriou-Leventis, N. Leventis, Jou. of Non-Cryst. Solids 350, 9 (2004).

"Laser Writing of Semiconductor Nanoparticles and Quantum Dots," M. F. Bertino, R. R. Gadipalli,² J. G. Story, C. G. Williams,¹ G. Zhang, C. Sotiriou-Leventis, A. T. Tokuhira, S. Guha, and N. Leventis, Appl. Phys. Lett. 85, 6007 (2004). The article was also published in "Virtual Journal of Nanoscale Science & Technology" (Dec. 20, 2004 issue), and was reviewed by "Micro/Nano Newsletter" (January 2005 issue), by "MRS Bulletin" (Feb. 2005 issue), and by "Nanotechwire.com" (<http://nanotechwire.com/news.asp?id=1385>).

"Three-Dimensional Imaging of Atomic Break-Up Processes," M. Schulz, R. Moshhammer, D. Fischer, A. Hasan, N.V. Maydanyuk,² H. Kollmus, D.H. Madison, M. Foster,^{2,3} S. Jones³ and J. Ullrich (INVITED), Physics of Electronic and Atomic Collision, Book of invited papers, Physica Scripta T110, 149 (2004).

"Three-Dimensional Fully Differential Single Ionization Cross Sections for 75 keV p + He collisions," A. Hasan, N.V. Maydanyuk,² B.J. Fendler,^{1,3} A. Voitkiv, and M. Schulz, J. Phys. B37, 1923 (2004)

"Nucleation rates of water and heavy water using equations of state," A. Obeidat,³ J.-S. Li, and G. Wilemski, J. Chem. Phys., 121, 9510 (2004).

"Binary Nucleation of a Nonideal System from Classical and Density Functional Theories," A. Obeidat,³ J.-S. Li, and G. Wilemski, Nucleation and Atmospheric Aerosols, 2004, edited by M. Kasahara and M. Kulmala (Kyoto University Press, Kyoto, 2004) p. 81.

"Nucleation of Polar Fluids from Gradient Theory," A. Obeidat,³ and G. Wilemski, in Nucleation and Atmospheric Aerosols, 2004, edited by M. Kasahara and M. Kulmala (Kyoto University Press, Kyoto, 2004) p. 186.

"Critical Points and Quenched Disorder: From Harris Criterion to Rare Regions and Smearing," T. Vojta and R. Sknepnek,³ Phys. Stat. Sol. (b) 241, 2118 (2004).

"Exotic vs. Conventional Scaling and Universality in a Disordered Bilayer Quantum Heisenberg Antiferromagnet," R. Sknepnek,³ T. Vojta and M. Vojta, Phys. Rev. Lett. 93, 097201 (2004).

"Smearred Phase Transition in a Three-Dimensional Ising Model With Planar Defects: Monte-Carlo Simulations," R. Sknepnek³ and T. Vojta, Phys. Rev. B 69, 174410 (2004).

"Order Parameter Symmetry and Mode Coupling Effects at Dirty Superconducting Quantum Phase Transitions," R. Sknepnek,³ T. Vojta and R. Narayanan, Phys. Rev. B 70, 104514 (2004).

Don Madison Honored for Service

Don H. Madison, Curators' Professor of Physics, was honored for his fund-raising efforts last year at the Russell House's tenth annual meeting celebration. Russell House is a domestic violence shelter in Rolla, Missouri.

The shelter houses battered women and their children, offers a 24-hour crisis line, counseling services, court advocacy, support groups, children's programs, and safety planning. Russell House helps abused women establish a life free of violence and assists them in finding community resources. All services provided to clients of Russell House are confidential and free.

Dr. Madison began serving on the Russell House Board of Directors in 2001. Based on a grant through the Missouri Department of Public Safety, Russell House donors receive a 50 percent tax credit on donations of \$100 or more. During his tenure on the board, Madison has ensured that the communities served by the Russell House are aware of the tax credit. He compiled a mailing list of potential donors to whom a letter is sent annually, informing them of the tax credit and the work of the Russell House. In response to his efforts over the past three years, Russell House has received over \$40,000 from individual donations.



*Curators' Professor of Physics
Don Madison*

Alumni Notes

Chris Thornton (BS '90) writes "**Pam** and I welcomed our daughter **Rowan Elizabeth** to the world June 26, 2003. Everyone is happy and healthy!"

Andreas Goroch (MS '69) tells us he is "still running--finished the Big Sur Marathon for the second year in a row."

Mike Noble (BS '91) has moved again! In last year's newsletter we reported his move from Albuquerque, New Mexico to Conyers, Georgia. Now he is in Hannibal, Missouri, working as an Assistant Plant Manager for General Mills. "It's great to be back in Missouri so I can finally get my UMR license plates," Mike tells us.

Robert Caldwell (MS '69) tells us "**Judy** and I are building our new home in Huntsville, Texas."

John Bosnak (BS '63) retired in April 2002 from Honeywell in Kansas City. He consulted with Honeywell until March 2003 and has been working with them part time since April 2003. His wife **Laura** is well and working at Bayer Research. John and Laura have three children and four grandchildren.

Ed Sickafus (BS '55, MS '56) received the UMR Alumni Achievement Award at the annual Alumni Association Meeting, at Homecoming, in October 2004.

Shella Keilholz (BS '97) reports "I got my PhD in Engineering Physics a couple of years ago at the University of Virginia. My new job in Atlanta is an assistant professorship in a biomedical engineering department shared between Emory

University and Georgia Tech, but my primary appointment will be at Emory. I'm really excited about it."

Franklin Schowengerdt (BS '66) retired in August 2003 from Colorado School of Mines and accepted a position at NASA Headquarters as Director of the Space Product Development Division within the Office of Biological and Physical Research.

Daniel Arbini (BS '94) says "Just got married. Never thought after being single for 41 years this would happen. I married **Kathi** and now have a 16 year old stepson, **Kevin!**"

Kiran Sonnad (MS '98) writes "I finished my PhD this year and since then have been a postdoc at the Stanford Linear Accelerator Center (SLAC). At my PhD I worked on problems varying from plasma physics to nonlinear dynamics, all of them concerning the study of charged particle motion in accelerators. I have been in touch with Dr. **Carstens**, who, you may recall was my masters thesis advisor at Rolla. I get to know about what's going on at UMR through the Alumni newsletter but I wanted to keep you updated on my whereabouts and what I am up to."

If you wish to get in touch with any of these alumni, or any others, please contact the Physics department at (573) 341-4781 or at physics@umr.edu. We can generally give you current phone numbers, along with postal and e-mail addresses. We would be grateful if you would take the time to fill out and return the alumni information on both sides of the last page of this newsletter.

Frontiers in Physics Colloquium Series

The 2004 *Frontiers in Physics Colloquium Series* included a variety of interesting talks from scientists from around the country and abroad. The year began with a visit of Prof. **Uwe Tauber** from Virginia Tech who talked about “*Scale Invariance and Phase Transitions in Diffusion-Limited Reactions.*” Later in the semester, two talks addressed the fascinating phenomenon of superconductivity: APS Fellow Prof. **Andrey Chubukov** from the University of Wisconsin asked “*Can superconductivity emerge out of a non-Fermi liquid?*” and Prof. **Joerg Schmalian** from Iowa State University discussed “*Pairing and magnetic frustration in quasi two-dimensional organic superconductors.*”



Doerte Blume

Further talks on condensed matter physics were given by Prof. **Erik J. Sanchez** (Portland State University), Prof. **Klaus Capelle** (Universidade de Sao Paulo, Brazil), Dr. **Claude Henry** (CNRS Marseille, France), and Prof. **Doerte Blume** (Washington State University). Dr. **Tom Rescigno** from the Lawrence Berkeley National Laboratory talked about “*Electron-driven chemistry: how resonances drive electron-molecule collisions.*” In her talk “*All optical quantum computation by engineering semiconductor macrostructures,*” Dr. **Irene D’Amico** from Institute of Scientific Interchange, Torino, Italy addressed the intriguing topic of quantum computing. The spring series closed with a talk on “*Acoustic parametric resonance*” by Prof. **Mack Breazeale** from the University of Mississippi.

Prof. **Renee Diehl** from Penn State University led off the fall semester colloquia, with a talk on “*Quasicrystals: patterns and beauty in new materials.*” Later in September, faculty member **Thomas Vojta** gave an overview over “*Cluster computing in physics research.*” This talk was part of the official opening of the Pegasus Computer cluster operated by the department’s quantum many-particle group.

One of the highlights of the fall series was the talk by UMR alum **Jeff Schroeder** (BS 95) who was this year’s Homecoming speaker. In his talk, “*There and back again: a physicist’s journey,*” Jeff gave an entertaining account of the turns and twists of his career as well as the influence his time at UMR had on his development.

Prof. **Eric Mazur** from Harvard University talked about “*Wrapping light around a hair,*” the light propagation in silica nanowires with applications for optical processing and environmental sensing. In November, Prof. **John Toner** from the University of Oregon used methods of statistical mechanics to explain how large flocks of birds, schools of fish, and millions of wildebeest can move collectively. Further talks were given by Dr. **Roberto D’Agosta** (University of Missouri-Columbia) and Prof. **Christopher Berven** (University of Idaho). The series closed with Prof. **Isamu Kusaka** (Chem. Engr. Dept., Ohio State University) who talked about “*Statistical mechanics of nucleation: from simulation to phenomenology.*”



John Toner

Eleventh Annual Schearer Prize Competition

The Eleventh Annual *Laird D. Schearer Competition for Graduate Research*, established by the family of Dr. **Laird D. Schearer** to recognize research performed by a graduate student, was held on December 4. Professors **John Schmitt**, **Allan Pringle**, and **Bob DuBois** judged the competition with Dr. DuBois chairing the Committee. Seven students submitted applications consisting of a short description of their research, copies and lists of any publications and presentations they have made, plus a résumé. These were used to select three finalists who gave oral presentations of their work during one of the departmental colloquia. The finalists were **Harshani Wijewardane** who is advised by **Carsten Ullrich**, **Raghuveer Gadipalli**, advised by **Max Bertino**, and **Junfang Gao**, who is advised by **Don Madison** and **Jerry Peacher**. Titles of their talks were “*Memory-dependent Plasmon Damping in Quantum Wells*” (Wijewardane), “*Laser Writing of Semiconductor Nanoparticles and Quantum Dots*” (Gadipalli), and “*3DW and DWIA Calculation for Electron-Impact Ionization of Molecules*” (Gao). All three students gave excellent talks and impressed the Committee with the quality of their research. After deliberation, the Committee awarded first prize to Miss Wijewardane, second prize to Mr. Gao, and third prize to Mr. Gadipalli.

Because of the generous donations of the Schearer family, cash prizes were awarded to the finalists. Following the presentations, the finalists and numerous faculty members had a relaxing dinner at a local restaurant.



Harshani Wijewardane

From Schearer Prize Winner Harshani Wijewardane

It is a great honor to be the winner of the Eleventh Annual *Laird D. Schearer Competition for Graduate Research*. I'd like to offer special thanks to my supervisor Dr. **Carsten Ullrich** for encouraging me to participate in the competition and for his patience and guidance on this project. I would like to thank the prize committee and the department of physics for giving me the opportunity to participate. And I also wish to thank my family and my friends for their love and support.

I came to UMR in the fall of 2001 to study for my Ph.D., after finishing my bachelor's degree in Sri Lanka, a beautiful island which at this moment suffers from the devastation caused by the tsunami. In the beginning I felt I had come to the middle of nowhere, and then I quickly found it to be a nice place to live, with many friendly people and a really competitive and rich scientific life. Especially my Sri Lankan friends helped me to adjust my life in Rolla, far away from home.

The talk I gave in the Schearer competition was based on my Ph.D. thesis research in theoretical condensed-matter physics. The intersubband (ISB) dynamics of conduction electrons in semiconductor quantum wells exhibits a variety of interesting and potentially useful phenomena. Studying ISB dynamics is currently of great experimental and theoretical interest, since electronic ISB transitions are the basis of a variety of new devices, such as detectors, modulators, or quantum cascade lasers, operating in the Terahertz frequency regime.

We have developed a computational approach based on time-dependent density functional theory (TDDFT) to describe nonlinear ISB conduction electron dynamics in the time domain. However, almost all present applications of TDDFT employ the adiabatic approximation for the exchange-correlation (xc) potential, ignoring all functional dependence on past densities at previous times.

In this talk I presented the viscosity based TDDFT formalism in the time domain for charge-density oscillations in quantum wells. The memory and velocity dependence of the viscosity based xc potential introduces retardation, which in turn leads to decoherence and energy relaxation. Applying this formalism, we were able to clarify the dissipation mechanism, extract relaxation rates and observe plasmon sidebands for strong excitations. I enjoyed working on this project, and it is very challenging and exciting to study ISB dynamics in quantum wells.

Student Notes

Nataliya Maydanyuk won first place and **Weerasinghe Priyantha** won third place in the UMR-UMSL Physics Departments graduate student poster contest.

Rastko Sknepnek, who graduated from the UMR Physics Department with a Ph.D. in May 2004 is now a postdoc at McMaster University in Hamilton, Canada, working with **Catherine Kallin** and **John Berlinsky**.

Nataliya Maydanyuk presented an invited talk "*Full kinematics of simple and complex collisions*" at the 8th Workshop on Fast Ion-Atom Collisions, Debrecen, Hungary.

Abdalla Obeidat received his Ph.D. degree in May 2004 and is currently an Assistant Professor at the Jordan University of Science and Technology (JUST) in Irbid, Jordan where he teaches physics. He began teaching in January 2004, and he was married in June 2004. A busy first year for Abdalla!



Nataliya Maydanyuk

To Contact UMR Physics

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

Faculty Notes

Dan Waddill was elected Chair of the Magnetic Interfaces and Nanostructures Division of the American Vacuum Society for 2005.

Thomas Vojta is spending January and February of 2005 on a research visit to the University of California, Santa Barbara. He is participating in the "Quantum Phase Transition" program at the Kavli Institute for Theoretical Physics which brings together the leading researchers in this field from all over the world.

The Gaseous Electronics Conference changed its bylaws so that **Don Madison** can serve 2 terms as treasurer. The bylaws previously restricted the treasurer to one 2 year term.

Barbara Hale and **Gerry Wilemski** visited Beijing, China last August following the 16th International Conference on Nucleation and Atmospheric Aerosols in Kyoto, Japan. While they were in Beijing they each gave an invited talk at the Theoretical and Computational Chemistry Summer School held at Peking University each summer.

Gerry Wilemski coauthored a paper last year that was published as a "Feature Article" in the Journal of Physical Chemistry. The paper was "*Isothermal nucleation rates in supersonic nozzles and the properties of small water clusters*," Y. J. Kim, B. E. Wyslouzil, G. Wilemski, J. Wölk, and R. J. Strey, *J. Phys. Chem. A*, 108, 4365 (2004).

Michael Schulz and **Max Bertino** received 2004 UMR Faculty Excellence Awards.

Come Back for Homecoming

The UMR Physics Department warmly invites you to return to Rolla for **UMR Homecoming 2005** on **September 30-October 1, 2005**. On Friday afternoon, September 30, 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 UMR physics students. Come see what we have done since you received your degree.

In keeping with a long-standing tradition, a UMR alum will deliver the Homecoming 2005 Physics Colloquium at 4 PM. on Friday, September 30. Later that evening, professors **Ed** and **Barbara Hale** will host a homecoming reception in their lovely home. Contact us at physics@umr.edu for specific information about physics department activities, or alumni@umr.edu for general homecoming information. Come home to your college roots, and help us celebrate UMR's past, even as we work to shape its future!

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 UMR, 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: **UMR Physics Department, University of Missouri-Rolla, 65409-0640**. Or, if you would prefer, you can e-mail us your comments at **physics@umr.edu**. Thanks for keeping in touch. It's always good to hear from old friends.

Name: _____ Phone: _____ E-mail: _____

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News or Comments: _____

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Rolla, MO 65409-0640