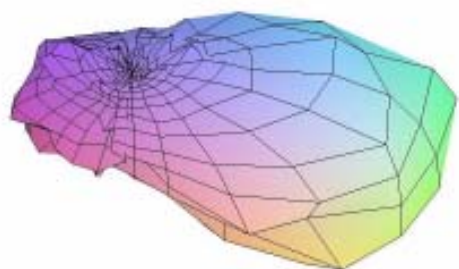


A publication for alumni, friends, faculty, and staff of the MSM-UMR Physics Department

## Schulz and Madison Found in Nature, Olson in Science



electron distribution from  $C^{6+} + He$  collisions

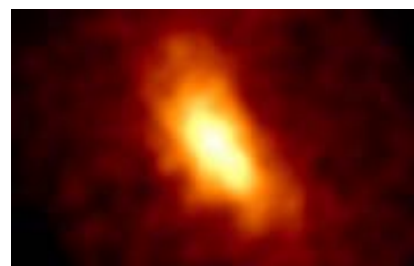
As the few-body problem, remains one of the unsolved, fundamentally important problems in physics. In fact there is no analytical solution to the three body problem and only recently, after three decades of work, have numerical solutions been reported for some elementary cases.

Employing the most recent technology in their experiments, groups led by **Michael Schulz** at Rolla and **Joachim Ullrich** at Heidelberg, Germany, have been able to measure all the details in full 3-dimensions for the four body problem of a bare carbon nucleus colliding with a helium atom. The theoretical group led by UMR's **Don Madison** performed calculations of what the best current theoretical models would predict for the outcome of this collision and significant differences between experiment and theory were found. These differences were unexpected and they clearly indicate that the experimental results have revealed some physical effects that have not been previously seen or predicted by any published theoretical model. These results appeared in *Nature* **422**, p. 48 (March 6, 2003).

This is the first time that currently-employed UMR Physics faculty have had a paper published in *Nature*, which is the world's oldest and most-respected science journal. More details about this work appear in the article on page 5 of this newsletter.

At the atomic level, all processes in nature are governed by the interaction between charged particles. Although many particles are usually involved, the basic interactions occur between pairs of charged particles. Using their understanding of these interactions, physicists attempt to describe the temporal and spatial evolution of many mutually interacting particles under the influence of the forces between them. This latter step, known

Curators' Professor of Physics **Ron Olson** published an article in the June 6 issue of *Science* describing the origin of X-rays emitted from comets as they transit our solar system. The work was done in collaboration with colleagues from the Lawrence Livermore National Laboratory and the NASA/Goddard Space Flight Center. The paper follows from the surprise 1997 discovery of X-rays being emitted from the comet Hyakutake. Many other comets have now been shown to emit X-rays.



Olson's calculations show that the X-rays are due to collisions between the comet's surface and highly-charged ions present in the solar wind. After these collisions, ions in the solar wind are left with more internal energy than before. They then get rid of this extra energy by emitting light waves in the form of X-rays. This interpretation follows directly from Olson's experience on light emission for similar types of collisions occurring in nuclear fusion test reactors, where his calculations are used to determine their performance characteristics.

The *Science* article was preceded by one in *Physical Review Letters*, the most prestigious journal in physics, and another in *The Astrophysical Journal*, that detail how charged particle collisions of this type lead to the unexpected X-ray emission. The UMR calculations are now being used to predict the light that will be observed with a new, high-resolution spectrometer that will be aboard the 2005 launch of the ASTRO-E2 satellite.

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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, and my hopes for the next, in this section of the department's annual newsletter. It is one of the aspects of the job I really enjoy, since it offers me the opportunity to postpone dealing with the next "Crisis du Jour," meeting the next administrative deadline, or responding to requests for information from "above." Instead, it allows me to reflect on how well the department functions in general, and how well it is carrying out its missions in education, research, and service. It is a chance to observe how, in spite of enormous challenges that face UMR, and higher education in general, the UMR physics department is well-positioned to meet those challenges, to take advantages of the opportunities that accompany them, and to increase the scope and quality of its many activities.

In the "challenges" department, no one who is interested in higher education these days can be unaware of the deleterious effect that the economic downturn of the last two years has had on state budgets throughout the country, and on the budgets of most state-supported universities. UMR is no exception, with the amount of money received from the state of Missouri down considerably over the past several years. No one likes budget cuts, but it is my view that the university is responding to the current fiscal situation in a positive way that, as long as budgets do not *continue* to decline, will ultimately increase its efficiency, competitiveness, as well as its standing throughout the country.

For example, the campus has undertaken an intense examination of all its degree programs, in an attempt to identify those which do not seem to attract sufficient majors, and consequently are unable to "support themselves." Those readers living in Missouri may have read in the news about the so-called "Program Viability Audits" being conducted on each of the four UM campuses, and noticed with concern that the UMR Physics B.S. and M.S. degree programs *were* on the initial list of 12 UMR programs being considered for review. I received a call one morning from UMR physics alum **Greg Upchurch** (BS '72 MS EE '85) who had just read an article listing the programs being considered. "Paul," Greg asked, "am I about to become an alumnus of a no-longer existing department?" I assured Greg, as I had been assured myself, that there was no way that Missouri's Technological University would *not* have a vital, active physics department, and that we would certainly be granting physics degrees long into the future.

In a few short weeks (that seemed long at the time), the Physics degree programs were removed from the list of programs slated for review; a move that many felt could have been made much earlier, given that UMR produces more BS physics degrees than any other UM campus, and leads the state in the preparation of physics majors going into high school teaching. Numbers aside, the *quality* of the physics degree

earned by our majors is competitive with the best in the country, as evidenced by the high starting salaries of our majors, and the graduate schools to which our majors get admitted every year. Last year we had physics majors admitted to the graduate programs at University of Pennsylvania, UCLA, University of Illinois-UC, and Washington University.



So, yes, the campus is going through hard financial times. Yes, the portion of the department's operating budget coming from the state has been reduced; but we are finding creative ways to cover the budget shortfall without sacrificing the quality of the education that we provide, and without hampering our faculty's ability to carry out and involve our undergraduate and graduate students in cutting-edge scientific research. In fact, the total operating budget of the department has actually increased over the last two years. In part this is due to new research grants and contracts, notably Phil Whitefield and Don Hagen's new \$3.15M NASA grant to set up a Center of Excellence for Aerospace Propulsion Particulate Emissions Research (see the article on page 8 of this issue).

But another important factor is the increased generosity of UMR physics alumni. Last year's phonathon set an all-time high, as alumni from around the country pitched in to help provide money for scholarships for UMR physics majors. The highlight of the fundraiser was the simple note from UMR Physics alum Dr. **Robert Hufft** (MS '64): "Dear Paul, Please use this in any way the department sees fit." Enclosed was a check for \$10,000. I am pleased to report that we have been using this generous donation to provide special **Robert Hufft** scholarships to recruit the best freshman class we can, and to thereby increase the number of majors in the department. I am sure that with the continued support of its alumni, and a lot of hard work by the students, faculty, and staff, the department will continue to grow, to do great things, and continue to produce alumni able to participate in the challenges of the current century.

On a final note, like many of our readers, I will be observing events in the department from afar for the next eight months, since I will be taking a sabbatical during which I will focus on my research program in theoretical condensed matter physics. Part of the time I will be at the University of New Mexico, where I maintain collaborations in the field of charge transport in organic electronic materials, and part of the time I will be in northern France, at the University of Lille, where I will be working on what are for me, interesting new theoretical problems involving classical and quantum chaos. During my absence, Curators' Professor **Don Madison** will be serving as interim chair. I would like to thank Don for taking on the chairman's hat in my absence. I know that under Don's leadership the department will be in good hands, and I look forward to returning to the Chair's position in September. - Paul E. Parris

## Physics Department Awards 2003-2004 Scholarships and Fellowships

The following scholarships have been endowed through the generous gifts of the friends of the UMR Physics Department. Scholarships are announced annually at the Harold Q Fuller Undergraduate Research Seminar, held last year on April 29, 2003. 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 **Timothy Ivancic** of St. Louis, Missouri, and **Armin Ahlheim** of St. Clair, Missouri, who commented "Some of us have what it takes between the ears to go to college but we lack it in our pockets to attend. This help makes it possible for the monetarily challenged to achieve an education." The \$1,300 scholarship-loan was endowed by the late Dr. Fuller, chair of the physics department from 1948 to 1970 and former Dean of the College of Arts and Sciences, to recognize outstanding achievements among juniors and seniors in physics. One quarter of the scholarship is an interest-free loan that students begin to repay when they start their first jobs.

The *Stephen P. Reed Scholarship Fund*, an endowment, provides scholarships to US citizens enrolled in mathematics or physics who are sensitive to a peaceful and humane search for knowledge and solutions to technological problems of mankind. **Micah Burgdorf**, of Florissant, Missouri, and **Samuel Woods**, of Smithville, Missouri, received the Reed Scholarship.

Recipients of the *Burke H. Miller Memorial Scholarship* were **Christopher Schwartz** of Vienna, Missouri, and **Sarah Eyermann** of Churubusco, Indiana. This \$500 endowed scholarship was established by the Miller family to commemorate the academic achievements of their son, Burke, who graduated with a bachelor's degree in physics in 1969 and later died during the Vietnam War. The award is for promising and dedicated students in physics.

**Ryan Kinney**, of Kansas City, Missouri, was awarded the first *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. "The scholarship has allowed me to focus just on school and related activities instead of payments and loan applications. It has been very helpful," said Kinney.

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. Nathaniel Bates received the Hannum Scholarship for 2003-2004.

**Charles Williams** of Poplar Bluff, Missouri, and **Matthew Krems** of St. Louis, 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. "This scholarship is a great honor and very much appreciated," commented Matt. 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 were awarded to **Benjamin Bethge**, of Webster Groves, Missouri, **Joshua Carey**, of Fredricktown, Missouri, **Toby Case** of Loveland, Colorado, **Christopher Chandler**, of Warrenton, Missouri, **Jeffrey Jau**, of Kansas City, Missouri, **Kevin Johnson** of West Plains, Missouri, **Christopher Owen**, of St. Louis, Missouri, **Adam Robbins**, of Fredricktown, Missouri, **Brett Sweeney**, of St. Charles, Missouri, **Andrew Walters**, of Omaha, Nebraska, and **Sara Whitbeck** of Webb City, Missouri.

### 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 established last year 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 **Lucy Sutcliffe** at 1-800-392-4112 or e-mail her at [lucys@umr.edu](mailto:lucys@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 Sara Whitbeck, President of SPS

The UMR chapter of Society of Physics Students has a new, younger look this year. Several of our members have graduated over the last year and we gained quite a few freshman and transfer students from other departments. While the average age in SPS has dropped by about two years the size of our chapter has nearly doubled!

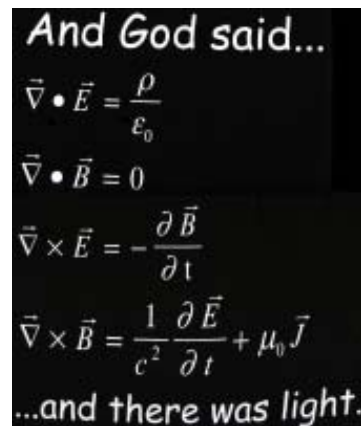
We have been sad to see the elder members graduate and move on. They will be missed. We have not let our youthfulness hold us back, however. We have strived to become even more active than we were in the past. In October several of the SPS members were able to travel to Argonne National Laboratory for their undergraduate research symposium. Our chapter had been unable to make this trip the last two years. It was a new experience for all who went. **Kevin Johnson** presented research on patterning aerogels with metallic clusters that he conducted under the supervision of Dr. **Max Bertino**. It was a great experience for all who went.

In October we also were able to have our traditional SPS/Physics department picnic. It was a great chance for the students and faculty to mingle and get to know one another. Those who were not at the picnic may have heard that for



the first time in history SPS defeated Dr. **Greg Story** in the biannual "students versus Dr. Story" volleyball challenge! On behalf of SPS I would like to apologize to Dr. Story for progressing slowly through the picnic and causing him to forfeit because he had to leave. Hopefully SPS will be able to gain an actual victory in the spring.

This semester SPS is looking forward to new opportunities. The Schrenk Society (chemistry) and SPS



will be holding joint meetings open to all students on campus. We are looking forward to having a chance to mingle with those in other organizations. In April we will once again be participating in the Girl Scout program, "Bridging the Gap," sponsored by the Helix Society. We also plan to participate in the annual

UMR Block Party. Last year we sold liquid nitrogen ice cream and our "God Said..." t-shirts. Both were a big hit with other students on campus and members of the community.

Finally I'd like to thank the outgoing officers, **Toby Case** (secretary) and **Kevin Johnson** (treasurer) and welcome the new officers, **Ryan Kinney** (vice president), **Joe Houston** (secretary), and **Paul Gholson** (treasurer). All have been wonderful in making this an exciting year for everyone in SPS.

## UMR Physics Faculty Receive Teaching Awards

This past year, four 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." **Ralph Alexander** received the College of Arts and Sciences *Excellence in Teaching Awards* for excellence in teaching lab courses.



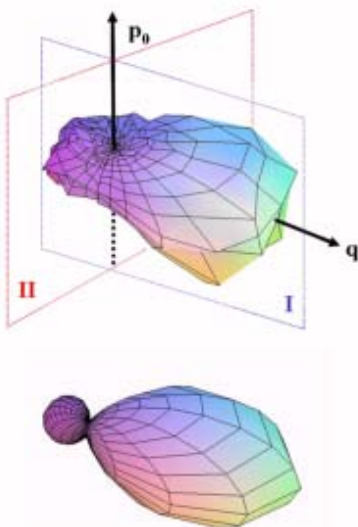
Teaching Excellence Awardees Bieniek, Alexander, Pringle, and Story

## More Than Two Bodies Is Too Many

One of the most persistent problems in Physics is the description of three or more mutually interacting particles. When two objects exert a known force upon each other, for example the earth and the sun through gravity, in general their motion can be predicted with certainty. However, if a third object is added, say Jupiter, the problem can only be approached by simulations. This so-called three- or few-body problem has been giving physicists a hard time for centuries.

At the times of Newton and Galilei, researchers observed the motion of celestial bodies to solve the few-body problem. **Michael Schulz** of UMR and his collaborators at the Max-Planck-Institut für Kernphysik in Heidelberg, Germany, now performed detailed experiments to study the interactions occurring in atomic systems. Here, an additional complication in understanding the few-body problem is the wave nature of particles of atomic size predicted by quantum-mechanics.

Energetic bare carbon ions were made to collide with neutral helium atoms so that electrons were knocked out (ionized). The scientists then recorded complete three-dimensional (3-D) images of the spatial distribution of the emitted electrons, an example is shown in the figure below. The experimental data were compared to state-of-the-art calculations (bottom part of the figure) performed by the group of **Don Madison**, also of UMR.



Fully differential electron  
distribution from  
 $C^{6+} + He$  collisions

Previous studies were restricted to electrons emitted into one specific plane called the scattering plane (the one spanned by the arrows labeled  $q$  and  $p_0$  in the figure). For this plane, theory and experiment are consistently in very good agreement. This success gave rise to the hope that such ionization processes can be satisfactorily modeled. However, the now-published 3-D images reveal serious and qualitative discrepancies outside the scattering plane. These differences were unexpected and they clearly indicate that the experimental results have revealed some physical effects that have not been previously seen or predicted by any published theory. These results appeared in *Nature* **422**, p. 48 (March 6, 2003).

## Congratulations to UMR's 2003 Physics Degree Recipients!

### May 2003

#### *Bachelor of Science*

Joseph Eimer  
Christopher Lloyd  
Ryan Mallery  
Robert Schott  
Deepak Vaid  
Travis Yates  
Kevin Zimmerschied

#### *Master of Science*

Mehmet Kahveci  
Alexander Silvius

#### *Professional Degree*

Sandra Magnus

### December 2003

#### *Bachelor of Science*

Armin Ahlheim  
Joseph Case  
Mark Dickison  
Sarah Eyermann  
Kurt Koch  
Robert Lowe

#### *Master of Science*

Jagat Lamsal  
Nataliya Maydanyuk  
Andrew Prideaux

#### *Doctor of Philosophy*

Joseph Baugh  
Kishore Kamaraju

## 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 **Louise Morgan** at 573-341-4508 or e-mail her at [lmorgan@umr.edu](mailto:lmorgan@umr.edu).

## Jack Rivers Remembered

Jack Lewis Rivers was born on April 18, 1928, in Fairbanks, Florida, the son of Glen Lewis Rivers and Frances Beatrice Bailey Rivers. He died on December 7, 2002, in Lawrence, Kansas. He is survived by his daughter Cassandra Rivers Messer, son-in-law Richard Messer, daughter Penelope Neitzert, son-in-law Don Neitzert, sister Joy Glaser, brother David Rivers and two grandsons, Jamie and Jesse.

After several moves the family ended up in Covington, Kentucky, where Jack attended Covington High School. After graduation he joined the Navy where he was trained as a radio operator.

Jack attended the University of Cincinnati, obtaining his BS in Physics in 1952. He continued in Physics at the University of Cincinnati, and received his PhD in 1956. The title of his dissertation was "A Theoretical Investigation of the U-Effect III" (the U-effects deal with electrical forces produced when capillary tubes containing electrolyte and mercury are shaken). His advisor was Boris Podolsky. At Cincinnati Jack studied relativity which later became his main interest.

From Cincinnati Jack moved to Rolla where in September, 1956, he joined the Physics Department of the Missouri School of Mines and Metallurgy (MSM) as Assistant Professor of Physics. Jack's voracious and eclectic reading habits brought him into contact with Helen Pruett, herself an avid reader, who worked at the MSM Library. On one of his frequent visits to the front desk, Jack slipped a short poem between the leaves of a book he was returning. That started



a courtship which ended in their marriage on September 20, 1959. Jack was promoted to Associate Professor in 1967. Helen died in 1979. Jack retired from the department in 1990 and moved to Lawrence, Kansas, to live with his daughters.

Jack's major professional interests lay in General Relativity and the geometry of space-time. In addition he contributed to the research of the Graduate Center for Cloud Physics Research, publishing two articles on droplet condensation with Louis Lund. He was well known as an excellent teacher, especially in advanced courses. He

pioneered the teaching of Mathematical Physics and General Relativity in the Physics Department. He was the advisor to two PhD students and several MS students.

Jack's interests extended well beyond Physics. He was a linguist, fluent in Spanish and German, and had a good working knowledge of French and Italian. He was a ham radio operator, stamp collector, electrician (a member of the Brotherhood of Electrical Workers) and licensed and active pilot. He was a competent and enthusiastic gardener, and a number of flower gardens in the area attest to Jack's expert green thumb; he managed to grow pecan trees in Lawrence, Kansas, and see them bear fruit in his lifetime. He built his own house on St. James Road and lived in it until his retirement. His colleagues and family remember him as a private person who nevertheless reached out to the many non-Americans on the MSM/UMR campus. His daughter recalls the many dinners at his house for foreign students. Students and colleagues remember Jack fondly as a scholar and a friend. *Ibrahim Adawi, Ralph Alexander, and John Carstens, 2003.*

### Physics Department Acknowledges

#### Corporate Support

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

3M Foundation  
 BP Foundation, Inc.  
 Boeing/McDonnell Douglas Foundation  
 Ford Motor Company  
 General Electric  
 General Mills Foundation  
 IBM  
 Reuters America Inc.  
 Shell Oil Company Foundation

### Schulz Awarded Mercator Scholarship

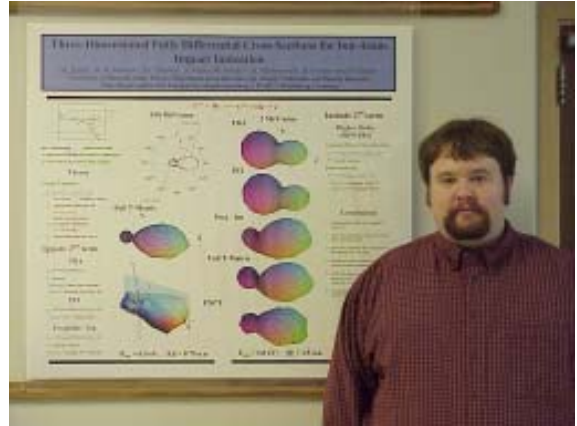
Since his last sabbatical year in 1998-99, which he spent with the group of Dr. **J. Ullrich** (then at the University of Freiburg in Germany), Dr. **Michael Schulz** of UMR has developed a fruitful collaboration with this group. This collaboration recently culminated in a publication in the general science journal *Nature* (see article on p. 5). The accomplishments of Dr. Schulz and his collaborators have been recognized by the Deutsche Forschungsgemeinschaft (German counterpart to the National Science Foundation), which awarded him the prestigious Mercator Scholarship. Dr. Schulz used this scholarship to take a year of research leave at the Max-Planck-Institut für Kernphysik in Heidelberg, Germany, where the group of Dr. Ullrich moved three years ago.



## Matt Foster wins Sigma Xi Poster Competition

Physics graduate student **Matt Foster** received first place in the campus-wide Sigma Xi Engineering and Scientific Posters Competition, held at the Winter 2003 Graduation Jubilee last December. Matt began his studies at UMR as an undergraduate in the fall of 1998. His research experience started in the summer of 1999 when he worked for **Don Madison** on theoretical atomic physics. Matt received his BS degree in Physics from UMR in August, 2002 and decided to continue his studies and research at UMR as a graduate student. In December of 2003, he was selected as a finalist and third place winner in the 10<sup>th</sup> Annual **Laird D. Schearer** Prize competition. Matt plans to get both his MS and PhD degrees at UMR.

Matt has found his research with Dr. Madison in the field of heavy-ion impact ionization to be very rewarding. He has collaborated with different groups around the world including a group at the Max-Planck Institut für Kernphysik in Heidelberg, Germany which performs many of the experiments directly related to Matt's work. The state-of-the-art theoretical models that Matt uses can take a day or more to produce a single number so he is always searching for idle computers. Matt says "I have been very fortunate to have worked with Dr. Madison since my days as an undergraduate. The opportunity has allowed me to be on many journal articles including a Physical Review Letter in December, 2003. I look forward to obtaining my degree and moving on to do more scientific research in atomic physics." So far, Matt has been a co-author on 7 refereed research papers and 9 papers presented at meetings.



## Sandra Magnus Receives Professional Degree at Spring Commencement

At the last Spring Commencement, UMR Physics Alum **Sandra Hall Magnus** (BS '86) was awarded the Professional Degree in Physics, in honor of her activities as a NASA astronaut, and in recognition of her recent trip aboard the space shuttle Atlantis. Magnus, who has also been chosen to receive the 2003 UMR Alumni Association Young Alumna award, is a 1996 graduate of the UMR physics department. After receiving her BS degree in Physics, she received an MS degree in electrical engineering in 1990. She spent the first several years of her career at McDonnell Douglas, conducting research and



development on stealth radar signature reduction techniques and on the propulsion system for the Navy A-12 Attack Aircraft program. In 1996, after earning her PhD from the School of Material Science and Engineering at Georgia Tech, she was selected by NASA to become an astronaut and is now based at Johnson Space Center in Houston, Texas. She has worked in various roles at NASA, including an assignment as a "Russian Crusader" to support technical exchanges with the Russian space program and activities related to the International Space Station. Her first

space flight was STS-112 in October 2002 on the shuttle Atlantis.

While on campus to receive her degree, Dr. Magnus presented the physics department with a UMR banner that she brought with her on the space shuttle, along with a plaque commemorating flight STS-112. The department is very proud to display the banner and the plaque in tribute to the courage and spirit of the members of the U.S. space program.



## 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](mailto:physics@umr.edu). You might also be interested in checking out our web page, <http://www.umr.edu/~physics>.

## The UMR Center of Excellence for Aerospace Propulsion Particulate Emissions Research

A university/industry Center of Excellence (COE) for Aerospace Propulsion Particulate Emissions Research was created at UMR by a congressional appropriation of \$3.15M in the spring of 2003. The COE is an outgrowth of the continued research efforts of the Cloud and Aerosol Sciences Laboratory led by Professors **Don Hagen** (Physics) and **Phil Whitefield** (Chemistry). The appropriation was spearheaded by Senator **Christopher Bond** and is administered through



*UMR mobile lab at Wright Patterson Air Force Base*

NASA. The COE will develop tools to measure and characterize particulate emissions from current aircraft propulsion systems and predict emissions from future aircraft. These tools will be validated in realistic laboratory test environments that integrate propulsion altitude cells with state-of-the-art diagnostic systems and numerical modeling, and will be used as much-needed standards for current and future engine design. The consortium consists of UMR, the Massachusetts Institute of Technology, the Boeing Company, Aerodyne Research Inc., the University of Illinois, and Georgia Tech.

There is an immediate need to characterize particulate emissions from aircraft engines and auxiliary power units associated with the commercial fleets, and to support the development of predictive tools for propulsion emission-reduction strategies. These emissions are poorly understood, but are a critically important component of aircraft exhaust that affects all aircraft operations.

These emissions represent:

- (1) Through impact on local air quality, a factor that limits the continued operation and proposed expansion of existing airports, the development of new airports in the US and continued access for US airlines and US-manufactured aircraft to foreign airports, especially those in Western Europe.



*UMR students in the field, Farnborough UK*

- (2) A potentially damaging influence on the meteorology and climatology of our global flight corridors. Aircraft emit particles directly into their flight corridors, where they have an uncertain but potentially adverse influence on

atmospheric composition. It is estimated that burning one gallon of aviation fuel at 30,000 ft. has twice the environmental impact of burning it at sea level. This impact is largely driven by contrail formation arising from particulate production.

- (3) A readily detectable signature of an aircraft that betrays the flight paths of both civilian and military aircraft. These emissions are capable of seeding visible contrails, rendering all aircraft susceptible to detection without the use of sophisticated detectors.



*COE team visiting replica of famous UMR landmark*

The need to characterize aircraft emissions and to develop predictive tools for future propulsion emission reduction strategies has not escaped the attention of our international competitors. A substantial research effort, addressing the characterization issue and sponsored by the EEC, continues in Western Europe, with annual expenditures in excess of \$20M.

Initial research efforts at the COE will focus on the following goals:

- (1) The development of standardized particulate emissions characterization and measurement methodologies to meet the needs of NASA, the US aerospace industry, regulatory bodies such as the EPA and FAA, and the DOD.
- (2) The development of standardized techniques for measuring particulate formation and growth outside the engine but in its exhaust plume.
- (3) Characterization and measurement of the particulate emissions of commercial aircraft, both in service and in development.
- (4) The development of predictive tools for future emissions reductions strategies by creating validated models of particulate production in the hot sections of turbine engines and in their exhausts.



*UMR aerosol probe about to test a B-52 engine*

With this critical investment, congress has enabled UMR to become the clear international leader in the field of particulate emissions reduction. A multi-agency roadmap is currently being developed to secure the required resources from federal agencies such as NASA, FAA, DOD, and the EPA. The focal point of the research is UMR's Center of Excellence. This research effort will help the U.S. maintain its major market share in the competitive aerospace economy of the 21<sup>st</sup> century.



## UMR's Thomas Vojta Co-Chairs International Workshop on Quantum Phase Transitions

Phase transitions like the melting and freezing of water are usually associated with changes in temperature. However, in the last few years a different kind of phase transitions has become a central topic in 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. They are thought to be of crucial importance for the understanding of phenomena like high-temperature superconductivity or the quantum Hall effect.



UMR Physics faculty member Thomas Vojta, together with Dietrich Belitz of the University of Oregon and Ted Kirkpatrick of the University of Maryland, coordinated an international workshop on quantum phase transitions this past summer. The five-week long workshop brought together 88 researchers from 17 countries and 3 continents. It was generously supported by the German Max-Planck Society and hosted at the Max-Planck Institute for Physics of Complex Systems in Dresden, the capital of the German state of Saxony. The program of the workshop was built around a conference in the middle week and a series of informal talks. Participants had ample time for

spontaneous discussions, which were widely used for exchanging ideas and starting new research projects.

In addition to the scientific program, the participants were treated to a Dresden tour featuring the city's famous baroque and renaissance architecture, and they could relax enjoying the mountains and rocks of Saxon Switzerland.



## Jeff Schroeder to Speak at Homecoming 2004

Jeff Schroeder will be the the guest speaker for the 2004 Physics department Homecoming Colloquium (see article, page 15). After graduating from UMR in 1995 with degrees in physics and mathematics, Jeff spent four years in the aerospace industry working on orbital mechanics software and analysis. The three-dimensional satellite visualization programs he wrote and maintained were used by several commercial and government programs. In addition to his full-time work, Jeff served as a college recruiter and was often seen at UMR career fairs or giving presentations to students around the country.

In 1999 Jeff left the corporate world to join a small consulting firm, where he did work in document management and database technology. Despite the small size of the company, he was able to do work for Hewlett-Packard, Intel, and several major airlines. He gained valuable experience in web development and decided to apply it on his own.

With the dot-com boom in full swing, Jeff formed his own consulting company. He did on-site contract work for several local companies, and was later able to move into his own office and work as a consultant. His specialty— database-driven web applications— has helped many companies expand their online presence and improve their business processes.

Three years later, Jeff continues working as a consultant and is looking for ways to expand his business. He loves the flexibility and opportunity to work with a variety of people and companies. Although he doesn't use his physics education in his daily work, he enjoys the challenges of web development and keeps abreast of the latest physics news.

## Congratulations to 2003 Physics Dean's List Recipients

### Winter Semester 2003

Armin Ahlheim, Joshua Carey, Joseph Eimer, Sarah Eyeremann, Paul Gholson, Timothy Ivancic, Ryan Kinney, Matthew Krems, Christopher Lloyd, Ryan Mallery, Matthew Richard, Charles Williams, Samuel Woods, Travis Yates.

### Fall Semester 2003

Armin Ahlheim, Joshua Carey, Kevin Day, Mark Dickison, Sarah Eyeremann, Ryan Kinney, Kurt Koch, Matthew Krems, Christopher Schwartze, Zachary Stegen, Andrew Walters, Clayton Weidinger, Charles Williams, Samuel Woods.

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

#### Donations over \$100:

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Wooley, Gary G



## Phonathon 2004

More than 160 alumni pledged \$26,413 in donations to the MSM-UMR Physics Department during last year's Fund-raising Phonathon with an average gift of \$164. 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 25-March 2**. 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 34 percent 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.

## Max Bertino Gets Ultra-light

The year 2003 was quite fruitful for **Max Bertino**. He published five papers based on work by UMR undergraduate student **João Sosa** (BS '02) and graduate students **Jared Hund** and **Carmen Doudna** (MS '02), and received a *Faculty Excellence Award*. His research, conducted in part in collaboration with Dr. **Nicholas Leventis** (NASA Glenn Research Center, Cleveland), focused on synthesis of ultralight materials (aerogels). These silica-based materials, which have a density 10 to 100 times smaller than water, have pores between 10 and 100 nm in diameter, and can be used for an array of applications, including catalysis, and, in form of thin films, electronics. A method was devised to load these materials at room temperature with metal clusters, and a typical example of the materials is shown in the figure to the right. From left to right, one can see a pure silica aerogel (totally transparent), an aerogel loaded with Au clusters (pink, not "gold," due to an effect called "surface plasmon," which is characteristic of small metallic aggregates), and three aerogels loaded with increasing amounts of Ag clusters (this time the plasmon is brown-yellow). The synthesis technique involves several steps, but the central one is the reduction of metal ions to metal atoms in aqueous solution. The reducing agent is something a physicist is well acquainted with: gamma rays from the core of our campus reactor. The radiation interacts with water molecules and produces, among other fragments, free electrons. These free electrons reduce metal ions to their neutral state. The reduced metal atoms aggregate to form clusters.



High resolution patterning of aerogels was successfully achieved by employing, instead of gamma rays, a collimated X-Ray beam source at Argonne National Laboratory. These experiments, conducted by undergraduates Joao Sosa (now a graduate student at Penn State), and **Kevin Johnson**, showed that patterns as small as a few microns can be realized. By moving the sample in front of the incident beam, complicated patterns, like our University's name, can be created (the length of the black bar is 400 microns, or 0.4 millimeters). Writing has never been lighter, at least for these physicists!



Recent publications by Max Bertino's group involving UMR graduate and undergraduate students:

- Formation and Entrapment of Noble Metal Clusters in Silica Aerogel Monoliths by  $\gamma$ -Radiolysis*, J. F. Hund, M. F. Bertino, G. Zhang, C. Sotiriou-Leventis, N. Leventis, A. Tokuhiko, and J. Farmer, *J. Phys. Chem. B* 107, 465 (2003).
- Synthesis of Aerogel-Metal Cluster Composites By Gamma Radiolysis*, J. F. Hund, M. F. Bertino, G. Zhang, C. Sotiriou-Leventis, N. Leventis, A. Tokuhiko, and J. Farmer, *Mater. Res. Soc. Symp. Proc.* 740, I11.2 (2003).
- Synthesis of Bimetallic Nanoparticles With High Aspect Ratio*, C. M. Doudna, M. F. Bertino, F. D. Blum, A. T. Tokuhiko, D. Lahiri-Dey, S. Chattopadhyay, and J. Terry, *Mater. Res. Soc. Symp. Proc.* 740, I7.15 (2003).
- Radiolytic Synthesis of Bimetallic Ag-Pt Nanoparticles With High Aspect Ratio*, C. M. Doudna, M. F. Bertino, F. D. Blum, A. T. Tokuhiko, D. Lahiri-Dey, S. Chattopadhyay, and J. Terry, *J. Phys. Chem. B* 107, 2966 (2003).
- High Resolution Patterning of Silica Aerogels*, M. F. Bertino, J. F. Hund, J. Sosa, G. Zhang, C. Sotiriou-Leventis, N. Leventis, A. T. Tokuhiko, and J. Terry, *J. Non-Cryst. Solids* 333, 108 (2004).



## Alumni Alliance Honors Park

**J**ohn T. Park, chancellor emeritus of UMR, received the University of Missouri Alumni Alliance Award during the annual UM Legislative Day Luncheon February 26 in Jefferson City, Missouri. Park, who served as UMR's chancellor from 1992 to 2000, received the award in recognition for his years of service to UMR.

Park joined the UMR faculty in 1964 as an assistant professor of physics. He was named vice chancellor for academic affairs in 1983 and became chancellor in 1992, a post he held until he retired eight years later.

During his chancellorship, UMR's existing physical facilities were improved, new structures were added, a degree program in computer engineering was begun, and a \$60 million capital campaign successfully concluded. Park also championed new student leadership programs and created the UMR Board of Trustees. UMR also won the Missouri Quality Award and, in so doing, became the first public research university in the nation to be honored for making substantial performance improvements.



## Alumni Notes

**Brian Polis** (MS '01) has been hired to teach math and science for 9<sup>th</sup> and 10<sup>th</sup> graders at Winfield High School.

**Vibhakar Dave** (MS '65) is Chairman of the Physics Department at Southern University in New Orleans. He tells us his son, who is a practicing ophthalmologist, was married in October 2003.

**Mike Noble** (BS '91) moved from Albuquerque, New Mexico to Conyers, Georgia, and misses the low humidity and sun of New Mexico but loves seeing green again. He is Operations Manager for the General Mills Plant in Covington, Georgia ("keep eating those Cheerios!").

**Katie Masterman Pimmel** (BS '96) says "we welcomed our first child to the family—Julia Grace was born on September 6<sup>th</sup> 2002."

**Emmett Redd** (PhD '86) was transferred from the Industrial Management Department to the Physics, Astronomy, and Materials Science Department at Southwest Missouri State University in January 2002. Redd's Enterprises, Inc. provided research services to SMSU for a grant from the National Collegiate Inventors and Innovators alliance on "Tornado Alarm Design, Beta Test, and Incidental Manufacture."

**Larry Oppliger** (BS '57) comments "I am enjoying retirement—fishing, making furniture, reading."

**Jerry Doug West** (BS '80) tells us "outside of work and family my hobby is astronomy. I take many observations of variable stars and write papers. It is a lot of fun and keeps me thinking about physics."

**Patrick Joseph Garey** (BS '82) says "our 2002 GDI reunion at UMR was the best ever! Hope to see you at the next one!"

**Don Schrieker** (BS '74) reports "enjoying our 2<sup>nd</sup> winter in Tucson after 10 years in Michigan. Everyone is well. Still

looking around Tucson for old W0EEE radio club members in the area."

**James Jensen** (BS '79) writes "after eight years in Texas, we are moving back to North Augusta, South Carolina. Have sold the ranch on which we raised deer and antelopes and watched them 'play.'"

**Nellie Fuller** turned 94 and lives close to her son, **Billy Thom**, in a rural setting near the Lake of the Ozarks.

**Jerry Koelling** (BS '61, MS '63) reports "after receiving five university degrees, teaching, consulting, and enjoying work at the Los Alamos National Laboratory for over 20 years my wife and I retired to a retirement community north of Tucson, Arizona. We have been involved in genealogy studies, flying private airplanes, golf, tennis, skeet and trap shooting, senior Olympics, motorcycle touring, traveling, tutoring, garden railroad building, and radio controlled airplane flying. Genealogy and RC flying take up the majority of our time now and hopefully will in the future."

**Bob Spratt** (BS '58) tells the Physics "Guns" that he enjoyed the telephone conversation with Travis during the 2003 Phonathon.

**Stephen Christiansen** (BS '73) and his wife Dr. **Carol Berner** have moved their office to a larger space in south Springfield, where they have an independent practice and employ three nurse practitioners.

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](mailto: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 2003 *Frontiers in Physics Colloquium Series*, featured a wide spectrum of interesting talks from scientists from around the country and abroad. The spring series started with a visit from



Peter Young

Prof. **Andr e Bandrauk** from the Universit  de Shrebrooke in Canada, who discussed computer simulations of molecules in intense ultrashort laser pulses. Later in the semester Prof. **Peter Young** of the University of California Santa Cruz addressed the peculiar properties of disordered spin systems called spin glasses. Prof. **Stephan de Bi vre** of the Universit  de Lille in France discussed the connection between chaos and quantum mechanics in a talk entitled *Quantum maps: a case study in quantum chaos*. Further talks on condensed matter physics were given by Dr. **Jeff Terry** of the Illinois Institute of Technology, Prof. **Kartik Gosh** of Southwest Missouri State University, Prof. **David Clarke** of the University of California Santa Barbara, and Dr. **Rajesh Narayanan** of the Max-Planck-Institute in Dresden, Germany. Prof. **Theo Zouros** of the University of Crete in Greece talked about *Quasi-free electron scattering from highly charged ions*. The spring series closed with Prof. **Igor Herbut** of Simon Fraser University in Vancouver in Canada who presented an intriguing new theory for high-temperature superconductivity.

Prof. **Ann Orel** of the University of California Davis led off the fall semester colloquia, with a talk on *Low-energy electron impact dissociation of molecules*. Later in September, faculty member **Don**

**Hagen** presented his plans for the new *Center of Excellence for Aerospace Propulsion Particulate Emissions Reduction Research* to be established at UMR. One of the highlights of the fall series was the talk by UMR alum **Dr. Ed Stephens** (PhD '94) of Cutting Edge Optronics who was this years Homecoming speaker. Ed gave a very witty and to-the-point talk on *Career*

*paths and expectations as an industrial scientist*. In October, faculty member **Thomas Vojta** discussed the background of the 2003 Nobel Prize in Physics which was awarded to **A. Abrikosov**, **V. Ginzburg** and **A. Leggett** for pioneering contributions to super-conductivity and superfluidity. The fall series also included talks on atomic



Stephan de Bi vre

physics by Prof. **Uwe Thumm** of Kansas State University and Dr. **Robert Moshhammer** of the Max-Planck-Institute in Heidelberg, Germany. Further talks were given by Prof. **Wouter Montfrooij** of the University of Missouri-Columbia, Dr. **Martina Hentschel** of Duke University, Dr. **Luca Vattuone** of the Universita' di Genova in Italy, and Prof. **John Shumway** of Arizona State University. The series closed with Dr. **Stephane Mazevet** from the Los Alamos National Laboratory who discussed *Simulations of matter under extreme conditions*.

### UMR Students & Alumni: In Press

The following journal articles which appeared over the last year feature work by UMR undergraduate students,<sup>1</sup> graduate students,<sup>2</sup> or UMR alumni<sup>3</sup> under the supervision of UMR faculty.

*Three-Dimensional Fully Differential Single Ionization Cross Sections for 75 keV p + He Collisions*, A. Hasan, N.V. Maydanyuk,<sup>2,3</sup> B.J. Fendler,<sup>1,3</sup> A. Voitkiv, and M. Schulz, submitted to J. Phys. B (2003).

*Three-Dimensional Imaging of Atomic Break-Up Processes*, M. Schulz, R. Moshhammer, D. Fischer, A. Hasan, N.V. Maydanyuk,<sup>2,3</sup> H. Kollmus, D.H. Madison, M. Foster,<sup>2,3</sup> S. Jones,<sup>3</sup> and J. Ullrich, Physics of Electronic and Atomic Collision, Book of Invited Papers, Physica Scripta, in press (2003).

*Doubly Differential Measurements for Multiple Ionization of Argon by Electron Impact: Comparison With Positron Impact and Photoionization*, A.C.F. Santos, A. Hasan, T. Yates,<sup>1,2</sup> and R.D. DuBois, Phys. Rev. A 67, 052708 (2003).

*Three-Dimensional Imaging of Atomic Break-Up Processes*, M. Schulz, R. Moshhammer, D. Fischer, A. Hasan, N.V. Maydanyuk,<sup>2,3</sup> H. Kollmus, J. Ullrich, D.H. Madison, M. Foster,<sup>2,3</sup> and S. Jones,<sup>3</sup> to be published in the proceedings of the XXIII International Conference on Photonic, Electronic and Atomic Collisions, Stockholm, Sweden, 23-29 July, 2003.

*Probing Scattering Wave Functions Close to the Nucleus*, D.H. Madison, D. Fischer, M. Foster,<sup>2,3</sup> M. Schulz, R. Moshhammer, S. Jones,<sup>3</sup> and J. Ullrich, Phys. Rev. Lett. 91, 253201 (2003)

*A Convenient Formalism for Auger and Ionization of Overlapping Resonances*, M.M. Tabanli,<sup>3</sup> J.L. Peacher and D.H. Madison, J. Phys. B 36, 217-233 (2003)

*Coplanar Symmetric (e,2e) Cross Sections for Krypton 4s Ionization*, M. A. Haynes, B. Lohmann, A. Prideaux,<sup>2</sup> and D. H. Madison, J. Phys. B. 36, 811-15 (2003).

*Role of Post Collision Interaction in Electron Impact Ionization of Argon and Krypton*, A. Prideaux<sup>2</sup> and D.H. Madison, Phys. Rev. A 67, 052710 (2003).

## Tenth Annual Schearer Prize Competition

The Tenth 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. **Ralph Alexander**, **Bob DuBois** and **Barbara Hale** judged the competition with Dr. DuBois Chairing the Committee. This year we were blessed with six entries from which three finalists were selected. The finalists were **Matt Foster** who is advised by **Don Madison** and **Jerry Peacher**, **Harshani Wijewardane** who is advised by **Carsten Ullrich**, and **Jared Hund** who is advised by **Max Bertino**. The titles of their talks were *The Study of Three Dimensional Fully Differential Cross Sections for Single Ionization of Ion-Atom Collisions* (Foster), *Time-Dependent Density-Functional Approach to Nonlinear Intersubband Dynamics in Quantum Wells* (Wijewardane), and *Formation of Noble Metal Clusters in Silica Aerogels* (Hund). The Committee was impressed by the quality of the talks and the knowledge the students displayed in addressing questions from the judges. This year, first prize was awarded to Jared Hund, second prize to Harshani Wijewardane, and third prize to Matt Foster.

In addition, a new feature was added to the competition this year. In order to acknowledge all the applicants, the non-finalists presented their work in poster form just prior to the talks. The participants and titles of their posters were; **Andy Prideaux** (advised by Dr. Madison) whose poster was titled *Post Collision Interaction Effects for Electron Impact Ionization of S and P Shell Electrons in Gases*, **Rastko Sknepnek** (advised by **Thomas Vojta**) whose poster was titled *Smearing of a Phase Transition in a 3d Ising Model with Planar Defects: Monte-Carlo Simulations*, and **Alex Silvius** (advised by **Paul Parris**) whose poster was titled *Classical Treatment of Polaron Dynamics on a One-Dimensional Oscillator Chain*. Thanks to the technology available the posters were not only informative but also visually attractive. We hope the poster competition can be carried on in the future.

Due to the generous donations of the Schearer family, cash prizes were awarded to all participants. The photo below shows the 2003 Schearer Competition finalists. From left to right they are Matt Foster, Jared Hund, and Harshani Wijewardane.



### From Schearer Prize Winner Jared Hund



Jared Hund

I am honored to be the winner of the Tenth Annual Laird D. Schearer Competition. There were a number of excellent submissions this year, so it was a very pleasant surprise to win. My sincere gratitude goes out to the committee and the department of physics for giving me the opportunity to participate. I would like to thank my advisor, Dr. Massimo Bertino, for his guidance and help with this project as well as Dr. Nicholas Leventis and Mr. Ghoui Zhang of the UMR Chemistry Department. Most importantly, I would like to thank my wife, Shannon, for her patience and support throughout my research.

My first experience with the UMR Physics Department was in the spring of 2000 while checking into possible graduate schools to attend. I was impressed with the quality of research in the department and the approachability of the faculty. I began my studies here that summer, and started my graduate research with Dr. Bertino. After graduating from Fort Hays State University (in Hays, Kansas), I had become accustomed to the small college town atmosphere, and adapted very well to Rolla.

My talk given in the Schearer competition was based on part of the research for my PhD thesis. The project I presented was an interesting collaboration with Dr. Leventis to use aerogels to study metallic clusters of atoms. Because silica aerogel is a low density, high surface area material that is relatively inert, it made an excellent choice to support and stabilize the metal particles. During my work our group was able to develop two different methods to produce these metal aerogel composites. I also developed a method to produce bimetallic alloyed clusters that provided control over the relative composition. The finished metal aerogel composite retained the basic structure and high surface area of the pure aerogel, making it an interesting material for catalytic applications. I enjoyed working on this project at UMR because of the challenge it provided, and also the number of people I was able to interact with across campus in this interdisciplinary work.



## Student Notes

**Alex Silvius, Andy Prideaux**, and **Rastko Sknepnek**, pictured below, received \$50 awards for posters they presented on their research at the Tenth Annual Scheerer Prize Competition.



**Barbara Hale** and **Gerry Wilemski** supervised the Masters thesis of a chemical engineering student, **Srivatsan Raman**, who graduated in December, 2003. His thesis was on "*Monte Carlo Simulations of Methanol Clusters*."

**Abdalla Obeidat** gave a talk entitled "*Nucleation Rates of Water Droplets Using an Equation of State*" at the Nucleation Symposium of the 77th ACS Colloid and Surface Science Symposium, held at Georgia Tech in Atlanta, June 15-18, 2003. Also at the same conference, **Srivatsan Raman** gave a talk called, "*A Monte Carlo Discrete Sum (MCDS) Approach to Energies of Formation of Small Methanol Clusters*" based on work supervised by Barbara Hale and Gerry Wilemski.

## Come Back for Homecoming

The UMR Physics Department warmly invites you to return to Rolla for **UMR Homecoming 2004** on the **October 15-16, 2004**. On Friday afternoon, October 15, 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, UMR alum **Jeff Schroder** (BS '95) will deliver the Homecoming 2004 Physics Colloquium at 4 PM. on Friday, October 15. Later that evening, professors **Ed** and **Barbara Hale** will host a homecoming reception in their lovely home. Contact us at [physics@umr.edu](mailto:physics@umr.edu) for specific information about physics department activities, or [alumni@umr.edu](mailto: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!

## Faculty Notes

**Max Bertino** and **Michael Schulz**, pictured below, both received a *Faculty Excellence Awards* in 2003. Max and Michael were two of only 19 UMR faculty chosen to receive this award.



In October, **Carsten Ullrich** was notified that the Petroleum Research Fund of the American Chemical Society will fund his proposal to organize a summer school on "*Time-Dependent Density-Functional Theory and the Dynamics of Complex Systems*." The school will take place in June 2004 in Santa Fe, NM, and the total funding is \$93,686.

**Barbara Hale** has been invited to give a talk at the 16th International Conference on Nucleation and Atmospheric Aerosols in Kyoto, Japan in July 2004. This is the conference which was last hosted by UMR in 2001.



Jeff Schroder

## 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](mailto:physics@umr.edu). You might also be interested in checking out our web page, <http://www.umr.edu/~physics>.

### So What's News with You?

We hope you enjoyed this years 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: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Job Title (if appropriate): \_\_\_\_\_

Business Phone: \_\_\_\_\_

Business Address: \_\_\_\_\_

News or Comments: \_\_\_\_\_

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