

Communique

Fall 2005

UNIVERSITY OF MISSOURI-COLUMBIA

DEPARTMENT OF PHYSICS & ASTRONOMY

New Hires Enlarge Department

The Department of Physics & Astronomy has hired seven new faculty members since 2003, which brings the fall 2005 faculty roster to 27 members. The following segments provide information about each of these new members.

NSF CAREER grant honors Carsten Ullrich

The arrival of Assistant Professor Carsten Ullrich to the department was quickly followed by the announcement of his receipt of a National Science Foundation CAREER grant award. Only 300 of the prestigious awards are bestowed nationally on young investigators in fields of science and engineering. In the past five years, nine MU faculty members have received CAREER awards. The \$400,000 award will support Ullrich's research in theoretical and computational solid-state physics, especially time-dependent density-functional theory (TDDFT) for ultra-fast excitations in semiconductors. This theory, Ullrich says, is the generalization of the widely used ground-state density-functional theory and allows one to describe the dynamics of



Carsten Ullrich

interacting many-electron systems. Ullrich's interest is in the formal aspects of TDDFT, such as non-adiabatic behavior and memory effects, as well as in various applications in the linear-response regime and for nonlinear, strongly driven systems. Most of these applications deal with electron dynamics in semiconductor nanostructures. Recent work includes the study of nonlinear intersubband terahertz dynamics, collective excitations of quantum dots in magnetic fields, and optical and transport properties of disordered transition-metal doped semiconductors.

Ullrich, who is from southern Germany, was interested in science from an early age and decided to focus on physics when he saw Maxwell's equations for the first time. He was fascinated, he says, by all the "weird symbols," and wanted to study them, clarifying "pretty early that he would become a theorist." After earning a doc-

torate in 1995 from Wurzburg University, Ullrich spent postdoctoral years in France, at MU from 1997 to 1999 and then with Nobel Prize winner Walter Kohn in Santa Barbara, Calif. After a three-year stint on the faculty at the University of Missouri-Rolla, Ullrich seized the opportunity to return to MU, where he had friends and knew the department. "It was almost like coming home," he says.

Infrared astronomer Angela Speck does stellar work

Angela Speck joined the department in 2002 as a visiting assistant professor and became a tenure-track assistant professor in 2004. Born and raised in Bradford, England, Speck graduated from Queen Mary College, University of London in 1992 with a bachelor's degree with honors in astrophysics. She spent a year in industry working on research and development of air-conditioning products, then returned to higher education at the Open University, researching oxygen isotopes in meteorites. After transferring to the University College London (UCL) in 1995, she completed a doctorate in 1998.



Angela Speck

After one year of postdoctoral research at UCL, Speck accepted a postdoctoral research associate position with the astronomy department at University of Illinois-Urbana/Champaign, where she continued research on the nature and distribution of stardust around evolved stars. An infrared (IR) astronomer, Speck has conducted research on stellar evolution, astromineralogy and dust around evolved stars, galactic chemical evolution, meteoritics and the optical properties of materials. Speck's primary research focus is on how circumstellar dust pertains to basic ques-
(Continues on Page 2)



(New Hires, continued from Page 1)

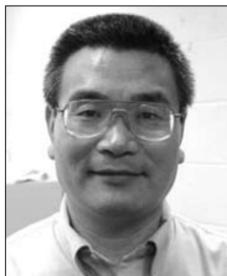
tions of galactic processes, and the origin of interstellar dust. She says that as a vital ingredient in understanding many astrophysical environments, dust is an essential part of star formation processes as it is related to discoveries of planet-forming disks. Speck believes that researchers must understand stardust to understand its contribution to astrophysics.

Currently Speck is designing an emphasis program in astronomy for physics students that could expand to an astronomy major program in the future. As an adviser to several undergraduate and graduate students, she has been responsible for overseeing student research that has resulted in eight conference presentations by five students in 2005 alone. Speck says she would like to be remembered by her students the way that she remembers her favorite teachers. She makes herself memorable to her students in many ways. In addition to a British accent, she sports four tattoos (none in weird places, says she), and frequently dyes her hair "silly colors." She dresses as a witch for her class lectures every Halloween. In December 2004, to raise money for the Melvin Y. Mora Scholarship Fund, Speck accepted monetary pledges in exchange for shaving her head. She raised \$1,200 for the fund.

Science and Physics Today publish Ping Yu's work

Assistant Professor Ping Yu joined the Mizzou physics and astronomy faculty in 2003. Born in Shanghai, the largest city in China, and raised in Tianjin, a harbor city in north China, Yu received bachelor's and master's degrees in physics from Nankai University and a doctorate in 1998 from Hong Kong University of Science and Technology. After two years at the Technical University of Denmark and Niels Bohr Institute in Denmark, he moved to Purdue University in 2000 as a postdoctoral associate, where he worked on biomedical imaging and optoelectronics. Yu's research interests include biomedical imaging, optoelectronics, semiconductor optics and nonlinear optics.

Yu's work on a holographic optical coherence imaging (OCI) technique based on AlGaAs/GaAs devices appeared in *Physics Today* in September 2003 and in *Science* in August 2003. He is currently working on two technologies that use near infrared light to image through tissue: frequency-domain photon diffusion and coherence-domain imaging. Coherence techniques can be used to get depth-resolved optical sections inside small tumors. This novel non-invasive and real-time spectroscopic optical biomedical imaging technique uses a holographic film and a low coherence interferometer that can record full-frame depth-resolved images through tumor tissue, without computed tomography, allowing real-time video fly-through under



Ping Yu

interactive control of an operator. Using frequency domain diffuse photon imaging, Yu is developing an optical tomographic technique to image small animals using MRI, PET, SPECT and CT scanners and so acquire multi-modal images simultaneously. In addition to biomedical imaging, current projects in Yu's laboratory include studies of nonlinear optics of new materials, semiconductor quantum dots and optoacoustic imaging. In his leisure time, Yu enjoys classical music and 19th Century European paintings.



Suchi Guha

Suchi Guha turns organic molecules into devices

Suchi Guha came to her current department position as assistant professor in September 2003, but she was not new to Mizzou. As a postdoctoral fellow from 1996 to 1998, Guha worked with Meera Chandrasekhar and returned to Columbia after working at Marquette University and Southwest Missouri State

University because she "saw great opportunities for collaborations with faculty members both within and outside our department." Prior to her first stint at MU Guha earned a doctorate from Arizona State University, a master's degree from Indian Institute of Technology and a bachelor's degree with honors from the University of New Delhi.

Guha's research explores the structure and electronic properties of organic and inorganic semiconductors and fullerene systems using optical spectroscopy. She currently investigates the photophysics of blue-emitting organic polymers and is developing novel optical techniques to study the vibrational spectra of organic layers in real devices. A related area is the study of endohedral fullerenes — promising device materials whose optical and electronic properties can be tuned by changing the metal cluster inside the fullerene cage.

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The department appreciates hearing from alumni and friends. Send announcements or milestones to the address listed above. Website at www.physics.missouri.edu.

Chair's Note

By H.R. Chandrasekhar, Department Chair

My first goal when I became the chair was to communicate with our alumni and friends through a newsletter. It has taken longer than a year to do it. Much has happened in this period. This newsletter will not cover all the accomplishments of our students and faculty, but we hope to catch up in the next newsletter.



H.R. Chandrasekhar

I heartily welcome our new group of students, graduate and undergraduate, who come with impressive credentials from Missouri and beyond. They have won many coveted awards and fellowships, thus alleviating the budget shortfall in student support. We also have a record number of postdoctoral fellows at this time. These young men and women have contributed to the intellectual atmosphere of the department. Of course, all of this is made possible by the research and creative activity of our faculty and their ability to garner extramural funding to support them.

This year has been declared as the World Year of Physics by the United Nations to celebrate a century of seminal contributions that physics has made to humankind. As a part of this worldwide celebration, we have organized a series of seminars, conferences and colloquia throughout the year. Professor Sashi Satpathy was a co-organizer of the workshop on Novel Oxides in Telluride, Colo., in August 2005. On Oct. 8-9, 2005, we are hosting the 52nd Midwest Solid State Conference. Despite its apparent reference to Midwest, this is a national conference; scientists from California to New York will take part. Under the O.M. Stewart Colloquia, special talks are being arranged on gravity and astrophysics in honor of the three papers written by Einstein a century ago that changed our view of space and time.

I conclude with a note of grateful thanks to Henry White, who has served our department as chair for many years. We admire and appreciate his service. I am equally grateful to our Leaders, a select group of alumni, who have been with us through thick and thin. I look forward to a bright future for the department.

Faculty Awards Honor Exceptional Achievements

Dorina Kosztin, resident instruction assistant professor and director of undergraduate studies, received the Provost's Outstanding Junior Faculty Teaching Award in 2005 in recognition of superior teaching and advising at MU. The award carries a stipend of \$1,000. Kosztin teaches a calculus-based introductory physics course to about 400 students each year and a seminar for physics majors. She serves as adviser to about 80 students. Kosztin has received accolades from an impressive number of students who take her courses. They say she teaches her students to think like a physicist and problem-solver. The students appreciate her wisdom that reaches beyond the physics lecture hall and into all aspects of their educational experience.

Shi-Jie Chen, associate professor, received the 2004 Provost's Outstanding Junior Faculty Research and Creativity Award. Chen was one of the department's first hires in biological physics, arriving in fall 2000, and has been funded by the American Heart Association and the National Institutes of Health. His active group of postdocs and students is pursuing work on the thermodynamics and kinetics of protein RNA folding. This award carries a stipend of \$1,000.

The Curators' Distinguished Teaching Professorship, awarded to outstanding faculty members on the

recommendation of the chancellor and approved by the MU Board of Curators, is a prestigious tribute to exceptional educators. **Meera Chandrasekhar**, who received the impressive honor in September 2004, is one of only seven recipients since the award was established in 1992. Recipients are expected to function as an educational resource to other faculty by giving lectures, assisting in improving the quality of teaching campuswide and engaging in teaching across divisional lines. The award carries an annual stipend of \$10,000, with no limit to chancellor-given extensions.

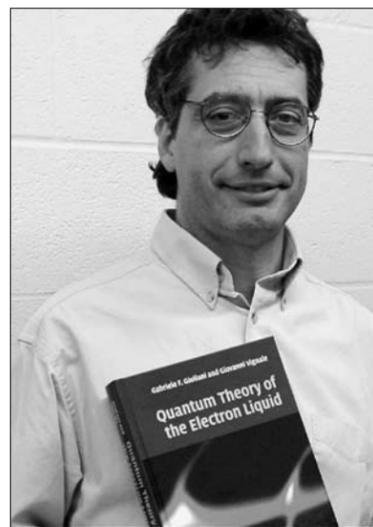
Wouter Montfrooij, assistant professor, shared an Excellence in Education award from the MU Division of Student Affairs in April 2005, with co-organizer Bruce McClure in biochemistry, for his part in the Saturday Morning Science lecture series. Modeling the series after a similar activity at the University of Michigan in Ann Arbor, Montfrooij created the series as a way to present exciting scientific information to the public and for scientists to learn about one another's work. Other goals of the creators are to recruit future scientists by highlighting the importance of science in everyday lives and to generate enthusiasm for scientific research in middle and high school students.

Faculty Kudos

Sashi Satpathy co-organized, with David Singh of Oak Ridge National Laboratory, a one-week workshop, Telluride Workshop on Physics of Novel Oxides, in Telluride, Colo. in August. Thirty experts from the United States, Japan, India and Germany attended.

In June 2004 **Haskell Taub's** group received its most recent grant from the National Science Foundation, which, when it expires in 2007, will complete 28 years of continuous support from the NSF, a total of 14 individual awards that total \$3 million. In summer 2004 Taub served a visiting professorship at the Technical University of Denmark (DTU), the third time he has been so honored. He has had a 28-year collaboration with DTU's Professor Flemming Hansen, who has been a frequent visitor to this department. Taub was recently invited to chair the General User Proposal Panel in Condensed Matter Physics at Advanced Photon Source, Argonne National Laboratory, a two-year position.

Peter Pfeifer is leading a multidisciplinary, multi-institutional project, Alliance for Collaborative Research in Alternative Fuel Technology (ALL-CRAFT), in which novel technology for low-pressure, high-capacity storage of natural gas (methane) is developed, using nano-engineered materials. Industrial targets include a flat-panel fuel tank for next-generation clean automobiles, recovery of methane as a renewable energy source from landfills and large-scale shipping of natural gas from Alaska and deep-sea methane hydrate fields. The technology is based on nanoporous carbon, manufactured from corncobs and other materials that adsorb methane in high density at low pressure (500 psi) and release it readily under decompression. The project is attracting national and international interest, as highlighted by the feature article in the April 2005 issue of *Fleets & Fuels*. ALL-CRAFT is led by the University of Missouri (<http://all-craft.missouri.edu>) and funded by NSF's Partnerships for Innovation program, MU and others, at \$1 million for 2004-06. Partner institutions are DBHORNE LLC of Atlanta, Ga., and Clean Vehicle Education Foundation of Washington, D.C., and several Missouri organizations: Midwest Research Institute, Lincoln University, Missouri Biotechnology



Giovanni Vignale

Association, Missouri Department of Natural Resources and the City of Columbia Municipal Landfill.

Sergei Kopeikin and his collaborators at the National Radio Astronomical Observatory continue to work on gravity waves using large radiotelescopes. They plan a new experiment using the Very Long Baseline Array to measure whether gravity experiences aberrations in the same way as light does. The experiment is planned for a week in October 2005 when the sun passes near the quasar 3C279 at a distance of two solar radii.

In a recent work published in *Physical Review Letters* and featured in *Physical Review Focus*, **Ioan Kosztin** showed that, contrary to the general belief, passive and spatially asymmetric channel proteins in living cell membranes can act as active transporters by consuming energy from nonequilibrium fluctuations fueled by cell metabolism. In the case of the glycerol uptake facilitator (GlpF) channel protein from the bacterium *Escherichia coli*, this newly discovered transport mechanism appears to fulfill a dual biological function, namely, (1) it accelerates glycerol uptake by the cell under poor nutrient conditions, and (2) in the presence of harmfully high glycerol concentration it provides protection to the cell by driving glycerol molecules out from the cell, against their concentration gradient. Kosztin presented this work in an invited lecture for the New & Notable Symposium at the 49th Annual Meeting of the Biophysical Society in February 2005.

Giovanni Vignale co-wrote the book *Quantum Theory of the Electron Liquid*. Published by Cambridge University Press in March 2005, this book introduces the quantum theory of the electron liquid and the mathematical techniques that describe it, providing an in-depth introduction to the physics of the interacting electron liquid in a broad variety of systems, including metals, semiconductors, artificial nano-structures, atoms and molecules. Vignale also ran in the New York Marathon in both 2001 and 2003. Although he was a distance runner in his youth, he says it was colleague Gabor Forgacs who convinced him to take part in the 2001 race.

George H. Vineyard Distinguished Professor **Gabor Forgacs** and his collaborators recently received a

\$5 million grant by the National Science Foundation for a project titled FIBR: Understanding Multicellular Self-Assembly. This proposal addresses the most fundamental mechanisms in the evolution of biological systems and the development of any particular organism. This cross-disciplinary project is aimed at discovering the principles of self-assembly at the multicellular level by dissecting the interplay between molecular and biophysical factors that drive the organization of cells and tissues into organs, and employing the garnered knowledge to direct the formation of organ modules: functional three-dimensional living structures of specific shape. The principles of multicellular

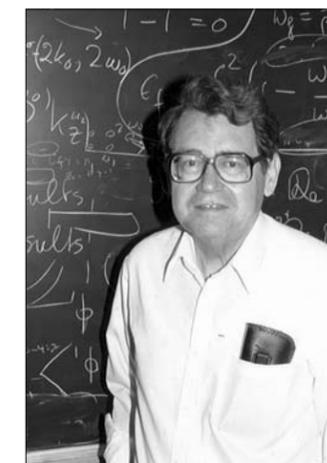


Gabor Forgacs

organization will serve as the basis for the construction of functional modules by "bioprinting": the biologically compatible delivery of living cells or their aggregates as "bioink" particles into the "scaffold-bioper." The principles of self-assembly illuminated through this project will provide a foundation on which other research can be conducted into possibilities for future organ building and replacement. Through interactive exhibits, this project will also help the public understand the process of science and what scientists do, especially as part of an integrated multidisciplinary team trying to tackle a problem of broad interest.

Retirements

Joseph Willett, a native of Missouri, came to Columbia in 1949. He received an MU doctorate in physics in 1956, working with Bernard Goodman in the area of quantum statistical mechanics. Willett held governmental and industrial research positions for nine years and then returned to MU in 1965



Joseph Willett

to join the faculty. Willett's research centered on plasma physics and most recently on solutions of Maxwell's equations for electric and magnetic fields in conjunction with either kinetic or fluid equations to describe the dynamics of the particles in a plasma or relativistic electron beam. His current projects relate to controlled fusion and free-electron lasers. Willett is well known on the Columbia music scene for his frequent performances with jazz instrumentalists. Although Willett retired in September 2004, for a couple more years, he will continue to teach at MU — another passion that he holds dear.

Brian DeFazio, who was born in Texas, joined the MU physics faculty in fall 1967, soon after he received his doctorate in physics from Texas A&M University. His research focused on two areas of theoretical physics, inverse problems and statistical mechanics. His recent work includes inverse problems in ultrasonic scattering, neutron reflectometry and electromagnetic scattering to determine important features such as the size, shape, location and the dynamic motions of the scattering object from data on the scattered wave. DeFazio was on the editorial boards of the *Journal of Mathematical Physics* from 1979-81 and the *Journal of Nondestructive Testing and Evaluation*. He was chosen Jubilee Professor by Chalmers Technological University in Sweden for 1983-84.



Brian DeFazio

DeFazio retired in September 2005 and has moved to Laredo, Texas. He will be missed; the coffee room is not the same. Contact Brian and Chris DeFazio at 2214 E. Frost St., Laredo, TX 78403-1613. Phone (956) 791-8550, e-mail bdefacio@stx.rr.com or defaciob@missouri.edu.

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Students Grateful for Department Scholarships

Each year the Department of Physics & Astronomy offers several undergraduate and graduate scholarships to students who show unusual aptitude and achievement in their studies. These scholarships, described here, honor distinguished former faculty and alumni as well as the students who receive them.

To donate to any of these scholarship funds, please write checks to the University of Missouri, with the name of the scholarship in the memo line, and mail to Department of Physics & Astronomy, ATTN Sherry Long, 223 Physics Building, Columbia, MO, 65211.

For more information about any of these funds, please contact department Chair H.R. Chandrasekhar by phone (573) 882-2619 or e-mail Chandra@missouri.edu.

Paul E. Basye Undergraduate Scholarship

Established for worthy undergraduate students in Physics and Astronomy by Dr. Paul Basye in 1985. Basye, who formed strong and lasting ties with Mizzou while working with professors O.M. Stewart and H.M. Reese, graduated in 1923.

Newell S. Gingrich Graduate and Undergraduate Scholarships

On the anniversary of 50 years of distinguished service to MU, friends, colleagues and former students of Professor Gingrich established the Newell S. Gingrich Undergraduate Scholarship. An endowed fund to support undergraduate scholarships and graduate fellowships was established in 2003. Internationally known for his pioneering studies in x-ray and neutron diffraction, Gingrich's record of scholarly achievements in research is paralleled by his record of excellence in teaching.



Former department Chair Tom Wolfram, right, painted the portrait of Newell S. Gingrich, who stands next to the image of himself.

Lionel E. Gravel Undergraduate Scholarship

Established by grandson James DeGraffenried, a 1987 physics department graduate, this scholarship honors a man committed to ensuring that his children enjoy the opportunities of higher education.

Eli & Nola Haynes Scholarship

This fund is for students in both the Department of Physics & Astronomy and the Department of Mathematics. Awards are made to undergraduate or graduate students who demonstrate a special interest in astronomy, physics or mathematics, preferably in the field of astronomy.

Eugene B. Hensley Undergraduate Scholarship

"Gene" Hensley, MA '48, PhD '51, physics, retired in 1985 as professor emeritus after more than 30 years of teaching. He remained an active member of the department until his death in 1992. One or more annual awards are made to full-time, deserving undergraduate or graduate students who plan to pursue a major in physics.

Ernest W. Landen Undergraduate Scholarship

In 1938, Landen was the seventh student to graduate from MU with a doctorate in physics. He specialized in Biophysics after receiving his master's degree here in 1933. This fellowship is awarded to qualified students who demonstrate innovation and excellence in their research and scholarly activities.

Samuel S. Laws Scholarship

To honor the scholar responsible for bringing an observatory to MU, one or more annual prizes are made to an undergraduate student who is interested in astronomy and displays academic achievement and promise.

Packwood Undergraduate Scholarship

This fund is available for undergraduate students majoring in physics. The award may be renewed if the recipient maintains a minimum grade point average of 3.0. Financial need is not a consideration for awarding the scholarship.

O. M. Stewart Scholarships

Oscar M. Stewart, an MU physics professor from 1901 until his retirement in 1940, was a renowned teacher, scholar and author. This fund is used for undergraduate and graduate scholarships or fellowships for students majoring or minoring in physics. It is also used for payment of honoraria for lectures held weekly and sometimes for the purchase of research apparatus.



O. M. Stewart

Clifford W. Tompson joined the department as assistant professor in 1959, was promoted to professor in 1970, accepted the position of director of undergraduate studies in 1983 and retired in 1992 as professor emeritus. As a tribute to his distinctive career, one or more annual awards are made to full-time deserving undergraduate physics majors. At the discretion of the Chair, this fund is used in other ways to benefit students.

Clifford W. Tompson Scholarship

Clifford Tompson joined the department as assistant professor in 1959, was promoted to professor in 1970, accepted the position of director of undergraduate studies in 1983 and retired in 1992 as professor emeritus. As a tribute to his distinctive career, one or more annual awards are made to full-time deserving undergraduate physics majors. At the discretion of the Chair, this fund is used in other ways to benefit students.

Scholarship Memorializes Student Killed in Iraq

Melvin Mora was killed in the line of duty just before his graduation date

Army Reserve Sergeant Melvin Y. Mora, a Mizzou physics major killed in Iraq during an ambush in the line of duty June 6, 2004, was a senior at Mizzou and close to graduating with his bachelor's degree. To honor him, fellow undergraduate students organized a scholarship fund to help students who share Mora's love of physics achieve their academic goals in his name. The Melvin Y. Mora Scholarship Fund is an endowed fund that will provide a scholarship for a deserving physics major every year.

Physics students worked on fund-raising projects during the 2004-05 school year and plan to continue to solicit funds during the 2005-06 academic year. The students are committed to seeing Melvin Y. Mora's name live on in the MU physics department, and they welcome contributions with gratitude.

Contributions are needed to maintain this fund. Donors interested in contributing to the Melvin Y. Mora Scholarship Fund may write checks to the University of Missouri, with "Melvin Y. Mora Scholarship Fund" written in the memo line, and mail to: Department of Physics and Astronomy, Attn: Sherry Long, 223 Physics Bldg., Columbia, MO 65211.

For more information about the fund or about Melvin Mora, please e-mail Yve Solbrekken at yesmb7@mizzou.edu.

Student Accomplishments

Graduate Students

Sunita Thulasi received a doctorate in 2005 with Sashi Satpathy as adviser and joined Intel Corporation in Portland, Ore., as a resolution enhancement techniques design engineer. She will work on optical proximity corrections, which become increasingly significant as feature sizes on chips grow smaller. Her thesis was "Theory of the Two-Dimensional Airy Electron Gas: Hartree-Fock and Density-Functional Studies."

Hakim Meskine obtained a doctorate in 2005 with Sashi Satpathy as adviser and joined the Fritz-Haber Institute in Berlin, Germany, as a postdoctoral research associate. Meskine also received two other prestigious awards: the Graduate Student Association Superior Graduate Achievement Award (SGAA), given in recognition of excellence in teaching, research or other department and community achievements, and Graduate School Superior Graduate Student Excellence Award, given by the Graduate School to the top three SGAA graduate students at Mizzou. His thesis was on "Electron-Phonon Coupling Effects on Magnetism in Solids."

Chen Hou, PhD '05, advised by Peter Pfeifer, wrote a thesis on "Scaling Laws for Oxygen Transport Across the Space-Filling System of Respiratory Membranes in the Human Lung." Hou is a postdoctoral fellow at Santa Fe Institute, Santa Fe, N.M.

Brian Kirby, PhD '04, advised by Jim Rhyne, wrote a thesis on "Annealing-Dependent Phenomena in $Ga_{1-x}Mn_xAs$." Kirby took a postdoctoral position with the Los Alamos National Laboratory.

Keary Schoen, PhD '04, with Samuel Werner as adviser, wrote a thesis on "Neutron Interferometry Experiments at NIST: A Study of New Body Forces." Schoen works at the MU Research Reactor Center as a postdoctoral fellow.

Haiding Mo, PhD '04, with Haskell Taub as adviser, wrote a thesis on "Neutron and X-Ray Scattering Study of Intermediate-length Alkane films adsorbed on Solid Surfaces." Mo is in a postdoctoral position at Northwestern University, Evanston, Ill.

Arjuna Flenner, PhD '03, advised by Brian DeFazio, wrote a thesis on "Wavelet Analysis with Information

Theory Applied to Laser Interferometric Gravitational Wave Antennas." Flenner took a postdoctoral position at the Naval Air Warfare Center in China Lake, Calif.

Undergraduate Students

Senior **Matthew Simpson** has many accolades, including a 2005 Barry M. Goldwater Scholarship. He received the scholarship for academic merit in competition with more than 1,000 applicants. Established in 1986, the Goldwater Foundation operates an educational scholarship program designed to provide opportunities for American undergraduate students with excellent academic records and outstanding potential, and will cover cost of tuition, fees, books and room and board. Simpson is also a recipient of a 2004-05 MU Undergraduate Research Scholarship and was selected in 2003 for the Undergraduate Research Mentor Program in the College of Arts and Science. His adviser and mentor in that program, physics Professor Haskell Taub articulates only the highest praises for Simpson, citing "Matt's combination of superb academic achievement, insight into research and personal interaction skills." Simpson's career goals include working toward a master's or doctorate in biophysics, conducting research and teaching at a major university.

Michael Gramlich won a New Focus Travel Grant to attend the Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference (CLEO/QELS) in May 2005. Gramlich was one of only 10 students selected worldwide, and the only undergraduate chosen this year. His oral presentation was titled "Optimizing two-wave mixing efficiency in photorefractive quantum wells by selective angle tuning." Gramlich earned his undergraduate degree in May 2005 and currently works as a research assistant with Paul Miceli on x-ray diffraction from thin film crystals. Future plans include finishing a doctorate and finding a faculty position "within the decade."

Mike Forney received a Life Sciences Undergraduate Research Scholarship (in the Life Sciences Undergraduate Research Opportunity Program) and was accepted in the Undergraduate Research Mentorship Program. As an LS UROP fellow in summer 2005 and the current academic year, Forney, a junior, works with loan Kosztin on a biomolecular modeling project. The

goal of his research is to investigate the energetics and the underlying physical mechanism of sugar molecule transport through the bacterial maltoporin channel protein by employing large-scale molecular dynamics simulations and statistical physical analysis methods. Forney's results were presented as a poster at the 2005 Summer Undergraduate Research and Creative Achievements Forum and will be presented as a poster at the 52nd Midwest Solid State Conference.

Christopher Volz received an Arts and Science Undergraduate Research Mentorship award in summer 2004 and was named an Undergraduate Research Scholar for 2004-05. Volz, a senior, worked with loan Kosztin in the study of water transport in asymmetric single-walled carbon nanotubes (SWNT) by using both equilibrium and nonequilibrium molecular dynamics simulations, in particular, nonequilibrium pressure fluctuations known as the ratchet effect.

Kyle Gustafson graduated *Summa Cum Laude* in 2004 and earned many other impressive awards. In 2002-03, Gustafson received an A&S Undergraduate Research

Mentorship award and worked with Peter Pfeifer on model calculations of the efficiency of molecular motors in biological systems. In 2003, Gustafson won a Barry M. Goldwater Scholarship for his research and other achievements. As a summer research intern at Lawrence Livermore National Laboratory, he worked in the area of plasma physics and co-wrote a paper titled "Magnetohydrodynamic Simulations of Shock-Cloud Interactions," which he presented at the annual meeting of the American Astronomical Society in January 2004. That research was also the topic of a talk given at the November 2003 annual meeting of the Physics Leaders and garnered the Physics Leaders' Prize for Outstanding Undergraduate Research. Gustafson also received a prestigious Hertz Foundation Fellowship Award for the current academic year, a merit-based award consisting of a cost-of-education allowance. He is enrolled in the physics graduate program at the University of Maryland.

Outreach

Saturday Morning Science

Saturday Morning Science presents a series of free, one-hour lectures by MU scientists at 10:30 a.m. most Saturdays in the Monsanto Auditorium of the Life Sciences Center. The lectures are co-sponsored by the Department of Physics & Astronomy, Department of Biochemistry, MU Office of Research and MU Life Sciences Center. For more information, visit <http://www.physics.missouri.edu/satscience.html>.

Date	Topic	Speaker
Sept. 10	Linking Genes and Proteins	Bruce McClure Shari Freyermuth
Sept. 17	The 'Truth' About Global Warming	Steve Keller
Sept. 24	Carbon Cycling in Soils	Peter Motavalli
Oct. 1	Can Plants Move?	Manni Liscum
Oct. 8	Fuel Cells and the Future of Energy	Galen Suppes
Oct. 15, 22	The Origin of Mind, part 1 and 2	David Geary
Oct. 29, Nov. 5	Ernst Mayr: The Species King, part 1 and 2	Jim Carrel
Nov. 12, 19	Why Are Plants So Picky About Their Mates?	Tim Holtsford
Dec. 3	Bioremediation by Bacteria	Judy Wall
Dec. 10	Muscle Regeneration	Dawn Cornelison

Alumni Corner

David Rainwater, BS '93, graduated from the University of Wisconsin-Madison in 1999 with a doctorate in particle theory. He spent three years as a research associate at Fermilab in the Chicago suburbs and two years as a research fellow at DESY, the German equivalent of Fermilab, in Hamburg, Germany. He is the first Marshak Fellow in high-energy physics at the University of Rochester. His focus is on the phenomenology of the fundamental interactions of nature, as studied at particle colliders. He spends most of his time studying how the Large Hadron Collider, being built at CERN in Geneva, Switzerland, will be able to observe new physics beyond the standard model and how it might go about disentangling competing claims of new models to fit the data. This includes supersymmetry and various recent new models of electroweak symmetry breaking. Rainwater continues his hobbies of playing cello and flying airplanes, which sometimes proves to be difficult in upstate New York weather. He has continually played with amateur orchestras since leaving Mizzou but may return to the smaller ensemble format, like the quartets of his college days. This summer Rainwater was a co-convenor at the Snowmass HEP conference, held approximately every four years, and spent a month at a collider workshop at the Aspen Center for Physics.

William G. Brinkman, BS '60, PhD '65, reports he is having fun teaching and doing research at Princeton. He recently wrote a paper with P.W. Anderson and D. Huse on the properties of solid helium. After an illustrious career as a researcher and administrator, Brinkman retired in 2001 as vice president of research at Bell Laboratories and Lucent Technologies. He is a past president of the American Physical Society, winner of the 1994 George E. Pake Prize and a member of the prestigious National Academy of Sciences. He will chair the plenary session at the 52nd Midwest Solid State Conference to be hosted by the physics department in Columbia on Oct. 8-9, 2005. Brinkman shows no signs of slowing down.

William L. Kennedy, BS, MS '74, is employed by MU's Department of Nuclear Engineering (Medical Physics), Columbia Regional Hospital Radiation Therapy, and MU Hospital and Clinics Radiation Therapy Department. His research interests include stereotaxic radiosurgery and implantable radiation detectors for radiation therapy patients. Kennedy's accomplishments include developing radiation plan simulations and treatments for more than 8,500 cancer patients.

Robert Cunningham, PhD '70, joined the department in a postdoctoral position and works to integrate computers into the control of research equipment, initially



Robert Cunningham of St. Louis prepares to unload the department's first computer transported from Boston to MU in 1970. The six-foot computer had 4K of memory.

diffractometers, and for use in teaching labs. In fall 1970 he brought the department's first computer back from Boston on a wooden pallet bolted to the bed of the department's pickup truck. The computer was a Digital Equipment Company PDP/20 that stood about six feet tall and had 4K of memory, a teletype console, no disk, a paper tape reader/punch, and an analog to digital converter.

In 1973 Cunningham joined McDonnell Douglas, now Boeing, in St. Louis and quickly moved into management. He is currently responsible for information technology in Boeing's Phantom Works research division.

Robert Kost, MA '67, PhD '71, accepted a faculty position at Missouri Western State College, where he taught for three years before transferring to a small company in Kansas City to design and synthesize linear passive networks; this led to working in California on circuits used in hard disk drives. Kost retired in 2003 after 17 years with Seagate Technology in Minneapolis. His area of interest was digital data recovery in a noisy environment. During those years in the drive industry, he wrote two articles in circuit design related to disk drives. Kost is now teaching and tutoring part time in a local community college and building furniture.

Please send alumni news to the department at hillsar@missouri.edu. We want to hear from you.

(New Hires, continued from Page 2)

Guha's research has been supported by the Research Corporation, the American Chemical Society Petroleum Research Fund and the National Science Foundation. A growth/fabrication (organic optoelectronics) facility was funded by one of two large awards captured by Guha from the National Science Foundation. The system consists of a glove box integrated with a spincoater and a thermal evaporator that are connected by an antechamber. The interior area of this system functions as a clean room [class (10-100)] with a laminar gas flow. Guha is the co-recipient of another NSF grant set to launch September 2005, titled "Light-scattering studies of organic semiconductor based devices." In addition to the scientific impact of this grant, Guha, along with co-principal investigator Shubhra Gangopadhyay, professor in physics and electrical engineering, aims to establish a collaboration between the physics and electrical engineering departments in the field of nanoscale optoelectronics.

Born and raised in New Delhi, India, Guha says she loved mathematics and technology early on and spent long hours playing with household appliances, sometimes to the point of no repair. Although she rarely indulges, she enjoys reading, listening to jazz and blues music, hiking and playing the guitar.

Aigen Li works with the Spitzer Space Telescope project

Assistant Professor Aigen Li came to Mizzou in fall 2004. After completing undergraduate studies at Beijing Normal University and the Chinese Academy of Sciences, he earned a doctorate in astrophysics from Leiden University in 1998. He was a postdoctoral research associate at Princeton University from 1999-2002 and a Theoretical Astrophysics Prize Fellow at the University of Arizona from 2002-2004. His chief research interests are the theoretical studies of the interstellar medium, with a focus on interstellar grains; the formation and evolution of stars and planetary systems, with a focus on protoplanetary dust disks around young stars, debris disks around main sequence stars, and dust envelopes around evolved stars; and comets and the infrared properties of galaxies.

Li has been closely involved with the Spitzer Space Telescope, one of the four "great observatories" recently launched by NASA. He is a team member of the Spitzer Legacy Project SINGS (Spitzer Infrared Galaxies Survey) and an invited guest member of the Spitzer IRS Dust Disk Project. NASA has funded three of his Spitzer proposals. He has written nearly 50 refereed papers and edited the book *Formation and Evolution of Solids in Space* with J. Mayo Greenberg. Among his invited review articles is "In Dust



Aigen Li



Deborah Hanuscin



Yun Zhang

We Trust: An Overview of Observations and Theories of Interstellar Dust," published in *Solid State Astrochemistry* in 2003.

Deborah Hanuscin studies teaching and learning in physics

Assistant Professor Deborah Hanuscin began her career as an elementary teacher in Tallahassee, Fla., and completed a doctorate in curriculum and instruction from Indiana University in 2004. As a jointly appointed faculty member in both physics and education, her work and research are related to the teaching and learning of physics, with special regard to scientific literacy and K-12 teacher preparation. A primarily qualitative researcher, Hanuscin conducts naturalistic inquiry of classrooms using questionnaires, interviews, participant observations and case studies to develop a robust understanding of learners' conceptions of scientific epistemology and the implications for education. In addition, she supports both practitioners — K-12 teachers — and faculty members in conducting action research, a form of scholarship of teaching and learning. To support the start-up of her research program, Hanuscin has received three internal grants; the Richard Wallace Faculty Research Incentive Grant, a Research Council Grant and a Research Council Small Grant.

Hanuscin's interest in physics evolved while teaching the subject, and she hopes to instill that same wonder in the prospective teachers she educates. In her spare time, Hanuscin says she runs, paints murals and is an avid swing dancer.

Yun Zhang connects labs with lectures

As the newest addition to the department in fall 2005, Yun Zhang comes to MU from Le Moyne College in Syracuse, N.Y. Zhang was born and raised in Kaifeng, Henan Province, China. She received a bachelor's degree from Tsinghua University in Beijing and a master's degree from Peking University in Beijing, both in physics. After moving to the United States in 1993, Zhang earned a doctorate in physics from the University of California-San Diego. After graduation in 1999, she worked at IBM in the Storage Technology Division in San Jose, Calif., for three years as a test engineer. Currently a resident instruction assistant professor, Zhang says she would like to concentrate on teaching. She plans to help improve student learning by making connections between laboratories and lectures and by building classroom demonstrations. She would also like to develop a course on the physics involved in storing and retrieving data in hard drives for engineering-oriented students.



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As part of the World Year of Physics 2005 celebrations, the Department of Physics & Astronomy hosted an Open House on April 9, 2005. Hundreds of children and their families enjoyed the demonstrations of physics phenomena and hands-on activities.

