

# REFLECTIONS

## UNIVERSITY OF ARKANSAS RECEIVES THE LARGEST GIFT IN HISTORY OF U.S. PUBLIC HIGHER EDUCATION

The University of Arkansas received a \$300 million commitment from the Walton Family Charitable Support Foundation to establish and endow an undergraduate honors college and endow the graduate school. The gift is the largest ever made to a U.S. public university. The gift also ranks as the fifth largest ever made to an American university, whether public or private, according to The Chronicle of Higher Education.

"This unprecedented generosity from the Walton Family will transform the University of Arkansas for our students and faculty, and in the process position us to serve as a powerful engine of economic development and cultural change for the entire state," said University of Arkansas Chancellor John A. White. "What the Walton Family has done will improve life in Arkansas for generations to come, and we are grateful beyond words."

"This gift will allow the University of

Arkansas to realize its vision as a nationally competitive, student-centered research university serving Arkansas and the world," White added.

The Walton Family Charitable Support Foundation was founded to support specific charities in the state of Arkansas by the family of the late Sam M. Walton, who created Wal-Mart Stores, Inc., now the world's largest corporation. The Walton Family Charitable Support Foundation also made a \$50 million gift in 1998 to what was later renamed the Sam M. Walton College of Business at the University of Arkansas.

Rob Walton, chairman of the board of Wal-Mart Stores, Inc., and co-chair of the University's Campaign for the Twenty-First Century, said, "The investment we are making demonstrates our confidence in the University of Arkansas and its potential for leadership in the global academic community. It is also an expression of our

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## THE URSA WEB TELESCOPE PROJECT

Undergraduate Research Studies in Astronomy, or URSA, is a project funded by the National Science Foundation, with matching support from the University. The goal of the project is to enable all undergraduate astronomy students to participate in research projects during each astronomy class they take. The hope is that this will foster an inventive research spirit in our students and lead to improved learning and satisfaction. Students are introduced to different kinds of astronomical objects in the classroom, and are encouraged to learn more about them by making their own observations. When students go to a web site ([ursa.uark.edu](http://ursa.uark.edu)) and request their observations, the telescope automatically makes the requested observations, then notifies the students by e-mail that their data are available. The enabling hardware is an automatic web-based observing system on top of Kimpel Hall on campus (see picture). On a winter night, this system can obtain more than 500 images of the sky, each 30 x 20 arc

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## NOBEL PHYSICIST STEVEN CHU DELIVERS THE 2002 MAURER LECTURE

Nobel Laureate Steven Chu delivered the 2002 Robert D. Maurer Lecture "Laser Cooling and Trapping: From Atomic clocks to Watching Biomolecules One at a Time" in Spring this year. This year's lecture was sponsored by the Physics Department, Fulbright College and the Arkansas Space Grant Consortium.

Professor Chu discussed how atoms can be cooled with lasers to temperatures of 200 billionths of a degree above absolute zero. These atoms can then be trapped and manipulated with light. This technology has permitted the construction of ultra-precise atomic clocks, atom interferometers, and the achievement of "Bose condensate" – a new state of matter. Prof. Chu said that the optical trap is also used to trap microscopic particles in water. These so-called "optical tweezers" are widely used in biology. Chu described the methods that his group has developed to simultaneously visualize and manipulate single bio-molecules. He and other scientists have used these techniques to study the behavior of individual bio-molecules and bio-molecular systems in real time. His research group has used this technique to study single DNA molecules to address a number of problems in

polymer science.

Professor Chu also offered a physics colloquium on March 29 on "Biology at the Single Molecule Level." He said that the ability to look at individual molecules has given researchers new insights into biological processes. For example, his studies of polymers using Deoxy-ribo Nucleic Acid (DNA) have fundamentally altered current thinking of polymer dynamics by showing that identical molecules placed under identical conditions take several distinct paths to a new equilibrium state.

Steven Chu is the Theodore and Frances Geballe Professor of Physics and Applied Physics at Stanford University. He received his Ph.D. in 1976 from the University of California at Berkeley. After two years as a postdoctoral fellow at Berkeley, he joined the technical staff at AT&T Bell Laboratories in 1978, where he served as Head of the Quantum Electronics Department from 1983 to 1987. In 1987, he joined Stanford University.

Professor Chu's research is primarily in atomic physics, quantum electronics, and biophysics. He has published over 130 scientific papers. Chu was awarded the Herbert Broida Prize

for Spectroscopy by the American Physical Society, in 1987, was named the co-winner of the King Faisal International Prize for Science in 1993, and won the Arthur Schawlow Prize for Laser Science in 1994. In 1997, he was a co-winner of the Nobel Prize in Physics. He is also the recipient of the Humboldt Senior Scientist Award and a Guggenheim Fellowship. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

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# Physics of Bio/Nanostructures: Dr. Jiali Li

Jiali Li grew up in a suburb of JiaMuSi in northeast China where she attended a local primary school. Her father wanted her to become a music teacher, so she spent most of her after-school hours taking music and dance lessons. During her middle school years mathematics and physics became her favorite subjects and she decided to become a scientist. In 1978 she passed the qualifying examination and entered the No.1 high school of JiaMuSi. After finishing high school in 1981, she entered HeiLongJiang University as a physics major. She intended to be a theoretical physicist and during the last year of her college she took a whole year of theoretical physics but decided to study "something more practical." Her wish was granted in 1985 when she was admitted to be a graduate student in solid-state physics at the University of Science and Technology of China. She received her Master of Science degree in 1988 and advanced to the Ph.D. program. During her graduate study there, she designed and built two vacuum systems to make and test combustible and poison gas sensors. She also acquired extensive hands-on training on structure and composition analysis of solid-state materials. In the beginning of 1991, the last year of her Ph.D. research, she left China to become a graduate student at City University of New York. That decision delayed her Ph.D. degree and changed the direction of



her research once more. Eight years later in 1999, she graduated with a Ph.D. in a rapidly emerging field of biophysics, studying electron and energy transfer kinetics in photosynthetic reaction centers using lasers under the supervision of Prof. M. Gunner.

The training of vacuum technology in China, laser optics and biotechniques in the US helped her to get a postdoctoral research position in Profs. Golovchenko and Branton's group in the Physics Department at Harvard University. Her research at Harvard during the

last three years has been to fabricate 1-5 nm pores in silicon nitride membranes and detect DNA molecules. She played a major role in the development of a feedback controlled ion beam sculpting system and made several discoveries on how to control nanopore dimensions. She is one of the major contributors of 3 pending patents and a Nature paper related to these discoveries. These new techniques have revolutionary implications for molecular and atomic scale evaluation of biopolymers. She says "my postdoctoral research at Harvard has enhanced my experience in ultra high vacuum systems, and has trained me in the fields of nanotechnology and single DNA molecule detection."

Her current research interests are in the areas of nanoscale materials science, optical spectroscopy, and their applications in biological systems. She is particularly excited about the application of solid-state nanopores as single molecule detectors and development of artificial membranes and biosolar systems.

She will be joining the physics department as assistant professor of physics in fall 2002. Professor Li brings a unique capability to our program in nano/biophysics area that will also help us build bridges across disciplines to biology and chemistry.

Professor Li's favorite pastimes are hiking, playing and listening to music, and talking to her five-year-old daughter.

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## Computational Condensed Matter Physics Dr. Huaxiang Fu

Dr. Huaxiang Fu finished his Ph.D. in 1994 at Fudan University, Shanghai, China, under the supervision of Professor Xide Xie. From 1995 to 1998 he worked with Dr. Alex Zunger as a postdoctoral fellow at the National Renewable Energy Laboratory in Golden, Colorado. In 1999 Dr. Fu was a postdoctoral research associate at Carnegie Institution of Washington, DC, working with Dr. R. E. Cohen. In September of 2000 he became a faculty member at Camden Campus, part of Rutgers University, the state university of New Jersey. In August of 2002 he will join the physics department at the University of Arkansas as an assistant professor.

Dr. Fu's research interest is in studying the properties of materials using computational approaches. The material properties he studies include electronic structure, lattice vibration, optical transition, electrical conductance, pressure effect, electrical-field effect, and electromechanical response. Most of Dr. Fu's research work is closely related to experiments



and practical applications. Dr. Fu is particularly interested in the following types of materials: (1) semiconductor nanostructures, in which electronic states, phonon vibrations, and the

coupling between them are drastically different from bulk semiconductor materials; (2) ferroelectric and piezoelectric oxides, a special class of materials which can efficiently convert mechanical energy into electricity or vice versa; (3) and organic/inorganic hybrid materials, which combine the advantages of semiconductors (with concrete functionalities) and organic polymers (with structure diversity and flexibility). These materials offer many technological applications. Another significant component of Dr. Fu's research is to develop efficient computational methods to study different material properties.

Dr. Fu likes to do things from scratch. He says that although this tends to slow him down, he enjoys learning the details first hand and accumulates a thorough knowledge of the problem. He also takes great delight in sharing his knowledge with others. In addition to his research and teaching, Dr. Fu likes jogging and sports.

## The KIDS Program: Inquiry-Based Science and Engineering Education in Arkansas Middle Schools

The National Science Foundation has awarded a grant that, with matching funds from the University of Arkansas, provides \$2.75 million to develop inquiry-based science and engineering education in Arkansas middle schools over a six-year period. Each year, nine University of Arkansas Graduate Fellows and nine to twelve local (Fayetteville, Springdale, and Winslow) teachers will participate in the six-week summer program and related teaching activities during the school year.

**KIDS (K-12, I Do Science)** is an interdisciplinary program focused on electronics and optics that will initiate a new effort to teach mathematics, science, and technology in middle schools in Arkansas. It is based on the inquiry, or "learning through doing" paradigm. This is the premise that students who explore their own curiosity, reach for their own ideas, and engage in their own experiments, are experiencing inquiry and innovation and hence are learning science. The project goal is to develop inquiry-based physics education in Arkansas middle schools.

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commitment to building a brighter future for the state and the nearly three million men, women and children who call Arkansas home."

Started in 1998, the Campaign for the Twenty-First Century is a six-year effort to raise \$500 million in private gift support by June 30, 2004. A condition of receiving the \$300 million gift is that the University commit to raising an additional \$300 million for academic and support programs between January 1, 2002, and the end of the Campaign.

Of the Walton family gift, \$200 million will be used to establish and endow a new, university-wide undergraduate honors college and \$100 million will be used to endow the University of Arkansas Graduate School.

The honors college is designed to "capture" for the University those high achieving Arkansas natives who are lured out of state by colleges and universities with attractive scholarship programs. It is also designed to attract extremely talented out-of-state students. Wherever they come from, their matriculation at the University of Arkansas greatly increases the likelihood that they will live in Arkansas after graduation. Their presence will enlarge the talented leadership corps in science, technology, education, business, and the creative fields needed to move the state forward

The \$100 million to endow the University of Arkansas Graduate School will be used to double the size of graduate enrollments to 5,500 by 2010 in the University's 34 doctoral and 96 master's programs, and to support the growth of University research programs. Various endowments will be used to establish distinguished doctoral fellowships, graduate faculty endowed research chairs, and graduate student research fund to support the travel, research and equipment needs of graduate students. In addition, \$4 million will be used for a library support endowment in support of graduate education.

—from UA News Release April 11, 2002

University of Arkansas Physics, Electrical Engineering, and Microelectronics and Photonics graduate students will partner with middle school teachers to teach 6th and 7th grade mathematics and science. Both graduate students and teachers will undergo extensive training, during which they will actively develop the skills to work as a team. Then, as a team, the teachers and graduate students will develop inquiry-based laboratory experiments, integrating optics and photonics, with teachers providing the connection to the appropriate state standards and curriculum. Graduate students will spend at least 10 hours per week in the classrooms during the academic year teaching these modules with the teachers. In addition, graduate students will come into the University laboratories twice a year to participate in workshops in which they build and characterize a chip and a laser. Parents and school administrators will be provided with programs that will help them to understand inquiry-based learning and their role in supporting teachers and students learning science.

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minutes in size (almost the size of the Moon). In addition to being a powerful teaching tool, the system has proven to be a superb research tool also, doing as well at measuring the brightness of eclipsing binary stars from the middle of Fayetteville as one could do with a larger telescope in the Chilean Andes, and doing it faster! In fact, this telescope now holds the record for producing the most complete light curve of an eclipsing binary star (WW Cam) with almost 6000 observations obtained in only five months (before this, 600 observations was considered good). The project actually started before the grant was funded when Physics major Ben Hood offered to buy a telescope for the project with some of his scholarship money. The Physics Department responded by funding the Robo-Dome, and then the NSF grant bought the CCD camera. Programming support has been provided by Dr. Lacy (telescope and dome), his graduate student Jeff Sabby (camera), and visiting assistant professor and alumnus Tamara Snyder

(web interface). So far, the system has been used by a number of students for their Honors projects, including Ben Hood, Amber Straughn, and Forest Denger, as well as summer REU student Jennifer McGee. The full web system, now in beta-test, will be classroom tested beginning in July 2002. Eventually, it will be available to all physics teachers in the state as well as to their students.



The outcome of the **KIDS** program will be middle school teachers who have learned the value of and developed the skills to implement inquiry-based instruction in mathematics, science, and engineering. Their effort will result in a new generation of middle school students who are self-confident and motivated to learn science, have a thriving curiosity, see a direct connection between learning and everyday phenomena, work successfully in teams, communicate and present their ideas skillfully, and are excited and prepared to further their knowledge and interest in science, mathematics, and engineering.

Additionally, the **KIDS** program will begin an effort in Arkansas to develop scientists who will take a greater interest in teaching and communicating science. They will begin their careers with a deeper understanding of their science, a greater ability to express it to others, and a passion to improve K-12 education in their new communities.

The proposal was developed and submitted to the National Science Foundation by the program team, which includes Fayetteville Public School Science and Math Curriculum Fellow Denise Airola, Assistant Professor of Education Caroline Beller, K-12 outreach specialists Sarah Faitak and Lynne Hehr, Professor Emeritus of Physics Art Hobson, University Professor of Physics Greg Salamo, Associate Professor of Physics Gay Stewart, evaluation and testing expert Ronna Turner, and Microelectronics & Photonics Graduate Program Director Ken Vickers.

### J. Lee Dawson (B.S. 1953) of

Searcy, Arkansas and native of Little Rock, Arkansas, died April 21, 2001. He served in the Navy during World War II and the Korean War and received the following awards: Combat Action Ribbon, Good Conduct, Asiatic Pacific Campaign, W.W. II Victory, Korean Service Medal, and Presidential Unit Citation - Korea. He was assigned to the destroyer U.S.S. Nicholas in 1942 and 1943 doing sonar work and later to the U.S.S. Little. He was an electronics instructor from 1946 until his discharge in 1947.

Mr. Dawson applied and was accepted to the University of Arkansas at Fayetteville in 1945 while he was still aboard the U.S.S. Little. He entered the university in January 1948. During his senior year the Korean War began and he was re-called to active duty with the Navy. After his discharge he returned to Fayetteville with his wife and two small boys to complete his Bachelor of Science degree in physics.

IBM employed Mr. Dawson in San Jose, California for 15 years until he left that company to work with a smaller electronic firm designing computer hardware. One son, Timothy, preceded him in death in 1968. He is survived by his widow, Meredith Martin Dawson, four children – Richard, Phillip, Rebekah, and Daniel, thirteen grandchildren, three step grandchildren, and one great-granddaughter.

# News

## 2002 PHYSICS GRADUATES

\*Graduated with Honors

### Bachelor of Science

\***Nadeem A. Akbar** graduated *Summa cum Laude*. Nadeem received early admission to the University of Arkansas Medical School in December 2001. He spent his junior year studying abroad at American University in Cairo, Egypt. Nadeem was selected to give the "Greetings from the Class of 2002" address at the May 2002 General Commencement.

**John B. Clark** graduated in August of 2001 and has been accepted into medical schools in North Carolina and at the University of Tulsa.

\***Matthew D. Covington** graduated *Summa cum Laude* in May 2002 and was inducted into Phi Beta Kappa. Matt wrote an honors thesis in physics and a second one in philosophy and received *Summa cum Laude* for both theses. He plans to attend graduate school at the University of California, Santa Cruz.

**Michael J. Devin** plans to attend graduate school in physics.

\***April L. Fortner** graduated *Magna cum Laude*. April plans to attend the University of Arkansas to pursue a Master of Arts in physics. She hopes to eventually teach high school or college physics.

**Ryan D. Godsey** graduated in December 2001 and is currently working for Pense Consulting in Ft. Smith, Arkansas.

\***Tracy L. Hoke** will graduate with honors in August 2002 and will continue attending the University of Arkansas in pursuit of a Master of Arts in physics. Her master's thesis deals with the secondary physics education of young women. Tracy is a fellow in the GK-12 program, which works with middle-school teachers and students to improve physics education at that level.

\***Ben A. Hood** graduated *Summa cum Laude* and will be completing his bachelor's degree in physics and computer engineering in June 2002. He will be attending graduate school on a Marshall Scholarship at the University of Saint Andrews in Scotland, where he hopes to work specifically on extra solar planets with Drs. Andrew Collier Cameron and Keith Horne.

**Paul M. Lewis** is attending graduate school in mathematics at the University of Arkansas.

\***David Allen New** graduated *Summa cum Laude*. He is now attending graduate school at MIT.

**Christopher J. Schilling** plans to attend the University of Texas at Austin to pursue a Ph.D. in physics on string theory.

\***Amber N. Straughn** graduated *Magna cum Laude*. She plans to pursue graduate studies at Arizona State University on a GAANN Fellowship (Graduate Assistance in Areas of National Need) to earn her Ph.D. in astrophysics. She hopes to study the early universe/cosmology.

**Ronald W. Toland** graduated with a 4.0 GPA and began working as a staff scientist at the NASA/Goddard Space Flight Center in January 2001.

\***Brandon E. Wolfe** graduated *Cum Laude* and will be attending graduate school on a fellowship at the University of Arizona.

### Bachelor of Arts

**Stephanie B. Coleman** is studying to be a physical therapist.

**Andy L. Felts** is working on his own on a high performance automotive carburetor system.

\***Jared K. Henderson** will graduate with honors in August 2002. This summer he is working as the Operations Manager of the NASA Academy at Goddard Space Flight Center. In October he will be moving to Dallas permanently to work as a management consultant for McKinsey & Company.

### **Leanna F. Obenshain**

**Mary Ann Wise** plans to attend the University of Arkansas to pursue a Master of Arts in physics. She will begin as a teaching assistant in the Physics Department this summer and hopes to teach high school physics after completing her master's degree.

### Master of Science

**Abdullah Al-Barakaty** will continue to attend the Physics Department to work on his Ph.D. in condensed matter physics.

**Timothy J. Clingan** completed a master's in applied physics with Professor Paul Thibado.

**Daniel B. Erenso** will continue working toward a Ph.D. in physics at the University of Arkansas. He has been working on quantum statistical and squeezing properties of two level atomic systems, which has led to four publications in PRL, PRA, and JOSAB. Currently he is working on quantum statistical and squeezing properties of semiconductor quantum well structure and generation of entangled states via quantum dots. In the future he plans to explore more efficient ways of applying these systems in quantum information, quantum communication and quantum computation.

**Aaron M. George** is continuing his pursuit of a Ph.D. in physics at the University of Arkansas.

**André M. Guérin** completed a master's in applied physics with Professor Min Xiao.

### Doctor of Philosophy

**Husam H. Abu-Safe** accepted a post-doctoral position with Prof. Hameed Naseem in the University of Arkansas Electrical Engineering Department doing research on crystallization of amorphous silicon.

**Ahmad M. Al-Yacoub** is now an assistant professor at the Jordan University of Science and Technology.

**Zhao Ding** will graduate with his Ph.D. this summer. He plans to continue with the University of Arkansas Physics Department in a post-doctoral position doing research on the atomic surface processes for gallium-arsenide.

**Aqiang Guo** will graduate this summer. He plans to continue in a post-doctoral position studying photorefractive phenomena.

**Hongjun Yao** is working as a technology/product engineer at High Connection Density, Inc. in California.

## UNDERGRADUATE STUDENT NEWS

**Nadeem Akbar**, a **Fulbright College Senior Scholar** and **Rhodes Scholarship Finalist**, graduated *Summa Cum Laude* in May 2002. Professor Lin Oliver was his thesis advisor. Nadeem received early admission to the University of Arkansas Medical School in December 2001.

**Ashley Altom** will participate in a **National Science Foundation Research Experience for Undergraduates** here at the University of Arkansas in the summer of 2002.

**Michael Barnes**, junior physics major, was selected as a 2001-2002 **Barry Goldwater Scholar**. He was also awarded a 2002-2003 **Robert D. Maurer Physics Research Fellowship**. During Summer 2002, Michael will participate in a **National Science Foundation Research Experience for Undergraduates** at Cornell University. During the summer of 2001, Michael participated in his first **Research Experience for Undergraduates** at the University of Illinois.

# FROM THE CHAIR

June 2002

Dear Friends,

Greetings from Fayetteville. It is my pleasure to bring you up to date on the events of the past year once again.

This was a particularly good year for the Physics Department. The department granted 16 bachelor's degrees, five masters and five PhDs. Our majors have continued to excel in nationally competitive programs. The number of students accepted into the Research Experience for Undergraduate (REU) programs around the country has continued to increase. In addition, several of our students have won national and state scholarships and grants, including SILO/SURF grants as well as Goldwater, Marshall and NSF Graduate Fellowships for graduate study. In recognition of the Department's continued success, the Office of Postgraduate Fellowships, awarded its first ever gold medal to the Physics Department.

Such student success is a reflection of a dedicated faculty. Not surprisingly, physics faculty members swept college awards in all three categories this year. The Master Teacher Award

was presented to Associate Professor Gay Stewart; Professor Min Xiao received the Master Researcher Award; and the Master Advisor Award went to Associate Professor William "Lin" Oliver.

The department has hired two new assistant professors. Dr. Jiali Li, currently a postdoctoral research associate at Harvard with expertise in nano-biophysics, will join the department in August 2002. Dr. Huaxiang Fu, whose expertise lies in computational condensed matter physics, will also join the department at the same time. Awards for research reached a new high of \$3.7 million last year. Our success reflects the stature of our faculty and the quality of their research at the national level.

Perhaps the most exciting development of the last year is the \$300 million gift by the Walton Family Charitable Foundation to the University. These funds will be used to endow a university-wide undergraduate honors college and to establish distinguished doctoral fellowships, endowed research chairs, and a graduate student research fund to support the travel, research and equipment needs of graduate students. This gift will offer us exciting opportunities for growth and progress.

Our biggest challenge continues to be the

lack of adequate space for teaching and research. We must meet this most critical need if we are to realize the opportunities offered to us by the Walton family gift, continue to compete at the highest levels, and recruit the kinds of productive, talented faculty and students you see featured in these pages.

We certainly appreciate your continued generous support of the Physics Department. Your contributions allow us to offer academic scholarships and to support many student activities which we would not otherwise be able to do. Please keep us posted on the progress of your careers. Write to us about job opportunities for new graduates and share your memories and anecdotes of colleagues, teachers, and yourself while at the University of Arkansas.

After seven years as chair, it is time for a change for me. I am returning to full-time research and teaching on June 30. I have enjoyed working with my special colleagues and staff in the physics department. Professor William "Lin" Oliver takes over as chair starting on July 1. I wish him all the best.

With my best wishes,

Surendra Singh, Chair

**Elizabeth Bulla, Heather Corely, Steven Fitzhugh, Mica Lunt, Jacob McElderry, and John Vickers** were awarded **Physics Faculty Fellowships** in recognition of their superior scholastic achievement.

**Matt Covington**, a **Fulbright College Senior Scholar**, won a **National Science Foundation Graduate Fellowship** in April 2002. Matt graduated **Summa Cum Laude** in May 2002 and was inducted into Phi Beta Kappa. Matt wrote an honors thesis under Professor Bill Harter and wrote a second thesis in philosophy, and he received *Summa Cum Laude* for both. He plans to attend graduate school at University of California, Santa Cruz.

**Joshua A. Daily**, a fall 2001 freshman in the physics honors program, was awarded a **Bodenhamer Fellowship**.

**Molly Darragh** will participate in a Summer 2002 **National Science Foundation Research Experience for Undergraduates** here at the University of Arkansas.

**Allen Doyel** and **Derrick Tucker** were each awarded a **Charles B. Richardson Senior Fellowship** for their excellence in undergraduate research.

**James Matt Doyle, Michael A. Barnes, and David G. Norris** were each awarded a **Robert D. Maurer Physics Research Fellowship** for 2002-2003 to help them continue their outstanding scholastic achievement and research in physics.

**Lynn Endicott**, junior physics major in the College Honors Program, was awarded a **Sturgis Honors Scholars Study Abroad Grant**.

**Nicholas Farrer**, a past recipient of the **George D. Lingelbach Award**, received a fellowship from **Sandia National Laboratories** for a Summer 2001 program, during which he collaborated with Drs. Eric Jones and Kevin Leung.

**Ryan Godsey, Amber Straughn, Mike Meyer, and Jim Czapinski** were selected by **NASA** to participate in a Summer 2001 experiment for the

**Arkansas-Oklahoma Center for Space and Planetary Sciences**. The team worked on discovering what happens to dust particles on the surface of asteroids when impact or volcanism disturbs the particles. The experiment the U of A team designed was conducted on NASA's reduced gravity facility in a military KC-135 plane that flies 30-40 parabolas — steep climbs and dives, over the Gulf of Mexico — because the gravity on Earth is much stronger than the micro-gravity conditions on asteroids.

**Jared Henderson** was awarded a **George D. Lingelbach Award**, given annually to an outstanding physics major, in April 2002 and was selected for honorable mention as a member of the **2002 USA Today College Academic Team**. He also received a **NASA Academy Research Scholarship at Goddard Space Flight** in summer 2001 and was selected in summer 2002 as the **Student Leadership Team Operations Manager of the NASA Academy at Goddard Space Flight Center**. Jared was a fall 2001 **Rhodes Scholarship Finalist**, and though he did not receive the Rhodes, he was offered a job by one of the interviewing panelists. He is one of only two graduating seniors in the nation to be hired by that particular corporation. Jared will graduate with honors in December 2002.

**Ben Hood** graduated **Summa Cum Laude** under Professor Claud Lacy and is completing his bachelor's in physics and computer engineering in June 2002. He was one of 20 outstanding undergraduates in the nation to be selected as a member of the **2002 USA Today All-College Academic First Team** and is the first UA student to receive that honor. Ben was also one of only 40 students nationwide to receive a **Marshall Scholarship** and was a **Harry S. Truman Scholarship Finalist**. In addition he received the **Admiral William C. Bryson Scholarship**, a 2001-2002 **SILO Undergraduate Research Fellowship**, and was a **Gates Cambridge Scholarship Finalist**.

The University of Arkansas Alumni Association also honored Ben at the 2002 Senior Honor Citation banquet held at the Janelle Y. Hembree Alumni House in spring 2002. The Senior Honor Citation was established by the Arkansas Alumni Association 37 years ago to recognize the senior man and

woman who exhibit outstanding academic achievement, campus and community involvement, and leadership. The citation includes a personal memento, a \$1,000 award, and permanent recognition on the Honor Wall at the Janelle Y. Hembree Alumni House. In Spring 2002, Ben received the **Ryan Allen Award** for his service and dedication to University Programs. The Ryan Allen award was created May 4, 2000 to reward those students who participated as members of University Programs for their entire undergraduate careers and to recognize their service to the organization and to the campus community. Ben Hood has held several positions in University Programs, including being a committee member and serving as the chairperson of the Issues and Ideas Committee in the 1999-2000 school year. Among Ben's many accomplishments was the Hunger Banquet, a new annual program that raises awareness about hunger in the world and has raised over \$7,000 over three years for various charities. Ben, a **Barry Goldwater Scholar** and **Bodenhamer Scholar** also, twice received the nationally competitive **Tylenol Scholarship**.

**Denise Malan** and **Greg H. White**, outstanding physics undergraduates, were awarded **Paul C. Sharrah Scholarships**.

**Michael Meyer** studied abroad during the 2001-2002 academic year at **University of Essex** in England.

**David Allen New**, a **Fulbright College Senior Scholar** majoring in electrical engineering and physics, was awarded a 2001 **SILO Undergraduate Research Fellowship**. He graduated *Summa cum Laude* in December 2001 and is now attending graduate school at MIT.

**David G. Norris**, a senior physics major and **Bodenhamer Fellow**, was selected as a 2001-2002 **Barry Goldwater Scholar**. In addition, he was one of 80 students nationwide to receive a **Morris K. Udall Scholarship** for the 2001-2002 academic year. He was also awarded a 2002-2003 **Robert D. Maurer Physics Research Fellowship**. David, a **National Merit Scholar** and **U.S. Presidential Scholar**, was a past recipient of the **Chickasaw Nation Education Foundation Scholarship**, the **Earl Collins Foundation Scholarship Award of Kiwanis International**, and a **SILO Undergraduate Research Fellowship**. During academic year 2001-2002, David studied abroad at the University of Saint Andrews in Scotland.

**Brian Sawyer**, a math and physics major, received 2001 and 2002 **SILO Undergraduate Research Fellowships** with Professor Reeta Vyas and he will also participate in a 2002 **National Science Foundation Research Experience for Undergraduates** at the University of California at San Diego. Brian was selected as the 2001 **Fulbright College Presidential Scholar**. This is the third consecutive year that a physics major has represented Fulbright College for this distinguished award.

**Amber Straughn** participated in a **National Science Foundation Research Experience for Undergraduates** at the **MIT Haystack Observatory** and received honorable mention in the 2002 **National Science Foundation Graduate Fellowship** competition. She also contributed to an article published in 2001 in *Information Bulletin on Variable Stars*. She presented her work from the MIT REU program at the American Astronomical Society meeting in January 2002. Amber plans to pursue graduate studies on a fellowship at Arizona State University.

**Brandon Wolfe** participated in a **National Science Foundation Research Experience for Undergraduates** at the James Franck Institute at the University of Chicago during summer 2001. He graduated *Cum Laude* in May 2002 and will be attending graduate school on a fellowship at the University of Arizona.

## GRADUATE STUDENT NEWS

**Ahmad Al-Yacoub** co-authored an article published in 2001 in *Applied Physics Letters* and contributed to an article for the *2001 Materials Research Society Fall Meeting Proceedings*. He also gave invited presentations at international meetings in Singapore and France.

**Andy W. Brown** received a **University of Arkansas Doctoral Fellowship**.

**Daniel Bullock** won the 2001 **Sigma Xi Audrey E. Harvey Graduate**

**Research Award**, received an **Arkansas Academy of Science Award** for best contributed talk, and contributed to an article in the May 25, 2001 issue of **Science** on transferring polarized electrons into a semiconductor surface.

**Daniel Erenso** presented papers at the *2001 Optical Society of America Annual Meeting* in Newport Beach, California, contributed to three papers published in *Physical Review Letters*, *Physical Review A*, and *Journal of the Optical Society of America B*, contributed to three papers accepted for publication in *Coherence and Quantum Optics VIII*, and to one paper accepted for publication by *Physical Review A*. He was also awarded an **ICSC World Laboratory Fellowship** and a travel grant for attending the *National Conference for Black Physics Students* at Alabama A&M University.

**Aaron George** co-authored with Laurent Bellaiche and Jorge Iniguez of Rutgers University an article published in the September 6, 2001 issue of **Nature** on findings about properties of piezoelectric compounds and electric fields. He and **Ahmad Al-Yacoub** gave invited presentations on their research at international meetings in Singapore and France. Aaron contributed to an article for the *Fundamental Physics of Ferroelectrics 2001: 11th Williamsburg Ferroelectric Workshop* at the American Institute of Physics in Melville, NY. He also contributed to an article published in *Nature* magazine and two papers published in *Physical Review B* (Rapid Communications).

**Amjad Nazzal** contributed to the article "Photoluminescence from Single CdSe Quantum Rods," accepted for publication in 2002 by the *Journal of Luminescence*.

**Fuad Rawwagah** presented a paper at the *2001 Optical Society of America's Annual Meeting* in Newport Beach, California, and co-authored an article published in *Physical Review A*.

**Juan Serna** received the Physics Department 2002-2003 **Lloyd Ham/AAPT Outstanding Teaching Assistant Award**.

**Shabnam Siddiqui** was awarded an **ICSC World Laboratory Fellowship** for research that involves looking for quantum correlations in quantum dots.

## NEWS ON OUR ALUMNI & FRIENDS

**John Carter** (Ph.D. 2001) accepted a postdoctoral position at Los Alamos National Laboratory.

**Christy Emery** (M.S. 2001) joined the Ph. D. program in Microelectronics-Photonics at the University of Arkansas.

**Laura Fields** (B.S. 2001) is currently working on a master's in Mathematical Physics at Cambridge, supported by an NSF Graduate Fellowship. She has chosen Cornell for her Ph.D. in physics.

**Ed Hach** (Ph.D. 2001) has accepted a visiting assistant professor position in the UA physics department for 2002-2003.

**Hongxiao Meng** (Ph.D. 1998) accepted a research associate position at Texas A&M University.

**Ken Phillips** (M.S. 1989) spent four and a half years at Madisonville Community College in Kentucky building a laser optics technology program followed by 4.5 years at Owensboro Community College (OCC), also in Kentucky, achieving tenure and improving their physics program. About 4 years ago, he left OCC and came to Guilford Technical Community College in Greensboro NC. The program there is larger and well established. For the last four years, he has been the Department Chair of Physical Sciences overseeing six faculty members.

**Michael Henry** (Faculty 1995-2002) has accepted a faculty position at the University of the Virgin Islands.

**Yujie Ding** (Faculty 2000-2002) accepted a faculty position at Lehigh University, PA.

**Howard Carmichael** (Faculty 1982-1989) accepted the Dan Walls Chair in Quantum Optics at the University of Auckland, New Zealand.

## FACULTY NEWS

### EFFICIENT ALL-OPTICAL SWITCH

**Min Xiao**, professor of physics, Hai Wang, a postdoctoral associate, and graduate student David Goorskey have used electromagnetically induced transparency (EIT) to create an all-optical switch. This is the first experimental demonstration of efficient all-optical switching in such system with a high degree of control. Such an all-optical switch has potential applications in the fields of all-optical communications and optical computing, which may be made more efficient by using less light energy than traditional methods. Xiao and his colleagues used a gas of prepared rubidium atoms inside an optical ring cavity. By changing the frequency of a controlling laser beam coupled to one of the atomic transitions, the intensity of the cavity output field, which is coupled to another atomic transition, can be changed by a factor of 30, producing “on” and “off” states. The switch works because of the nonlinear enhancement that creates a large intensity change in the cavity resulting from a small change in the frequency or intensity of the controlling laser beam. Such all-optical switching, which requires only weak intensity light, may one day require only a single photon to perform, although this has not yet been demonstrated, Xiao said.

### A COLORFUL APPROACH TO RELATIVITY AND QUANTUM THEORY

**William Harter**, Professor of Physics, has developed a novel approach to quantum theory that uses color and light waves to derive the basic equations of relativity and quantum theory. Harter published his derivation in the *Journal of Molecular Spectroscopy*. “The new results, I believe, represent a significant paradigm shift in that they show that quantum wave behavior has simple and beautiful properties which were overlooked, and that a truly simpler and more ‘down-to-earth’ view of the world is a fundamentally quantum one,” Harter said.

Harter’s approach is based on interfering light waves of pure color or frequency, such as those found in lasers. Harter shows that by exploiting ideas about wave interference, the basic equations of relativity and quantum theory can be derived in a few lines of simple algebra—simple enough for high school students to grasp. “The main idea is based on the statement that ‘all colors of light go the same speed,’” Harter said. This observation is related to the way one can find location, speed and time using laser wave interference in an elementary Global Positioning System, or GPS. Simple wave interference, a duet between two colors or frequencies, is the key idea here.

### ART HOBSON IN CHINESE

The second edition of *Physics: Concepts and Connections* by **Art Hobson**, professor emeritus of physics, has been translated into Chinese and was published this month by the Shanghai Scientific and Technical Publishers. The textbook, written in a conceptual, non-technical style suitable for non-science college students, presents the major ideas of physics with a strong emphasis on modern physics and on the social and philosophical implications of physics. It covers several physics-related topics not usually discussed in conventional texts, such as global warming, energy and society, nuclear weapons, scientific methodology, pseudoscience, the search for extraterrestrial intelligence, and contemporary physics. Professor Hobson plans a several-week visit to China later this year to discuss with physics educators how to use the book effectively. He is currently at work on the third edition, to be published by the Prentice Hall Publishing Company in 2002. The second edition is in use at 112 colleges and in eight high schools in the United States.

### POWERFUL AND EFFICIENT PIEZOELECTRICS

University of Arkansas researchers have found that when certain alloys of technological interest pass through a certain state, their energy becomes optimized, creating an effect ten times that which is currently available commercially. This could make these alloys, piezoelectric compounds used in medical ultrasound and naval sonar, more powerful and efficient. Graduate student Aaron George, assistant professor of physics **Laurent Bellaiche**, and visiting professor Jorge Iniguez of Rutgers University reported their findings in the September 6 issue of *Nature*.

### INNOVATION IN EDUCATION RECOGNIZED

**Ken Vickers**, Research Professor and Dr. John Todd won the Decision Sciences Institute 2001 award for Instructional Innovation for their course MGMT 5383, *Intra/Entrepreneurship of Technology*.

## FACULTY AWARDS

### Physics Faculty Honored by the College

The Fulbright College of Arts and Sciences honored three physics faculty members with awards for outstanding teaching, research, and advising. The Master Teacher Award was presented to Associate Professor Gay Stewart; Professor Min Xiao received the Master Researcher Award; and the Master Advisor Award went to Associate Professor William “Lin” Oliver. Each year award nominations are sought in the three categories from 19 departments in the Fulbright College.

“These individuals have been selected by their peers as model professionals. We are proud of their talents and dedication,” said Randall Woods, dean of the college.

Gay Stewart was honored as a Master Teacher for her outstanding contributions to teaching and mentoring physics majors. Wally Cordes, Professor of Chemistry and widely regarded as one of the best teachers on this campus, said that Gay Stewart is “well near the top teacher on this campus.” Ryan Coffee, an undergraduate, echoed other students when he said “She is not only an amazing teacher, but also a wonderful mentor. She has changed my life in a way no other could have and for that I owe all of my career success to her. I am right now fulfilling a dream I never would have dreamt were it not for Dr. Stewart.”

Min Xiao, who was named Master Researcher, received his award for his tireless work and creativity that have established him as a leader in the areas of quantum optics and atomic physics. Since joining the physic department in 1991, Prof. Xiao has published papers in some of the most prestigious journals in physics and obtained more than \$ 20 million in funding. Professor Wolfgang Ketterle of M.I.T. (Nobel Laureate 2001) said in a letter of nomination that “his work is internationally recognized and frequently cited by other leaders in the field.” Professor Xiao was also honored by an Alumni Distinguished Achievement Award for research in 1999.

William Oliver was honored as a Master Adviser for his role in mentoring physics majors. Suzanne MacCray, Assoc. Director of Honors Studies, had high praise for Lin’s role in the recent successes of Fulbright students in winning national recognition. Many of his advisees have won prestigious state and national awards, including SILO/SURF grants as well as Goldwater, Udall, Marshall, and NSF Graduate Fellowship, and have graduated with highest academic honors. Laura Fields, a National Science Foundation Fellow, echoes many of his advisees when she speaks of the friendship, care, sensitivity and respect which characterize his interactions with students.

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Through your generosity, you are helping us build our programs and support our talented students and faculty.

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## **Physics Scholarship Funds**

Alumni and friends of the Physics Department have generously contributed to the establishment of the following funds. Income from these funds is used for supporting a variety of student-centered activities. The numbers inside parentheses indicate the number, amount, and frequency of the award. Should you wish to contribute, and we hope you will, please make your checks payable to the U of A Foundation and indicate on the memo line the activity you would like to support. Please know that we appreciate your continued support.

### **Physics Department Alumni Fund**

Income from this fund is used to support a variety of undergraduate and graduate student activities.

### **Rear Admiral William C. Bryson Scholarship (1 @ \$1,000, Annual)**

Awarded to an outstanding undergraduate physics major with a demonstrated interest in astronomy

### **Lloyd B. Ham Outstanding Teaching Assistant Award (1 @ \$250, Annual)**

Awarded to an outstanding physics teaching assistant

### **Paul C. Sharrah Scholarships (2 @ \$500, Annual)**

Awarded to an outstanding undergraduate physics major

### **George D. Lingelbach Award (1 @ \$250, Annual)**

Awarded for overall outstanding scholastic achievement in physics

### **Physics Faculty Fellowships (8 @ \$500, Annual)**

Awarded to outstanding physics majors at any level on the basis of superior scholastic achievement

### **Charles B. Richardson Senior Fellowship (2 @ \$500, Annual)**

Awarded to a junior or senior physics major for excellence in undergraduate research

### **Robert D. Maurer Research Fund (2-4 @ \$1,000, Annual)**

Income from this fund is used to organize the annual Robert D. Maurer Lecture and award fellowships to physics juniors or seniors on the basis of scholastic achievement and undergraduate research.

### **Raymond Hughes Graduate Fellowship (1 @ \$1,000, Annual)**

Income from the fund will be used to support add-on graduate student fellowships, travel to scientific workshops, and to meetings and conferences to present papers