Newsletter of the Department of Physics, University of Arkansas

REFLECTIONS

Volume IX, Number 1 Summer 2001

Research Center for Physics of Nanostructures

The National Science Foundation has awarded a five-year, $4.5 million grant to fund a shared Center for Semiconductor Physics in Nanostructures at the University of Arkansas (UA) and the University of Oklahoma (OU). The U of A will receive about $2.25 million over five years to fund research into nanostructures for use in faster, smaller computers and information units.

Greg Salamo, University Professor of Physics who led the UA team, says that the center will place the U of A at the forefront of emerging information technologies research as computing and telecommunication devices become progressively smaller. The impact of nanostructure research is to make things smaller, faster and lighter, which could lead to the development of new and smaller communication, computing, and medical technologies. A common integrated circuit would support 400 billion semiconductor nanostructures called quantum dots.

The center's research team will be composed of 18 UA and OU faculty members, representing researchers in physics, chemistry, and electrical engineering. Salamo and Matthew Johnson, OU associate professor of physics, will serve as the center's co-directors.

Chancellor John A. White noted that the NSF funded only four such centers this year. Along with the UA/OU nanosciences center, the NSF provided grants for Materials Research in Science and Engineering Centers at the California Institute of Technology, Pennsylvania State University and the University of Virginia. "We've been able to achieve something here that they've not been able to do at a number of national research universities. When you put it in the context of the competition, you can begin to understand just how big it is for the University of Arkansas. It's huge," White said.

Research funding like this also brings potential economic benefits to Arkansas, from attracting industry to slowing the "brain drain" to other states as young people leave to seek other opportunities. Salamo added the U of A could partner with other universities and corporations in the future to advance their research capabilities.

Otto Loewer, Dean of Engineering, said that attracting cutting-edge, high-tech industries to Arkansas should be the state's focus, and the University could play an important role in supplying educated, qualified workers for new industry.

"This grant recognizes the top-notch, competitive research our faculty are conducting," said Dean Randall Woods of Fulbright College. "The research at this center will be characterized by strong interaction among disciplines. I believe the scientific breakthroughs of today and the future will come from just such teams that understand the value of sharing information and knowledge."

Philip Morrison Presents the 2001 Maurer Lecture

By Claud Lacy

"Planets Galore," the Maurer Lecture this year, was presented by Philip Morrison, Institute Professor Emeritus at MIT, to a standing-room only audience in Giffels Auditorium on March 29. Morrison was assisted by his wife and collaborator, Phylis Morrison. Dr. Morrison is well-known for his research in astrophysics and his popularization of science through short films and books *(Powers of Ten)*, book reviews and articles in *Scientific American*, PBS shows *(Whisper from Space)*, and video series *(The Ring of Truth)*.

His Maurer Lecture dealt with the discovery over the last five years or so of more than 50 extra-solar planets orbiting nearby sun-like stars. The announcement of the discovery of the first of these giant planets around 51 Pegasi on Oct. 10, 1995 reached Dr. Morrison while he and Phylis were visiting a university in South Africa. E-mail communications with knowledgeable astronomers soon convinced him that this claim

see **PHILIP MORRISON** *on page 3*

Physics Undergraduates Soar for NASA

A team of undergraduate students from the University of Arkansas has been selected by NASA to participate in its reduced gravity campaign scheduled for this summer. This is the second time a team from the University has been selected to participate in the program, which is designed to encourage the development of space and planetary science research. The UA team consists of **Ryan D. Godsey**, a senior in physics, **Mike Meyer**, a sophomore physics/math major, **Jim Czlapinski**, a freshman physics major, and **Amber Holley Straughn**, a junior in physics and math. The team is working on an experiment for the new Arkansas–Oklahoma Center for Space and Planetary Sciences to discover what happens to dust particles on the surface of asteroids when the particles are disturbed by impact or volcanism.

NASA's reduced gravity facility is a military KC-135 plane that flies 30 to 40 parabolas, consisting of steep climbs and dives, over the Gulf of Mexico. During the climbs and dives, passengers in the plane are under micro-gravity conditions. The experiment the UA team designed must be conducted on the KC-135 because the gravity on Earth is much stronger than the micro-gravity conditions on asteroids. During the flight, the team members will lose gravity and float through the air while their equipment is anchored to the floor. The plane is sometimes referred to as the "vomit comet," since a number of participants have become nauseated during these flights. NASA's reduced gravity campaign is scheduled for July 2001, giving the students two months to prepare for their experiment.

For further details, contact Ryan Godsey at rgodsey@penseconsulting.com

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Rocket Science, Razorback Football, and Carl Sagan

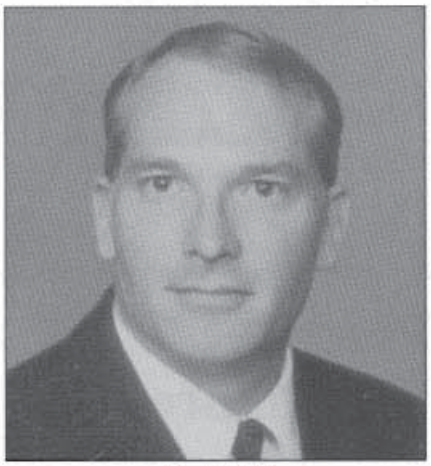
Alumni Profile: Alan Tribble, B.S. 1983

Two big events that were literally worlds apart happened in 1969 that ultimately impacted my decision to study physics at the University of Arkansas. First, Apollo 11 landed on the Moon. My memories of the early days of the space race nurtured my interest in rocket science, which led directly to my interest in physics. Second, Texas beat Arkansas 15 – 14 to win the national football championship. Feeling the pain of that loss ensured I'd be a Razorback for life.

By the time I got to high school, Carl Sagan was on TV with his *Cosmos* series. A little bit of research told me that the best way to ensure a possible career in rocket science, astronomy, or almost anything technical was a degree in physics. So I eagerly arrived in Fayetteville in August of 1979 and enrolled as a physics major. I thoroughly enjoyed my four years as a Razorback, though as my advisor Dr. Lieber may tell you, I was not exactly a stellar student. I graduated from high school with honors and barely had to crack a book to do it, so I arrived in college with very poor study habits. In spite of that, I managed to graduate in four years with decent grades and even did a little research project for Dr. Lacy. After verifying that it was impossible to see the women's dorm from the University observatory, I measured the period of some variable stars and did some of the early work on the automation of the telescope.

After leaving Fayetteville, I attended graduate school at the University of Iowa where my poor study habits eventually caught up to me. After the first semester in graduate school, all new students were required to take a two-day comprehensive exam, which I failed. In retrospect, failing it was the best thing that ever happened to me because it made me realize that the only way to get through grad school was to sit down and learn this stuff inside and out. Over the course of the second year, I made mountains of study notes and passed the exam easily the second time around. A few years after that, my study notes were published as the *Princeton Guide to Advanced Physics*, a study guide that many graduate students use throughout the country.

Once I was ready for a graduate research project, I was lucky to get to work with Professor Nicola D'Angelo, who is the discoverer of ion acoustic waves. The University of Iowa, where James Van Allen flew the first radiation detector on Explorer I in 1958, has been flying spacecraft for years. They built the first payload ever carried on the Shuttle called the Plasma Diagnostics Package (PDP), and I got to work with a Langmuir probe (a device to measure plasma density and temperature) on the PDP's next mission on the Spacelab-2 flight. We measured the large scale plasma wake



Alan Tribble

structure of the Shuttle, which extends several hundred meters downstream from the orbiter. These results were used to help with the design of the International Space Station, which is now in orbit.

While most of the people I went to graduate school with wanted to go into an academic position or government lab, I always wanted to work in industry. After studying the effect of the space environment on spacecraft in graduate school, I got hired by Rockwell International to work on satellite systems in the Los Angeles area. There I spent eight years working on the design of over a dozen spacecraft, from the Global Positioning System (GPS) satellites to Mars Landers and communications spacecraft. One program manager I worked for was Gary Culp, a retired Air Force Colonel who got his degree in physics from the University of Arkansas in 1963. I spent about half my time working as a systems engineer and the other half doing physics related R&D on the subject of space environments and effects.

For personal reasons, I transferred back to Iowa and Rockwell Collins in 1996. There I found myself in the Information Technology group after a massive reorganization of the company. I'm doing research for NASA again, but this time on the aircraft side. At Collins, which manufactures aviation and communication electronics, we're investigating ways to make the computing systems used by the aircraft safer and more capable. Since air traffic is expected to double in the next 15 years, there's a lot of push to find better ways of doing things.

As an industrial physicist I have usually found myself outnumbered by engineers or computer scientists. We need all kinds, but it's obvious that physicists bring special skills to the table. I feel we have a better understanding of the basic processes used to solve problems. Engineers may be more efficient at solving some specific set of problems due to their training, but physicists are better at understanding why certain approaches are better than others. Computer scientists may be better at programming, but physicists are better at understanding the limitations of solving problems numerically. With our problem solving skills, physicists are often found working right alongside the engineers. Here are the three biggest revelations I've had in industry:

1. The only time employers really look at your degree is when they're hiring you. Once you get in the door and prove your worth, they tend to forget what your degree was in and judge you based on your abilities and experience. Unfortunately, getting hired into industry is often the hardest problem physicists face. Most hiring is done by engineering managers who tend to focus on the short-term needs of the organization, and engineers often come up to speed quicker because they've had a more application-oriented education. On the other hand, physicists often do better in the long term. They tend to be more adaptable and can move from mechanical problems to electrical problems easier. Salary surveys conducted a few years ago showed that engineers made more money the first few years out of school, but about ten years after graduation, physicists caught up and eventually passed them.

2. Although you may have the perfect technical skills for the job, the ultimate hiring decision will be based on how well you'll work and play with others. Communications skills and teaming skills are critical. If you don't have some, get them.

3. No one will ask you to solve a problem you learned how to solve in school. Those problems already have solutions, and it's quicker and easier to look it up in a book than it is to pay you to solve it. You'll be asked to solve new problems that no one has ever had to solve before.

I encourage physicists to seek industrial employment because we've got a lot to offer. I have absolutely no regrets about choosing physics as a career path. It takes a lot of hard work, but it can be very fulfilling.

After getting his B.S. from the University of Arkansas, Alan Tribble attended graduate school at the University of Iowa, where he received the M.S. and Ph.D. degrees. He is the author of four books, including A Tribble's Guide to Space and numerous other technical publications. He lives in Marion, Iowa with his wife, Beth, and sons Matthew, age 10, and Daniel, age 5. He'd like to hear from any of his old classmates or Razorback physics fans at www.alantribble.com.

Maurer and Team Awarded National Medal of Technology

A team of researchers consisting of UA alumnus Dr. Robert Maurer, Dr. Donald Keck, and Dr. Peter Schulz at Corning received the 2000 National Medal of Technology from President Clinton, winning the highest honor a President of the United States can bestow upon America's leading innovators. It is given annually to individuals, teams, or companies for accomplishments in the innovation, development, commercialization, and management of technology. It recognizes technological pioneers who have made lasting contributions to enhancing America's competitiveness and standard of living.

In 1970, Drs. Robert Maurer, Donald Keck, and Peter Schultz teamed up at the Corning Glass Corporation to co-invent low-loss fiber optic cable. The key to their innovation was overcoming the previously limiting factor of light loss during transmission. By keeping it to less than 1% per kilometer, they successfully sent light through a kilometer long hair-thin glass fiber. This single channel fiber transmitted up to 65,000 times as much information as copper wire, the state-of-the art communications technology at that time. Each of the 300 million kilometers of fiber optic cable on line today can carry more than 10 gigabytes of data per second — enough capacity to transmit the entire 30-volume *Encyclopaedia Britannica* from New York to California in a second. Fiber optic cable now carries almost all long-distance calls in the U.S. and has made the global Internet a reality. The global information industry has grown to a $1.5 trillion annual business since 1970. Over the next ten years, fiber optic technology is expected to increase communications power a million-fold. New fiber optic technology allows each hair-thin fiber to carry hundreds of wavelengths simultaneously — and bumps capacity to three trillion bits per second!

Robert Maurer, a native of Arkadelphia, Arkansas, retired from Corning in 1989 as a research fellow. In 1948, Maurer received his B.S. in physics from the University of Arkansas and, in 1952, his Ph.D. in physics from M.I.T. Donald Keck currently serves as division vice president and technology director of Corning's Optical Physics Technology Group. Peter Schultz, president of Heraeus Amersil, served in a variety of senior research and managerial positions until leaving Corning in 1984.

Steve Thomas Hildebrand (1948-2001)

Dr. Steve Thomas Hildebrand died of ALS April 6, 2001. Steve was a native of Prescott, Arkansas. He received a BS. in Physics in 1970 and an MS. in Physics in 1973 from the University of Arkansas under the supervision of Steve Day. He started his career in exploration geophysics at Phillips Petroleum in 1973. Steve was a Society of Exploration Geophysicists (SEG) member since 1974. Steve moved on to make significant contributions in seismic processing technology at Amoco, Superior Oil Co. Sohio, BP Berrong Geophysical, and finally Los Alamos National Laboratory. In 1993, he earned a Ph.D. in geosciences from the University of Texas at Dallas under the supervision of George McMechan. A quick review of the SEG Cumulative Index records 17 published works and presentations. Many more papers by Steve exist in oil company archives on far ranging subjects including digital signal processing, seismic modeling, seismic migration and inversion. In all of his research, Steve showed a great deal of curiosity, insight, determination, and patience. Steve is survived by his wife of 28 years, Mary Jane Watson of Plainview, Arkansas and three daughters, Melissa, Emily, and Katie. His family has established a fellowship in his memory to support a woman physics major. *See a detailed write up in the *Leading Edge*.

Contributed by Steve Chilcoat with contributions by Mary Hildebrand and Jody Benson.

Graduate Fellowship Fund Honoring Raymond H. Hughes Established

The physics faculty passed a resolution to establish the Raymond H. Hughes Graduate Fellowship Fund to honor his contributions to the department's Graduate Research Program. The income from the fund will be used to support graduate students who have been accepted as candidates in the Ph.D. program in physics. Eligible support includes graduate student travel to professional meetings to present papers, add-on scholarships to outstanding graduate students, and full year or summer fellowships. The recipients will be selected by the Graduate Affairs Committee of the department. Professor Hughes says that he received similar supplementary support as the recipient of the Mendenhall Fellowship at the University of Wisconsin during his graduate student career there. The endowed scholarship fund will make a major difference in helping qualified students reach their educational goals at the University of Arkansas. Professor Hughes has donated $5,000 to initiate the fund, and members of his family have committed to contributing a similar amount. Department faculty and students appreciate the generosity of Dr. Hughes and his family.

University Professor Raymond Hughes retired in 1990 after 36 years with the Physics Department at the University of Arkansas. In 1959, Professor Hughes wrote the successful proposal for initiating the Ph.D. program in physics. He chaired the department's graduate affairs committee for 20 years. Over a period of 36 years (1954-1990), Professor Hughes conducted a series of significant experiments in atomic and surface physics, work that resulted in 35 M.S. and 19 Ph.D. degrees in physics. His research accomplishments were recognized by the American Physical Society by electing him to the status of a Fellow (1968) and by the University of Arkansas by appointing him as University Professor (1989). He also won the UA Alumni Association Distinguished Achievement Award for Research in 1984.

PHILIP MORRISON *continued from page 1*

was actually a valid one, unlike many false detections of extrasolar planets during the last century. The rate of new extrasolar planet discoveries has averaged about one per month since that first finding.

The newly discovered planets are not directly seen, but are inferred from the reflex orbital motion of their parent stars; only the star can be seen, for the planet is much too faint to detect directly. It is the Doppler shifts of absorption lines in the star's spectra that are now precisely measured relative to a rock-solid comparison standard, usually a gaseous iodine absorption filter at the entrance slit of a high-dispersion spectrometer. The accuracy achieved by the new measurement innovation is truly impressive: +-3 m/s now, the speed of a casual jogger. By measuring the changes over time of the star's radial velocity, the planet's orbital period and other orbital parameters can be determined, including a fair estimate of the planet's mass.

Most of the extrasolar planets detected so far have orbital periods that are much shorter than those of the planets in our solar system, in the 4.5-5 day range, but this is probably because the technique used to discover them is strongly biased towards finding massive, short-period planets. The planets' masses are in the 1-15 Jupiters range, with many more smaller masses than larger ones. It is now known that these are gas giants larger than Jupiter. Planets as small as the Earth cannot be detected at our present radial-velocity accuracy, but plans are under way to detect such small planets by other techniques.

Transits of the extrasolar planets across the disks of their parent stars will produce dips in the stars' brightness that might be detected by an accurate imager on a spacecraft in orbit. One such transiting planet has already been detected from the ground. The Kepler satellite is a NASA project that may receive funding this year to perform such a search for planetary transit events before the end of the present decade. Dr. Morrison believes that the future is bright for this and other more sophisticated search strategies that will be carried out in the next few decades and centuries. By then, there will surely be planets galore!

Gea-Banacloche Named Associate Editor

Julio Gea-Banacloche was chosen for his expertise in one of the most rapidly growing fields in physics today to take over as an associate editor of *Physical Review A*. Gea-Banacloche will be in charge of the section on quantum information, which covers quantum communications, cryptography, and computing. For over a century, *Physical Review* and its offshoot *Physical Review Letters* have been the main research journals published by the American Physical Society. They have emerged as the world's most read and quoted journals in physics.

Quantum information refers to information that is stored in or processed by purely quantum systems, or microscopic objects such as atoms, electrons, or photons. Quantum objects can, paradoxically, exist in two different places at the same time. Researchers in quantum information are exploiting such bizarre properties to create radical new methods for handling the way information is processed.

"As traditional processing devices like computer chips keep becoming smaller and smaller, eventually they will reach a size in which "weird" quantum effects allow us to do things with information that seemed impossible in classic physics," says Gea-Banacloche. "For example, in quantum cryptography, this means being able to send coded messages that are completely impossible for an eavesdropper to detect. In computing, it means solving problems that are fundamentally intractable for today's computers." In computers, researchers are exploring how atoms and molecules can serve as basic operating components.

Gea-Banacloche noted that last year on August 15, IBM announced it had successfully operated an experimental quantum computer consisting of just five atoms, representing the next step toward the lightning fast computers of the future. A quantum computer of several hundred atoms should be able to perform billions of calculations simultaneously.

"At the current rate of miniaturization, this is expected to happen around 2020," said Gea-Banacloche. "As experimental techniques have become increasingly more sophisticated, it has become possible to verify some theoretical predictions in the laboratory. Whenever this happens in a field dominated by theoretical research, it always generates a great deal of excitement." A native of Spain, Gea-Banacloche has been a faculty member in the department since 1990.

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News

THIS YEAR'S PHYSICS GRADUATES

Jennifer S. Bone, Bachelor of Arts, will continue to pursue her education at the University of Arkansas. She plans to receive a master's degree in physics.

Daniel W. Bullock, Doctor of Philosophy, was hired as a Research Associate in the Department of Physics at the University of Arkansas. He will be continuing on as a post–doctoral student with Dr. Paul Thibado in the newly funded Focused Research Group on Spintronics.

Winfred D. Byrd, Bachelor of Science, is pursuing a Ph.D. in Computer Science at the University of Wisconsin, Madison.

John H. Carter, Doctor of Philosophy, has accepted a summer teaching position at Crowder College in Neosho, Missouri.

Benjamin J. M. Crawford, Bachelor of Arts, is interviewing for jobs.

Zhao Ding, Master of Science, will continue to pursue his education at the University of Arkansas. He plans to receive a Ph.D. in physics.

Christi L. Emery, completed a Master of Science degree in Applied Physics.

Laura J. Fields, Bachelor of Science *summa cum laude*, will attend graduate school at the University of Cambridge this fall on an NSF Graduate Fellowship. She will work toward a master's degree in math/physics.

Dorel I. Guzun, Doctor of Philosophy, accepted a position at Corning, Inc.

Edwin E. Hach, Doctor of Philosophy, will be spending his summer at the University of Arkansas teaching *Physics and Human Affairs* and *Modern Physics*. He plans to return to Boston this fall, where he will continue to pursue a law degree at Boston University.

Thomas C. Holloway, Bachelor of Arts, plans to attend graduate school.

Lisa M. Madewell, Bachelor of Science, will continue to pursue her education at the University of Arkansas. She plans to receive a master's degree in physics.

Jasmine A. Stotts, Bachelor of Arts, accepted a position at Southwestern Bell in Little Rock, Arkansas.

Ananth Venkatesan, Master of Science, is pursuing a Ph.D. degree at Northeastern University in Boston, Massachusetts.

Travis W. Wages, Bachelor of Science, is interviewing for jobs in industry.

Clint E. Wood, Bachelor of Science *magna cum laude*, will begin his graduate education at the UA Physics Department this fall as he works toward an M.D./Ph.D. degree here and at the University of Arkansas Medical School.

UNDERGRADUATE STUDENT NEWS

Nadeem Akbar and **Ben Hood** were each awarded a **Richardson Senior Fellowship** for excellence in undergraduate research. Nadeem Akbar spent this year studying abroad at the University of Cairo in Egypt.

Katrina Bogdon, a B.A. senior in Physics, won the **Presidential Scholarship** for the Fulbright College of Arts and Sciences. This award is given to only one student in each college per year. Katrina also won a $1,000 Sturgis Research Fellowship.

Allen Doyel, J. Matt Doyle, Steven Fitzhugh, April Fortner, Mica Lunt, Jacob McElderry, and **Derrick Williamson** were awarded **Physics Faculty Scholarships** for 2001-2002.

Nick Farrer was awarded the **Lingelbach Prize** for overall outstanding scholastic achievement as a physics major. He has been accepted in the summer program at Sandia National Laboratories, where he will collaborate with Drs. Eric Jones and Kevin Leung.

Laura Fields, a senior Sturgis Fellow from Little Rock majoring in physics and mathematics, won an **NSF Graduate Research**

FROM THE CHAIR

July, 2001

Dear Friends,

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

This year the department granted 12 baccalaureate physics degrees. Our majors have continued to do well in nationally competitive programs. They have been accepted in the National Science Foundation (NSF), sponsored Research Experience for Undergraduate (REU) programs around the country and have won national and state scholarships and grants. These include REUs at NASA, SILO/SURF grants, and Goldwater, Morris Udall, and NSF Fellowships for graduate study.

The department has also been strengthened through new programs, faculty, and federal funding. An interdisciplinary Ph.D. program in microelectronics-photonics was approved by the Arkansas Department of Higher Education. We plan to hire two faculty members next year with expertise in the physics of nanostructures. Awards for research reached a new high: as of last April, the department total was $3.1 million. This includes the department's share of a five-year, $4.5 million NSF grant establishing the Center for Semiconductor Physics in Nanostructures, in collaboration with the University of Oklahoma and led by Professor Salamo at the U of A. Another major success is the $600,000 NSF-Focus Group award to the condensed matter physics group. The competition for these awards is fierce, and so our success reflects the stature of our faculty and the quality of their research at the national level.

Our biggest challenge continues to be the lack of space for teaching and research. Increasing space for physics ranks as the highest priority for the Fulbright College of Arts and Sciences as well as one of the fund-raising goals set by the University. We must meet this most critical need if we are to continue competing at the highest levels and recruiting 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.

With my best wishes,

Surendra Singh, Chair

Fellowship. She is one of only two recipients of this fellowship from the University of Arkansas this year. The graduate fellowship program is one of NSF's oldest and most competitive, offering support for graduate study in all scientific disciplines. The award carries a stipend of $18,000 for a 12-month tenure with slight increases for each of the next two years. The NSF also provides the fellowship institution a cost-of-education allowance of $10,500 per tenure year.

Laura is also a **Barry Goldwater Scholarship** recipient and has twice been funded by the NSF for Research Experiences for Undergraduates Program. One summer, she worked as a research assistant in an atmospheric physics lab at the Geophysical Institute at the University of Alaska, Fairbanks. The next summer, she was one of 20 undergraduates to be selected from across the country to join a research team at CERN, the European Laboratory for Particle Physics, spending nine weeks working with the unique symbiotic relationship between particle physics and cosmology. Fields completed an honors thesis on biophysics with Lin Oliver, UA physics professor. After graduation this spring, she plans to work on a one-year M.S. thesis at the University of Cambridge before deciding to pursue further graduate studies. She has standing offers to continue work toward a Ph.D. at both Cal-Tech and Cornell University.

Jared Henderson, a B.S. senior in physics, was accepted into the NASA Summer Academies at both Ames and Goddard, as well as several REU programs. He chose the **NASA Academy Research Scholarship at the Goddard Space Flight Center,** and his summer research experience will include trips to NASA-Ames and Cape Canaveral to watch a shuttle launch.

Jared Henderson, David New, and **Ronnie Toland** were declared the first recipients of the **Robert D. Maurer Fellowship** awarded to physics juniors or seniors on the basis of scholastic achievement and undergraduate research.

Amber Holley Straughn, a junior B.S. physics major with aspirations to practice astronomy, will spend her summer in the REU program at the MIT Haystack Observatory. She turned down offers at several other prestigious REU programs. Amber, who has been working this year on her honors thesis under UA astronomy Professor Claud Lacy, was awarded the **Rear Admiral William C. Bryson Scholarship.**

In addition to **Amber Holley Straughn**, five other students from our program have been awarded REU positions at programs around the nation. These include **John Lafayette** at the University of Oklahoma, **Michael Barnes** at the University of Illinois, **Brandon Wolfe** at the James Franck Institute at the University of Chicago, and **Robert "Sean" Nichols** and **Daniel Marsh** in our own REU program.

Ben Hood, a physics and computer science engineering major, received a **Barry Goldwater Fellowship**. Goldwater Scholars are selected for their outstanding academic records and their commitment to pursue careers in the disciplines of mathematics, the natural sciences and engineering. The Goldwater Fellowship remains one of the most prestigious and competitive awards available to undergraduates. To qualify for a Goldwater Fellowship, applicants typically hold a GPA of 3.9 or higher and must be entering their junior or senior years in college. Ben will receive $7,500 per year for tuition, books, and room and board.

Hood is also a **Bodenhamer Scholar** and won the **Admiral William C. Bryson Scholarship** offered by the Physics Department. Twice he has won the nationally competitive **Tylenol Scholarship**, awarded for outstanding academic performance and leadership — the only UA student ever to have done so. Hood was also recognized for establishing the Hunger Banquet on the UA campus to increase student awareness of global issues. He has completed three internships, including one last summer at the NASA Ames Research Center.

Competitive **SILO Undergraduate Research Fellowships** were awarded this year to **Shireen Hussain** and **David New** (under Professor Lin Oliver), **David Norris**, (under Professor Mark Filipkowski), and **Brian Sawyer** (under Professor Raj Gupta).

Denise Malan and **Greg White** both won the **Paul Sharrah Scholarship** for 2001-2002, given to outstanding undergraduate physics majors.

Mike Meyer, a B.S. junior in physics/computer science, will spend next year studying abroad in the Physics Department at the University of Sussex in England. He will focus on computational physics.

David New, a B.S. senior in physics and electrical engineering was accepted into the MIT graduate program in electrical engineering.

David Norris, a junior **Bodenhamer Fellow** majoring in physics, was selected as a **Morris Udall Scholar.** The Morris K. Udall Scholarship Foundation awarded 80 scholarships worth $5,000 each nationwide this year. These merit scholarships are awarded to sophomore or junior students who are planning careers in environmental public policy and to Native Americans and Alaska Native students who intend to pursue careers in health care or tribal public policy. David, a native of Little Rock, is a member of the Chickasaw Nation. He was both a National Merit Scholar and a U.S. Presidential Scholar. In addition to the Bodenhamer Fellowship, Norris has received the Chickasaw Nation Education Foundation Scholarship and the Earl Collins Foundation Scholarship Award of Kiwanis International. While still in high school, he received the Achievement Award in Writing from the National Council of Teachers of English. He has served as a research assistant in the Department of Physics at the University of Arkansas and as an engineering intern for ALLTEL. "Eventually, I plan to specialize in public policies concerning science and technology," says Norris. "My goal is to encourage federal assistance to Native American reservations and other underdeveloped communities to facilitate technological and economic development." Next year, Norris, who is also majoring in European Studies, plans to study abroad at the University of St. Andrew's in Scotland.

Ronald W. Toland had the opportunity to work at the NASA/Goddard Space Flight Center in Greenbelt, Maryland, as part of the center's co-op program. He was assigned to the Testing and Alignment Group in the Optics Branch, which is responsible for the evaluation and assembly of many of the optical instruments NASA puts into space — the Hubble Space Telescope, for instance, is monitored and "serviced" by Goddard. While he expected to have to spend much of his time there reading and trying to "catch up" on optics (since he had not gone beyond UP II), he was put to work in the lab on the first day testing an off-axis parabolic mirror. Although Ronnie still had plenty of reading to do, his mentor did a good job of explaining everything in the lab and helped him to understand what they were doing. Ronnie ended up being responsible for most of the preliminary mirror testing for the project. He was assigned to the Infrared Multi-Object Spectrograph, which is being built for the Kitt Peak Observatory in Arizona, to try out some of the technology for the Next Generation Space Telescope, due to replace the Hubble in 10 years.

Ronnie shared these thoughts about his visit to NASA/Goddard Space Flight Center: "Words are inadequate to fully describe the experience. I absorbed an incredible amount of information, worked really hard, and loved every minute of it. Working for NASA was literally a dream come true for me, as that is precisely why I chose to get a degree in physics. I plan to return this summer for another co–op 'tour' and will likely have a job there when I graduate. The hardest thing to believe is that I did all of this, and actually got *paid* for it. What could be better?"

GRADUATE STUDENT NEWS

Oleg Nadiarnykh and **Melody Thomas** were co-winners of the 2000-2001 **Lloyd B. Hamm Outstanding Teaching Assistant Award** in Physics, given annually and jointly by the Physics Department and the American Association of Physics Teachers.

Ahmad Al-Yacoub was awarded a one-year, $4,800 fellowship from the ICSC World Laboratory based in Lausanne, Switzerland. He has presented two invited talks and has been asked to present an invited talk in China this fall. Ahmad published a paper with *Physical Review B* and submitted a paper to *Applied Physics Letters.*

Daniel Bullock, while a physics graduate student, won the 2001 Sigma Xi Aubrey E. Harvey Award. This award is given for outstanding graduate research, with emphasis on national distinction. Mr. Bullock received the award for work in the field of Spintronics, which is centered around developing devices that utilize both the charge of the electron, as in traditional electronics, and its spin. These novel devices would be multifunctional; one spintronic device duplicates the functionality of traditional electronic devices, naturally leading to higher speed and lower power consumption. Mr. Bullock's research findings were published in the May 25 issue of the journal *Science.*

Daniel Erenso was awarded a one-year, $8,400 fellowship from ICSC World Laboratory based in Lausanne, Switzerland. He published one paper in *Physical Review Letters* and has submitted three more to *Physical Review A.* He was also selected to attend the Black Physicists Conference held at Stanford in Spring 2001.

John Carter completed his Ph.D. in Theoretical Physics this May at the age of 19. His research advisor was Professor Michael Lieber.

NEW GRADUATE STUDENTS

Alireza Akbarzadeh, M.S., Isfahan University of Technology, Isfahan, Iran
Jennifer Bone, B.A., University of Arkansas, Fayetteville
William Black, B.S., Texas A&M–Commerce
Dileep Karanth, M.Sc., University of Poona, India
Mazin Khasawneh, M.S., Al al-Bayt University, Jordan
June Lee, B.S., Kyung Hee University, Seoul, Korea
Lisa Madewell, B.S., University of Arkansas, Fayetteville
Dianne Phillips, M.S,, University of Arkansas, Fayetteville
Ram Sastry, M.S., University of Florida, Gainesville, Florida
Shahram Seyed-Mohamadi, M.S., University of Isfahan, Isfahan, Iran
David Sichuga, B.S., Kishinev State Pedagogical University, Moldova, USSR
Shabnam Siddiqui, M.Sc., University of Delhi, Delhi, India
Kjell Tengesdal, B.S., University of Arkansas, Fayetteville

NEWS FROM ALUMNI & FRIENDS

Please send news items about your careers, promotions, and other accomplishments. Several people have asked us to include e-mail contact information in the items reported in the Alumni News section so they can establish links and renew old friendships. Please include your e-mail address, if you have one and do not mind sharing it with others, when submitting items for this column.

William (Liam) Burkett (Ph.D. 1999) joined Xtera Communications, Inc. in Austin, Texas.

Dorel Guzun (Ph.D. 2000) joined Corning Inc. in Corning, New York.

James Knox Hendren (M.S. 1971, Ph.D. 1972) was honored as a distinguished alumnus by the Fulbright College of Arts and Sciences. Dr. Hendren, who earned bachelor's, master's and doctoral degrees in physics from the University of Arkansas, transformed a small company with four employees into an international company worth $12 million, with 160 employees and customers in 64 countries. Arkansas Systems Inc., the largest software firm in Arkansas, has developed ATM technology for small banks, as well as products that allow community banks to connect with regional interchange networks and to offer real-time and point-of-sale teller machines, telephone banking, credit card processing and online banking. Hendren oversaw the development of clearing systems for the Central Bank of Russia, the Peoples' Bank of China and the states of Arkansas, Louisiana and Ohio. In 1999, he founded eCountyInfo.com, a new dot-com company offering access to every county in the country. Hendren is a member of the Arkansas Association of Entrepreneurs, the Greater Little Rock Chamber of Commerce, the Association of Knowledge-Based Companies of Arkansas, and the UALR Business Advisory Council.

Marvin Young (Ph.D. 1987) is working for Celion in Dallas, Texas.

Mansour Mortazavi (Ph.D. 1991) was promoted to Associate Professor at the University of Arkansas, Pine Bluff.

Perry Rice (Ph.D. 1988) was promoted to Professor of Physics at Miami University, Oxford, Ohio.

Jim Spann (Ph.D. 1985) has been working at NASA headquarters for a two-year term as a Discipline Scientist for Geospace. This is a new experience for him, one he hopes will help greatly in future research and space mission endeavors. He plans to return to Marshall Space Flight Center (Huntsville, AL) in the summer of 2002. His plasma research laboratory in Huntsville is going strong: he is using the electrodynamic balance technique that he worked on under Dr. Richardson to simulate deep space interaction of dust grains and plasmas and UV.

Roslan Abd Shukor (Ph.D. 1991) has been teaching at University Kebangsaan in Malaysia since 1991. He has been promoted to full professor. With S. C. Lim and K. H. Kwek, he co-edited a book titled Frontiers of Quantum Physics (Springer, New York), which brings together distinguished researchers from 24 countries on topics ranging from quantum measurements and quantum computers to single-atom and single-electron devices.

Berol Robinson (faculty member, 1952-1956) is working on a book both in French and English titled Environmentalists for Nuclear Energy in collaboration with a young French engineer and scientist. The French title of the book is more provocative: Le Nucleaire Avenir de l'Ecologie?, loosely translated, means "Is the future of ecology nuclear?" Professor James Lovelock, a scientist well known to English-speaking environmentalists, has written an excellent introduction to the English edition. The preface to the French edition is by two notable French medical professors. The English version was sent out on diskette for translation by correspondents in Romania, Italy, Germany, Japan, Slovakia, Slovenia and the Czech Republic. The Romanian edition is close to publication, as is a Russian version. Versions in Spanish, Portuguese, and Finnish are in progress too. Visit the website at www.ecolo.org to meet Jim Lovelock.

FACULTY NEWS

Art Hobson, Professor Emeritus of Physics, still comes to work every day, but now he doesn't get paid and he doesn't have to attend faculty meetings. Since retirement in May 1999, he has published nine scientific journal articles, two proceedings articles, and six scientific journal letters. He has presented seven invited talks, seven contributed talks, and four posters at scientific meetings, including meetings in China, Hungary, Spain, and Germany. He has also given numerous talks to local groups, published far too many letters and articles in local newspapers, and has just begun work on the third edition of his textbook, *Physics: Concepts and Connections*, to be published in 2002 by Prentice- Hall.

Lin Oliver won a Master Teacher Award from the Fulbright College of Arts and Sciences. Dean Randall Woods announced the winners during the annual spring faculty meeting in April. These awards recognize outstanding teaching in the college.

Gay Stewart continues to serve on the APS Forum on Education Executive Committee and the PKAL Physics Task Force. Last fall, she became chair of the Advanced Placement (AP) Physics Curriculum Development Committee. She gave several talks, including two invited, at the March and April APS meetings and published an article, "Growth in Undergraduate Physics at the University of Arkansas," on the successes of the department's efforts in reforming the undergraduate program in the APS *Forum on Education Newsletter.* She also directed "Preparing Future Physics Faculty," a project funded by the NSF in cooperation with the Pew Charitable Trusts, the Association of American Colleges and Universities, the Council of Graduate Schools and the AAPT. The U of A is one of only four physics departments chosen nationwide to participate in this project to develop models other institutions will be able to adopt. This spring, she organized the largest High School Physics Day ever, with 200 students from schools throughout the state participating. Hamburg High School won the top honors for the day.

Paul Thibado's research group published a paper in *Science* on *Spintronics*. This is a hot research area in which normal electronic devices are replaced with ones that use the spin of the electron to produce novel electrical properties. His graduate student Daniel Bullock graduated in May 2001 with his Ph.D. in surface physics and won the Sigma Xi Harvey Award.

Reeta Vyas was awarded a research grant by the Office of Naval Research to investigate microcavity lasers. She and her students published three papers and gave several contributed talks. One of her students, Daniel Erenso, won a World Laboratory scholarship worth $8,400.

Min Xiao has expanded his research in quantum optics and atomic physics to nanoscience and optical communication in the past year. His group has published eight refereed journal papers and given several presentations at international conferences. He actively participated in the successful MRSEC proposal and has several continued research grants from the National Science Foundation and the Office of Naval Research. Two Ph.D. students graduated from his group in the past two years and went to work for Corning, Inc. and Xtera Communications, Inc.

NSF Award for Spintronics

Laurent Bellaiche, Vince LaBella, William Oliver, and **Paul Thibado** won a Focused-Research Group (FRG) grant of $600,000 from NSF in the area of Spintronics. This is the first FRG grant to be won on the UA campus. Other winners around the nation include MIT, CalTech, and UC–Santa Barbara. The grant will help support graduate students and research projects that include growing ferromagnetic metal spin-injection contacts on semiconductors, using scanning tunneling microscopy to locally (~1 nm) quantify the spin injection process, and using first-principles theory to simulate the injection probability to uncover the role of defects on the process.

Nineteen-Year-Old Earns Ph.D. In Physics, Plans To Teach

John Carter went to college at age 10, and nine years later, on Saturday, May 12, 2001, John Carter earned a doctorate from the University of Arkansas.

At 18 months, John worked a 300-piece puzzle, his mother, Belinda, recalled. By the age of 4 he had taught himself to read and write. A second-grade contest offered to award students a trip to Six Flags if they read 800 books. John read 1,643.

He worked his way through a college algebra book at the age of 9. That's when John's parents decided to introduce him to Greg Beil, a nuclear physicist at East Texas Baptist University (ETBU) in Marshall, Texas. Ten years old, he was given a full scholarship to attend ETBU. Beil became John's mentor and teacher. "Right from the beginning, he was over and beyond any student at the normal college level…John is capable of doing work of the caliber that could win a Nobel Prize," Beil said. John graduated *summa cum laude* from ETBU at age 14 with a degree in mathematical science. He minored in computer science and physics.

When it came time for Carter to go to graduate school, the family picked up and moved from Texas to Anderson, Missouri. John's father, Thad, is a Methodist minister, and took a job at a church about 50 miles north of Fayetteville. Carter was accepted at the University of Arkansas at Fayetteville to pursue a doctorate in physics. With a fellowship he earned a master's degree at 16. Three years later he has earned a Ph.D. in physics. His Ph.D. mentor Professor Lieber says, "John is an extremely precocious student. At 19 he is a mature physicist, with a great potential for the future. But he is no narrow student focussing only on physics. He is also interested in music (he plays violin) and in ancient languages, notably Latin, Greek, and Hebrew, all of which he uses in his study of religion and philosophy."

So what does a 19-year-old doctor of physics do for fun? "I like watching old movies and reading foreign language books," John said. One of his favorites: The New Testament—in Greek.

John will teach temporarily at Crowder College in Neosho, Missouri this summer. Then what? Carter simply replies, "I'm not sure."

—from Associated Press news reports

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THANK YOU!

Contributors

Mr. John William Dixon
Dr. William Daniel Evans
Mr. & Mrs. Paul F. Glezen
Dr. & Mrs. Lewis G. Gray
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Dr. & Mrs. Alan W. Hughes
Dr. & Mrs. Robert D. Maurer
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Alumni and friends of the Physics Department have generously contributed to the establishment of the following funds. Income from these funds are used for supporting a variety of student-centered activities. The numbers inside parentheses indicate the number, amount, and frequency of the award. We appreciate your continued support. 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.

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. Hamm Outstanding Teaching Assistant Award (1 @ $150, 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 @ $200, 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 H. Hughes Graduate Fellowship
Used to support graduate students who have been accepted as candidates in the Ph.D. program in physics. (see page 3)