Newsletter of the Department of Physics, University of Arkansas

REFLECTIONS

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Faculty Profile: Laurent Bellaiche

Computational Condensed Matter Physics

Laurent Bellaiche joined our department in January 1999. He received physics BS. MS and PhD degrees Summa Cum Laude at the University of Paris VI. His dissertation title was "Theoretical and experimental study of different aspects of the electronic density in BN, LiH and Be single crystals."

He became Research Associate at the University of Paris XI in August 1994, where he provided theoretical support to experimental groups on surface reconstruction and high pressure effects in semiconductors. In September 1995, he was chosen out of 200 candidates to join the National Renewable Energy Laboratory in Golden, Colorado, where he performed calculations on semiconductor alloys. Two years later, Dr. Bellaiche transferred to the Department of Physics and Astronomy at Rutgers University, where he did theoretical investigations of ferroelectric systems. He taught undergraduate and graduate courses at both Paris and Rutgers Universities. He received various academic honors, including four fellowships for materials science studies, and research and teaching awards from the French government and from different Paris universities, and co-authored over 20 journal articles, including 3 in *Physical Review Letters* and 3 in *Applied Physics Letters* during the past two years. He gave invited presentations at APS meetings, about his semiconductor alloys studies at the 1998 March Meeting and about his ferroelectric systems work at the 1999 Atlanta Centennial Meeting, and four other invited talks.

Dr. Bellaiche's primary research interest is the prediction, design, and optimization of materials properties. To reach that goal, he uses and develops state-of-the-art computational and simulation methods. His current research program is divided into three activities: ferroelectric systems, semiconductor materials, and high pressure physics.

The ferroelectric systems have the ability to swell or shrink when electricity flows through them, as well as to give off electricity themselves when compressed or pulled apart. Engineers have exploited this trait for decades to convert mechanical energy to electricity and back again in applications ranging from phonograph needles to telephone speakers. The versatile family of ferroelectric systems has recently gained some even more gifted members which display an effect 10 times greater than that of the current family members. These new members could usher in a new generation of devices that would improve everything from the resolution of ultrasound machines to the range of sonar listening devices. One of Dr. Bellaiche's goals is to predict the

properties of ferroelectric systems, and to identify the microscopic effects responsible for their anomalous behaviors.

In semiconductor systems, he is especially interested in the effects of surfaces and alloying on structural, optical and electronic properties. He focuses on the microscopic understanding of nitride semiconductor alloys. These systems promise to greatly improve the high-temperature performance of the laser diodes used in optical-fiber communications. They are also of fundamental interest since they exhibit very unusual semiconductor alloy features, including an anomalous composition- and pressure-dependence of the band gap. Gaining a broad atomic understanding of these nitride alloys may lead us to revisit common beliefs about semiconductor properties, and to an optimization of device performance.

In his high-pressure physics research, Dr. Ballaiche studies pretransitional effects, i.e. effects in a crystallographic structure just before it undergoes a phase transition to another structure. Although a systematic understanding of the crystal structure of the ground state and of the high-pressure phases in terms of ionicity and atomic instabilities has been achieved over the past 2-3 decades, the existence of pretransitional effects is not at all understood. Little is known about their microscopic signatures. How are electronic properties affected by these effects? What are their consequences on ionicity, bond angles, and atomic distances? Understanding the cause(s) and consequences of pretransitional effects is of great fundamental interest, and will significantly improve our current knowledge of high pressure phenomena.

Dr. Bellaiche's research interests are shared by several members of our department, e.g. Paul Thibado for semiconductors, Lin Oliver for ferroelectric systems and high pressure physics, and Greg Salamo for ferroelectric systems and semiconductors. These common interests should generate fruitful interactions and collaborations.

One of Dr. Bellaiche's main goals is to efficiently train undergraduate and graduate students. He intends to do that by leading them to a deep understanding of various fundamental and technological problems, and by showing them how these two aspects of science are related at a microscopic scale. Learning computer skills will also enhance students' ability to compete on the job market.

Faculty Profile: Ken Vickers
Research Professor and ACEMI Director

Ken Vickers joined our faculty on April 1, 1998, as Research Professor and Director of the NSF-supported Arkansas Center for Electronic-photonic Materials Innovation (ACEMI). His has had an active first year. He created an interdisciplinary Master of Science program in microelectronics-photonics and recruited 14 students into it, created an MS Degree in Applied Physics, created (with Dr. John Todd of the Management School) a new course called "Intra/entrepreneurship of Technology," and co-authored a successful $2.1 million NSF Integrative Graduate Education and Research Training (IGERT) proposal, not to mention additional grant proposals that are still pending.

In appointing Professor Vickers to our faculty, the Department of Physics welcomes back one of its own. Ken received his BS degree with High Honors from our department in 1976, and his MS degree from our department in 1978.

Since 1978, Vickers has had extensive management experience in integrated circuit manufacturing at Texas Instruments (TI). During 1980-89 he was Engineering Section Manager of a TI integrated circuits plant in Sherman, Texas, where he managed sections in plasma, diffusion, physical vapor deposition, photolithography, ion implant, and epitaxial silicon growth. During 1991-98, he was the Engineering Manager of this plant, managing a group of one hundred technologists with an annual budget of over nine million dollars. He also chaired two worldwide, inter-factory improvement teams formed to manage TI improvements. In 1997, these teams implemented a worldwide knowledge distribution database to assure rapid problem solution propagation throughout the company.

Professor Vickers was recognized as a technical leader within TI, being elected by his technical peer group to Member Group Technical Staff (top 20% of technologists in TI), to Senior Member Technical Staff (top 8% of technologists in TI), and then to Technical Manager after promotion to Engineering Manager. He served as Chairman of the Sherman Site Technical Council during his last five years at TI. He received 23 patents in field emission display technology and process control methodology, as sole author of 11 of these, principle author of 4, and contributing author of 8.

In the international arena, Professor Vickers served a one-year assignment as co-manager for an advanced integrated-circuit technology startup at TI's plant in Freising, Germany. He also served on the TI Silicon Wafer Procurement Team, which required extensive travel in Europe and Japan. As chairmen of the worldwide teams, he organized annual meetings of all team members that were held in both the U.S. and overseas.

Vickers has a long-term interest in public school outreach programs, an interest that began during his graduate education at the University of Arkansas. As a graduate teaching assistant, he taught three semesters of the lab-based course Physical Science for Elementary Teachers (PSET). Former Professors Glen Clayton and Richard Anderson created this course in 1974 as part of the Student Science Training Program that they developed for future public school teachers. Regrettably, and despite enthusiasm for the program from students and the College of Education, the course and the entire program were terminated in 1977 due to pressures resulting from the University's increased emphasis upon research, and to decreasing NSF support. Professor Vickers has also served for nine years on the Callisburg Independent School District Board of Trustees and for eight years was Chairman of the Industrial Advisory Board for Murray State College in Tishimingo, Oklahoma. His continued personal involvement in K-12 education, triggered during the PSET course, is direct evidence that the ultimate goals of training efforts such as PSET will be effective in the K-12 science reforms that our nation so dearly needs.

Vickers moved to the University as ACEMI Director in order to create a fully interdisciplinary educational approach to working in solid-state devices, an approach that will comprise science, engineering, and business perspectives. ACEMI supports interdisciplinary research in laser light and its interaction with solid state/quantum materials and devices. The outcome will be a better

understanding of microelectronic-photonic materials; the creation of high-performance, miniaturized devices and systems made from these materials; and an understanding of the economics that affect successful introduction of these devices and systems into industry and the community. ACEMI will include faculty from the Colleges of Arts and Sciences and of Engineering, as well as cooperative research with industrial partners. ACEMI students will take courses in engineering, science, and business to gain the full spectrum of skills needed to make good decisions in high tech industry. Students from any BS science or engineering program will be qualified to enter ACEMI.

The Center's faculty and post-doc staff from the Departments of Physics, Chemistry, Chemical Engineering, Mechanical Engineering, and Electrical Engineering will lead the ACEMI research efforts. Students will begin working with staff in their research laboratories within days of their enrollment at the University. Entering students will first complete an interdisciplinary research-based MS Degree in Microelectronics-Photonics, a degree that will be highly marketable for career opportunities in the development and manufacturing of high tech materials and devices. Students interested in continuing for a PhD will choose between a departmental-based degree or a Microelectronics-Photonics degree. Students wishing to pursue this ACEMI interdisciplinary PhD path can now apply for a five year IGERT grant for living expenses, tuition, research materials, travel, and computer. These support grants may start as early as June 1999.

Art Hobson Retires

Professor Art Hobson retired in May after 35 years in the physics department. Among the reasons he came here in 1964 were his friendly but professional job interview with Chairman Paul Sharrah, his talks with faculty members Glen Clayton, Steve Day, Ray Hughes, Charles Jones, George Lingelbach, Herman Schwartz, and Otto "Bud" Zinke, the camaraderie within the department, and the gorgeous Ozark environment. Among his early memorable experiences, he recalls his first day in town, when he moved furniture into his rental house in Farmington until 1 a.m. and only then found time to begin preparing for his first class lecture in physical science the following morning. The course had already been meeting for a week, and was in the middle of the astronomy segment--a topic in which he had never taken a college course! The class meeting time: that morning at 07:00!!

Art's earliest interest was music. He received a music degree from North Texas State University in Denton in 1955, was drafted into an Army band in Europe for two years, tried to make the big-time in New York City in 1957, realized that he possessed more desire then he did talent for jazz, and returned to college in 1958 where he tried something more likely to lead to actual employment, namely physics.

He finished his PhD, doing his dissertation in theoretical statistical mechanics, in 1964, and came directly to the University of Arkansas. During the next ten years, he taught the complete spectrum of graduate and undergraduate physics courses, researched the application of information theory to statistical mechanics, received two National Science Foundation grants, and published 14 research papers and a book, *Concepts in Statistical Mechanics* (Gordon and Breach, 1971).

Art was heavily involved in the campus protests against the Vietnam War during 1967-1972, and traces his continuing societal concerns partly to this involvement. Out of such concerns, he developed a new socially relevant introductory physics course for nonscientists to replace the older physical science course. According to Hobson, every campus needs such science courses "because industrialized democracies cannot survive unless their citizens are scientifically literate." After two years of working through the campus bureaucracy, the new course "Physics and Human Affairs" was approved in 1976. By Spring 1999 it had grown to 480 students per semester, and over ten thousand students had passed through it. In 1989, Hobson received the Fulbright College of Arts and Science's Master Teacher Award for developing and teaching this course.

Hobson soon realized that no existing textbook fit the range of topics needed in a "relevant" physics course. These included philosophical topics such as scientific methodology, the interpretation of quantum physics, and pseudoscience; societal topics such as global warming and energy resources; and a heavy emphasis on modern physics. So he began writing class notes for the course, which by 1982 developed into a published textbook, *Physics and Human Affairs* (Wiley, 1982). During 1991-1995, Hobson wrote an entirely new textbook, *Physics: Concepts and Connections* (Prentice Hall, 1st edition 1995, 2nd edition 1999), based on the course as it had developed by that time. It is now used on some 85 college campuses, and was recently chosen by the Library of Science as its "Main Selection" for May, 1999.

During 1980-1984 Hobson teamed up with his friend James R. "Dick" Bennett, Professor of English, to develop and teach a new course called "The Arms Race and World War III." The course continues today under the title "Peace and War" (Humanities 4313).

While on Off Campus Duty Assignment in Stockholm, Sweden in 1985, Hobson studied physics-related arms control issues. This led to his participation in an American Physical Society (APS) arms control study group, and to his co-editing and co-authoring *The Future of Land-Based Strategic Missiles* (American Institute of Physics, 1989). This work also led to his appointment as editor of *Physics and Society*, a quarterly publication of the APS Forum on Physics and Society. He developed this quarterly into a vehicle for the publication of serious articles, commentary, and reviews at the interface of physics and society. In recognition of this work and for other contributions, Hobson was in 1992 elected a Fellow of the APS.

During 1995-1996, Hobson helped revise and revitalize the Department's Bachelor of Arts degree program. He has been program's mentor and advisor since 1995.

Art says that he's not really retiring; he's just exchanging some of his professional activities. His calendar is already full through mid-November. Included in his "do" list are meetings of international physics educators this summer in Szeged, Hungary and in Guilin, China, and a two-month course for future physics teachers on "Teaching Relevant Physics" scheduled for this Fall at Eotvoes University in Budapest, Hungary. His textbook is being translated into Chinese and will be published by the Shanghai Scientific and Technical Publishers--an exciting prospect that he hopes will lead to interesting collaborations with physics educators in China. His list also includes writing articles, a book on physics and the environment, a high school physics textbook, working on

science-related social issues, learning German so well that Germans won't reply in English, not to mention skiing, the beach, and Dickson Street.*

From the Chair

Dear Friends,

It is my pleasure to bring you greetings from Fayetteville and share exciting news of the past year.

Our new BS degree program went into effect in Fall 1998. It is flexible, offering our students optics, electronics, and computational tracks in addition to the traditional PhD-bound track, depending on career goals. Partly due to higher University admission standards, eight scholarship students joined the physics program. Increased attention to undergraduate mentoring by Drs. Stewart, Oliver and others, and undergraduate research, are reflected in the success of our majors. Several students won national and campus scholarships such as materials research society and SILO grants, the John Bower Buckley Scholarship, and American Physical Society Centennial grants. These efforts to improve our undergraduate program have continued to pay off. This year the Department granted 11 baccalaureate physics degrees, far more than the national average for departments of our size. We hope that, during the next year or two, we can similarly tap the BA program's potential.

There are changes at the graduate level too. An interdisciplinary MS Degree program, ACEMI (Arkansas Center for Electronic and Photonic Materials), was approved and implemented. An applied physics MS Degree was also approved and becomes effective in Fall 1999. Other changes are under consideration to provide students more flexibility and early research exposure.

Looking at major faculty achievements, Gupta was elected a fellow of the American Physical Society and Salamo was elected a fellow of the Optical Society of America. Xiao and Henry won a $1 million NSF grant to initiate a collaboration with Lucent Technologies. Thibado won Research Corporation's Research Innovation Award and Bellaiche won the Ralph E. Powe Junior Faculty Enhancement award. Professor Art Hobson is retiring after 35 years. He developed the Physics and Human Affairs course, taken by some ten thousand students! Research Professor Ken Vickers joined the Department as Director of ACEMI, following 20 years at Texas Instruments. Laurent Bellaiche joined the department in Spring 99 as a condensed matter theorist, adding further strength to our condensed matter program.

I appreciate your continued support to our Department. Please keep us posted of your progress, write to us about your experiences at Arkansas, about job opportunities for new graduates, or about any aspect of our program.

With my best wishes,

Surendra Singh, Chair

Robert D. Maurer Lecture 1999

William Phillips on "Time, Einstein, and the Coldest Stuff in the Universe"

Nobel Prize-winning physicist William D. Phillips delivered this year's Maurer Lecture to a capacity crowd on March 4 in Giffels Auditorium. Dr. Robert Maurer and Mrs. Barbara Maurer were in attendance. Dr. Maurer received the Fulbright College's Distinguished Alumni Award from the Department of Physics. Bernard Madison, Dean of the Fulbright College of Arts and Sciences, presented the certificate and inducted him into the College's Alumni Academy.

In his public talk, Dr. Phillip discussed atomic clocks, the most accurate timepieces ever made. Accurate clocks are essential for synchronization of high speed communication, the Global Positioning System that guides aircraft, boats and backpackers, and other features of modern life. The limitations of atomic clocks come from the thermal motion of the atoms. Hot atoms move fast and suffer from time shifts as predicted by Einstein's Theory of Relativity. Contrary to intuition, things can be cooled by shining laser light on them. With laser cooling, gases can be cooled to less than one millionth of a degree above Absolute Zero. The slow-moving atoms in such a gas allow one to make even more accurate clocks, perhaps accurate to within a few billionths of a second per year. Laser cooling also makes possible the recent observation of Einstein's long-standing prediction of Bose-Einstein condensation, hailed as one of the most important recent scientific developments.

The following day, Dr. Phillips delivered a Physics Department Colloquium entitled "Atom optics with Bose condensates." This dealt with the quantum wave aspects of atoms. Because of the wave nature of atoms, many of the phenomena familiar in "photon" optics can also be observed in "atom" optics, including diffraction, Bragg scattering, and interferometery. With the experimental achievement of Bose-Einstein condensation, scientists now have coherent atom sources for atom optics analogous to laser sources for photon optics. He described a number of matter-wave optics experiments that have been performed by his group using Bose condensates, including the first demonstration of non-linear atom optics: four-wave mixing of deBroglie waves.

Phillips joined the staff of the National Institute of Standards and Technology in 1978. He is leader of the Laser Cooling and Trapping Group in the Atomic Physics Division of NIST's physics lab, and is Adjunct Professor of Physics at the University of Maryland. He is a Fellow of the APS, the Optical Society of America, and the American Academy of Arts and Sciences, and a member of the National Academy of Sciences. He received the Department of Commerce's Gold Medal (1993), the Franklin Institute's Michelson Medal (1996), and the APS Schawlow Prize (1998). He shared the 1997 Nobel Prize in Physics "for development of methods to cool and trap atoms with lasers."

Surendra Singh

Working with Industrial Leaders on Optical Telecommunication

Technologies increased transmission capacity of fiber optic links will play a critical role in next-generation telecommunication systems. Advances in materials and devices are the driving force and are already enabling higher transmission rates than ever thought possible. However, many of these advances are developing slowly and the potential to satisfy the demand by this growing market is in serious jeopardy. To move more rapidly the U.S. desperately needs university-industry partnerships to make possible a new approach to such national concerns. Greater balance is needed between the basic and applied research that underlies telecommunications advances, and that educates students in the skills that make these advances possible.

By using our Department's strength in nonlinear and quantum optics, we are trying to position ourselves in the exciting field of optical communication. In an important step, Min Xiao (Principal Investigator) and Michael Henry (Co-Principal Investigator), have received NSF funding of $500,000, with $500,000 matching from the State of Arkansas, for their proposal "University-industry partnership for enabling advances in telecommunications." Their plan centers on forming a partnership between scientists at the University and at Bell Laboratories, Lucent Technologies.

It is Xiao's and Henry's conviction that we are in the early stages of the evolution of new material and device developments that can dramatically increase the transmission rate of information over optical fiber links, and that a university-industry partnership is the best vehicle for creating the educational and research approach needed to produce enabling technologies. This partnership is based on a team effort where faculty, post-doctorals, students, and Lucent scientists will work together, spending time at both laboratories while advancing the state-of-the-art of components and devices for optical communications.

Lucent Technologies is the industry leader in optical communications. Our work with them will help us identify projects that are important to future optical communications developments, and will give our faculty and students many opportunities. They will be able to fine tune their research efforts to impact a significant national problem, they will bring real industry problems into university research, they will establish a higher level of scientific and public visibility, they will engage in an expanded dialog on electronic-photonic problems that will bring together the views of two different cultures, they will develop new telecommunications technical skills, and students will have broader career opportunities. In short, this unique partnership will provide immediate inroads out of geographical and intellectual isolation, to higher levels of competitiveness for outside support, recognition, and bright students.*

Professor Gupta Elected to APS Fellowship

Raj Gupta has been elected a Fellow of the American Physical Society "for the first Doppler-free spectroscopy of the optically inaccessible states of alkali atoms, for the most complete study of photothermal technique in flowing fluids, and for innovative use of photothermal technique to combustion diagnostics." He joins Professors Ray Hughes, Art Hobson, and William Harter as the Department's fourth APS Fellow.

During 1970-78, in collaboration with William Happer at Columbia University, Gupta developed new Doppler-free spectroscopic techniques to reach the optically inaccessible states (the states that cannot be excited directly from the ground states) of the alkali atoms, and performed the first high-resolution measurements on these states. These measurements revealed *inverted* hyperfine structures in certain states and led, for the first time, to understanding the role of many-body effects in these simple single-valence-electron atoms.

After joining the University of Arkansas in 1978, Gupta proposed and successfully applied photoacoustic and photothermal techniques to combustion diagnostics. This was a new idea, radically different from anything else in use (e.g., laser induced fluorescence on coherent anti-Stokes Raman spectroscopy), and generated considerable interest in the combustion diagnostics community. Raj has also done extensive work on the development of the photothermal technique itself. He was one of the first to apply this technique to flowing media and has performed, in collaboration with UA colleague Reeta Vyas, the most complete study of the generation and evolution of photothermal signals in flowing fluids. This work has found applications in such diverse areas as anemometry, smoke detection in exhausts, pollution measurements, combustion diagnostics, laser-induced plasma diagnostics, and chemical analysis in flowing media.*

Alumnus Supports Physics BA Program for Pre-Law Students

We received this letter from a 1981 graduate of our BA program:

I have been working as a commercial litigation lawyer since graduating. I am pleased that two recent BA graduates (Joanne Gold and James Harrington, 1998) are entering law school. I still find my physics background useful, though I did not enter a "technical" field of law. I write to suggest that you mention to your physics majors that intellectual property law is evolving favorably for job prospects. This field has an inherent advantage for physics majors, in that one sub-field--patent law--essentially requires an undergraduate science degree in order to sit the examination to practice.

I have been in law practice 14 years, and have never seen a legal market like today's for intellectual property attorneys. It has turned into a boom I do not see deflating for some years. This market results from the high tech and internet explosion over the past years. Although some law schools are difficult to get into, many fine schools emphasizing intellectual property law do not require astronomically high grades or prodigious law school admission (LSAT) tests. Two such fine programs are at the University of Houston School of Law and the John Marshall Law School in Chicago.

I agree wholeheartedly with your newsletter that a physics BA is good preparation for a non-physics career (Spring 1996, pages 1-3). But I'm not sure that the word is out among students that intellectual property lawyers not only use their science background, but frequently earn more than other physics graduates. Some of your students might not be aware of this field. There are no "required" courses or pre-requisites for taking the LSAT or for admission to law school. While undergraduates are well-advised to practice their written and oral presentation skills, there is no reason why any BA or BS physics major making about a "B" average or better could not excel in

the exam and in law school.

Robert Nunnally

News and Notes

THIS YEAR'S PHYSICS GRADUATES

Crystal Bailey, Bachelor of Science; she has a Fellowship to attend graduate school at Indiana University.
Karen Bockel, Bachelor of Science; she will attend graduate school at Colorado State.
Matt Brown, Bachelor of Arts; he will attend graduate in mathematics at the University of Arkansas.
Ryan Coffee, Bachelor of Science and Bachelor of Arts; he will attend graduate school in physics at the University of Conneticut.
Bryan Eliason, Bachelor of Science; he will working in computer programming in Bentonville, Arkansas.
Josh Hamblen, Bachelor of Science; he has a Fellowship to attend graduate school in physics at the University of Rochester.
Michael Maese, Bachelor of Science; he will be working as Chief Broadcast Engineer in Continuing Education at the University of Arkansas.
Noel Naperielski, Bachelor of Science; she will attend graduate school in either engineering or applied physics.
LoAnn Nguyen, Bachelor of Science; she will attend graduate school in applied physics at the University of Arkansas.
Brent Ragar, Bachelor of Arts; he will attend medical school at Washington University in St. Louis.
Jasmine Stotts, Bachelor of Arts; she will attend pilot training school in Fayetteville.
Ryan Wolfe, Bachelor of Science; he will attend graduate school in physics at the University of Arkansas.
Ditta Gallai, Master of Arts, directed by Assistant Professor Stewart; she has returned to Hungary where she just finished her masters degree in English; she has begun looking for a position teaching physics at an English-speaking institution in Hungary.
Horace Crogman, Master of Arts, directed by Professor Singh.
Jon Osborn, Master of Arts, directed by Assistant Professor Stewart; he is now employed as a physics instructor at DePauw University in Indiana.
Mike Schillaci, Doctor of Philosophy, directed by Professor Lieber; he is working as an Assistant Professor of Physics at Francis Marion University in Florence, South Carolina.
Tim Burt, Doctor of Philosophy, directed by Associate Professor Gea-Banacloche.
Scott Hawkins, Doctor of Philosophy, directed by Professor Salamo.
Mathew Klotz, Doctor of Philosophy, directed by Professor Salamo.

STUDENT NEWS

Nadeem Akbar, **Leann Brown**, **Nicholas Farrer**, **Mark Thompson**, and **Clint Wood** won undergraduate Departmental Scholarships.
Matthew Schaeffer won the Bryson Scholarship.
Clint Ryan won the first annual Richardson Scholarship.
Steven Sandh won the Sharrah Scholarship.
Crystal Bailey and **Joshua Hamblen** shared the Lingelbach Award. **Crystal Bailey** also won a grant from the Materials Research Society
Luke Post, **Josh Hamblen**, **Crystal Bailey**, **Michael Offenbacher** and **Christi Emery** won APS Centennial Travel Awards.
Clint Wood, **Jennifer Morrow**, **LeAnne Brown**, and **Loann Nguyen** received NSF Research Experience for Undergraduates grants
Laura Fields won the Presidential Fellowship for the Fulbright College of Arts and Sciences for this year.
Brent Ragar won an Arkansas Science Information Liason Office (SILO) Grant. He also gave a talk at the APS centennial meeting in Atlanta, and won the John Bower Buckley Scholarship to study at Cambridge.
Lin We resolved the atomic structure of the most important semiconductor surface [GaAs(001)-(2x4)], discovered a new STM imaging mechanism, and has submitted an article to Physical Review Letters.
Our congratulations to all on their achievements!

NEW GRADUATE STUDENTS

Husam Abu-Safe, BS Yarmouk University in Jordan, MS Wilkes University in Pennsylvania

Zhao Ding, BS Wuhan University in China, MS Wuhan University in China

Christi Emery, BS East Texas State University

David Goorsky, BS Kings College in Bristol, Tennessee

Aqiang Guo, BS and MS Xian Jiaotong University in Xian, China

Fernando Montes, BS University of Los Andes in Bogota, Colombia

Lucas Post, BA University of Arkansas

Fuad Rawwagah, BS and MS Yarmouk University in Irbid, Jordan

Stephen Skinner, BS University of Arkansas

Michael Teplitsky, BS University of Dayton in Ohio

Ananth Venkatesan, BS Univ of Madras in India, MS Bharathidasan University in India

Ryan Wolf, BS University of Arkansas

ALUMNI NEWS

Calling all alumni! Please keep in touch with us and other alumni. Tell us about the interesting things you've been doing!

Robert B. (Bob) Owen
We are sorry to report the death of Robert B. (Bob) Owen (MS 1964) on March 6, 1996. His wife, Suzanne K. Owen, tells us that Bob never was able to read Dr. Sharrah's book "Physics At Arkansas" (see Reflections, Spring 1997, page 1), but he would have enjoyed it immensely. While Bob was never mentioned in the book by name, some of the pranks he knew about were, and he was one of the students for whom Dr. Zinke bought soft drinks. During Bob's career at Texas Instruments (TI), he received clearances above top secret with no problems. He worked on parts of Telstar, the Lunar Lander, Identify Friend or Foe concept, sonar, and antennae of various kinds including Airport Surveillance Radar. He was in the first Summer Development Program at TI and later administered that program and others to enhance the educational growth of employees and potential employees. He received awards for his work with the Cooperative Education Program and headed several projects for the regional and national co-op organizations. Bob is greatly missed by his family, friends and associates.

James Bennett (MS 1990), after six years with the Nippon Electronics Corporation (NEC) Research Institute in Princeton, has moved to California to join Symyx Technologies, a startup company doing combinatorial materials science. His job title is Research Engineer and he is working on the development of instrumentation for rapid sample screening. For more information on Symex, see www.symyx.com.

Collin Condray and his wife, Kathleen, lived last year in Vienna, Austria. She was the assistant to the director of the exchange program between the Economics University of Vienna and the University of Illinois, and he taught English and helped teach mechanical engineering, mathematics, and computer science at a technical high school. This year they are back in Champaign, Illinois where Kathleen is finishing her doctorate in Germanic literature, and he is working at Wolfram Research as one of their webmasters. He has with Wolfram for 9 months and has been "learning a lot from all the bright people they have here."

Lynn L. Hatfield (MS 1964, PhD 1967) has recently become Chair of Physics at Texas Tech University, where he has been for thirty years. He plans to change the way his department teaches physics, and to hire a new faculty member specializing in physics education. He expects that being chairman will cut down on his research. For 20 years he has been part of a faculty group from EE, Physics, ME, Chem E, Chemistry, doing pulsed power research at high energy densities. They work on dielectrics and have improved the understanding of discharges across the surface of insulators in vacuum when hundreds of kilovolts per centimeter are applied parallel

to the dielectric surface. Presently, they are studying breakdown of dielectric windows subjected to high power density traveling waves at microwave frequencies.

Steven (Shao-zheng) Jin (PhD 1996) has been working with Northern Telecom (Nortel) as a software engineer for one and half years. Nortel is the world's 3rd largest telecommunication equipment manufacturer, with 78,000 employees. Nortel's research center in Ottawa employs 8,500 researchers and engineers.

Tacy Joffe-Minor (BS 1988, MA 1990) received her PhD in High Energy Physics from Northwestern University in June 1997. She is now a post-doc at Argonne National Labs, working on the "Soudan 2" and "MINOS" experiments. Tacy ran into Julia Smith (BS 1989). Julia is an Astrophysics postdoc at Oxford, England, has married, and is now Julia Kennefick.

Bill Kiehl (MS 1990, PhD 1995) got married a couple of years ago and is still at Ball Aerospace.

David Mooney (PhD 1990) is Director of Denver Operations for the Spire Corporation. He was formerly administrative vice president and corporate secretary for a wireless communications company, but recently left that position to get back to his first love, photovoltaics. In November 1997 he opened a Denver office for Spire, a Boston area company that is the leading supplier of photovoltaic module manufacturing equipment. See their website at www.spirecorp.com.

Jon Osborn (MS 1998) is a physics instructor at DePauw University in Indiana.

Forrest Payne (BS 1998) will begin graduate school at Colorado State University, where he has a graduate fellowship.

Luke Post (BA 1998) has entered the University of Arkansas MS program. He received APS funding to attend the APS Centennial meeting in March, where he presented a paper based on undergraduate research he had done with Assistant Professor Gay Stewart's Arkansas Precision Education Group.

John (Jujiang) Qu (PhD 1995) is a member of the British Telecommunications (BT) technical staff, at BT's US Systems Engineering Center, where he helps develop telecommunication system software. He is working on a venture for Concert Management Services, to provide global telecommunication services to major corporations. John is working on a product that manages all Concert Voice products and services. Since Microwave Communications Inc. is merging with World Communications, Concert is removing its Voice products from their dependency on MCI. John's project is building Concert voice products while making it independent of MCI.

FACULTY NEWS

Laurent Bellaiche published three Physical Review Letters, two Applied Physics Letters, and one Physical Review B article, on semiconductors, ferroelectrics and high-pressure effects. He also gave an invited talk about his work on perovskite alloys, at the 1999 Centennial Meeting of the American Physical Society in Atlanta. (See article in this issue).

Raj Gupta spent the Fall of 1998 Semester at Princeton University in the research group of Professor William Happer. He participated in the ongoing research on the polarization of xenon by spin-exchange with optically-pumped rubidium. He was also elected a Fellow of the American Physical Society (see news article in this issue).

William Harter has developed several new computer simulations that help to combine research and teaching. One simulates molecular-beam epitaxy (MBE) deposition based on random walks. Other simulations show the relations between linear and non-linear resonance phenomena. Another allows a more realistic way of teaching quantum mechanics, corresponding to current experimental methods. These programs take advantage of Feynman's approach as well as classical optical polarization theory.

Art Hobson's textbook Physics: Concepts and Connections was published in its second edition, by Prentice Hall, Inc. It has been adopted by the Library of Science as its Main Selection for the month of May, 1999 (see www.booksonline.com/los), and is being translated into Chinese and will soon be published in China by Shanghai Scientific and Technical Publishers. The first edition was published in 1995 and was adopted on over 85 campuses. Hobson retired from teaching this year (see article in this issue).

Claude Lacy's most interesting discovery of the last decade was published in January. Twice this century, the eclipsing binary V907 Sco has stopped eclipsing for several decades. It is the only eclipsing binary known to have done this. It is currently not eclipsing, but Lacy predicts it will start eclipsing in 2030. The driver of this behavior is a third star that causes the eclipsing pair to "wobble" and turns the eclipses on and off. The third star is probably a white dwarf or low-mass star since it does not show up in spectrograms.

William Oliver was one of 35 selected to attend an NSF-funded two-week Harvard University workshop on "Teaching Physics Conservation Laws First," out of 200 faculty applicants. Oliver also developed and implemented our new University Physics I course and lab. He was invited to the National Science Foundation for a CAREER Awardee Symposium, where he presented a talk. He presented three research talks at the Centennial meeting of the American Physical Society in Atlanta.

Gay Stewart has been elected to the Executive Committee of the APS Forum on Education, where she will serve as liaison to the AAPT. She continues to serve on the College Board Advanced Placement Physics Curriculum Development Committee. In a program under her direction, the U of A has been chosen as a pilot site for "Preparing Future Physics Faculty," a program sponsored jointly by the NSF, the Pew Charitable Trusts, and the AAPT.

Paul Thibado has resolved the atomic structure of the most important semiconductor surface, known as GaAs(001)-(2x4). He has also discovered a new scanning-tunneling microscope imaging mechanism, and submitted a Physical Review Letter about this technique.

Ken Vickers joined our department as Research Professor and Director of the Arkansas Center for Electronic-photonic Materials Innovation. He created an interdisciplinary MS program in microelectronics-photonics, a new MS Degree in Applied Physics, and a new course called "Intra/entrepreneurship of Technology." He co-authored a successful $2.1 million NSF Integrative Graduate Education and Research Training proposal. (See the article in this issue).

Min Xiao was promoted to Full Professor, and received the Distinguished Faculty Achievement Award on Research. He published 8 papers, including a Physical Review Letter. He and Dr. Michael Henry won an NSF grant for "University-Industry Partnership for Enabling Advances in Telecommunications" (see the article in this issue). He received a 3-year NSF grant for research in "Quantum-Statistical Properties and Applications of Atomic Coherence in Multi-Level Atomic Systems."

Thank You! The Paul C. Sharrah Scholarship Fund

We are nearing our goal of $15,000 to endow the Paul C. Sharrah Scholarship fund. We are grateful to all of our friends and alumni who have contributed to this fund in the past and who have continued their support. This year, the Sharrah Scholarship was awarded to Steven Sandh. During the past year, Paul C. Sharrah Scholarship Fund contributions were received from the following people: *Mr. & Mrs. Richard Anderson, Mr. Wilson Lee Logan, Mr. George K. Wallace, Ms. Carrin Wiggins, Dr. and Mrs. Min Xiao*

Other Gifts

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