Newsletter of the Department of Physics, University of Arkansas

REFLECTIONS

Volume VIII, Number 1 Summer 2000

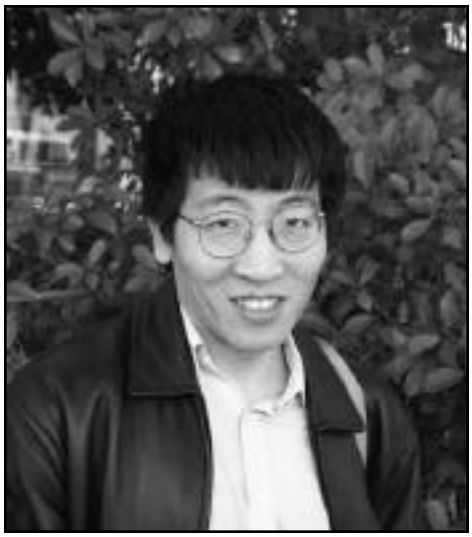
Faculty Profile: Yujie J. Ding

Optoelectronic Devices and Nonlinear Optics

Yujie J. Ding joined the physics department in August 1999 as an associate professor. He received a B.S. from Jilin University, China, M.S. from Purdue, and Ph.D. from Johns Hopkins University. His dissertation title was "Nonlinear optics from vacuum to semiconductors." He became a postdoctoral fellow at Johns Hopkins in 1990 and an associate research scientist later the same year. There he studied optical properties of novel narrow quantum-well structures and implemented the first blue-shift self-electro-optic-effect device (SEED). He was appointed assistant professor of physics at Bowling Green State University in 1992 and was promoted to associate professor in 1998. He has published 56 refereed journal articles.

His research interests include design and implementation of optoelectronic and nonlinear optical devices for generation, amplification, and modulation of tunable and coherent radiation in the ultraviolet, visible, mid-infrared, terahertz (THz), and submillimeter wave domains. Some near-term goals are to efficiently generate and amplify THz waves, implement transversely-pumped counter-propagating optical parametric oscillators and amplifiers, and realize intersubband lasers based on a variety of novel structures and configurations. On the road to these objectives, he has considered forward and backward optical parametric oscillation and amplification, and difference-frequency generation for generating and amplifying terahertz waves in CdSe, GaSe, periodically-poled LiNbO3 and LiTaO3, and diffusion-bonded-stacked GaAs and GaP plates. The advantage of using CdSe and GaSe is tunability of the output terahertz radiation. Furthermore, both CdSe and GaSe can be used to achieve backward parametric oscillation without any cavity. On the other hand, in periodically-poled LiNbO3 and LiTaO3, one can take advantage of large second-order nonlinearity. In the diffusion-bonded-stacked GaAs and GaP plates, quasi-phase matching can be achieved by alternatively rotating the plates. The attraction of using coherent parametric processes is the possibility of efficiently generating temporally-coherent and narrow-linewidth terahertz waves.

He has also systematically studied Potassium Titanyl Phosphate (KTP) crystals for efficient generation of coherent blue and green light. He has developed a simple method for measuring the damage threshold of KTPcrystal for CW irradiation using an Argon laser. The experimental results show that there are two types of optical



Yujie J. Ding

damage in KTP crystal depending on the polarization of the incident laser beam. One type of optical damage corresponds to gray tracks that are formed when the polarization is perpendicular to the crystal z-axis. Another type of damage which is invisible occurs when the polarization is parallel to the z-axis. He has also observed photorefractive two-wave mixing in KTP crystal for each of the above two polarization states. His experimental results imply that there exists charge drift during the process of optical damage at both of these polarization states, but the mechanisms are different. After analyses, he concluded that the first type of the damage was due to the formation of Ti3+ centers and the second one was due to the drift of K+ ions. In these KTP crystals, he has produced blue light by second-harmonic generation in one KTP crystal and subsequent sum-frequency generation in second Ce-doped KTP. The latter crystal was used to reduce the absorption in the blue region as a result of the doping. The overall efficiency achieved so far is around 2%.

He has also characterized ion-exchanged KTP waveguides using backward second-harmonic generation. These waveguides have extremely short periods of index gratings in each waveguide. He has observed backward second-harmonic generation in the 6th and 7th orders. These phase-matching peaks are accompanied by the presence of other sharp peaks due to distributed Bragg reflection. Although the conversion efficiency is low, he thinks he can improve it to a level suitable for many practical applications.

Dr. Ding has designed, grown, and characterized GaAs/AlGaAs multilayers for generating tunable and coherent waves in the mid-infrared in the presence of a diode laser and/or an erbium-doped fiber laser. These coherent sources are compact, monolithic, robust, and integrable. He has observed high-order phase-matching second-harmonic generation peaks in the reflection geometry in GaAs/AlGaAs mutlilayers. He has designed an optimized structure that can be used to generate coherent beam at 3.2 micrometers by mixing 1.06 and 1.6 micrometers in a GaAs-based mutilayer structure. He has also designed and grown another optimized structure for generating 2.7 micrometers by mixing 980 nm from a laser diode and 1.55 micrometers from an erbium-doped fiber laser. He has shown that these structures can be used as efficient optical amplifiers and frequency shifters.

In an asymmetric-coupled quantum-well structure, he has observed donor-acceptor pair transition. When increasing the pump intensity, the energy of the observed donor-acceptor pair transition shifts

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Alumni Profile: Dr. James K. Hendren

Dr. James K. Hendren

Dr. James Hendren, a native of Little Rock, Arkansas received his B.S. Physics with high honors in 1969, MS Physics in 1971 and his Ph.D., also in physics, only a year later in 1972 from the Physics Department, University of Arkansas. For his Ph.D. thesis he used x-ray diffraction to study "Structure of Liquids and Experimental Techniques."

After leaving graduate school, Dr. Hendren joined Safeguard System Evaluation Agency at White Sands Missile Range. There he performed independent tests of the Weapons Process Software to determine system boundary capabilities. In 1973 he joined Science Applications, Inc. (SAIC) in Huntsville, Alabama where, working as a systems analyst on the Safeguard Antiballistic Missile System, he supervised and designed the evaluation tests for the acceptance of the Perimeter Acquisition Radar (PAR) weapons system. This work lead to the modifications that changed the PAR from a long-range missile system to the most accurate early warning system for the Space and Tracking Command of the USAF. These modifications allowed the system to be quickly converted to a peaceful mission upon signing of the SALT agreement.

In 1977 Dr. Hendren joined Arkansas Systems, Inc. (ARKSYS), where he has been a leader in bringing Arkansas Systems from a 4 employee entrepreneurial company to a $12 M internationally known 140 employee company with customers in 64 countries. Dr. Hendren was President of the company from 1980 to 1996 and became its Chairman in 1996. Under Dr. Hendren, the company moved the community banks of the US into a competitive position allowing them to compete in an environment of increasingly larger banks. Arkansas Systems developed the technology that allowed community banks to interface regional interchange networks, real-time teller terminals, Point of Sale terminals, telephone banking credit card processing, Internet banking, and other payment systems.

Arkansas Systems went on to develop multinational Electronic Funds Transfer (EFT) networks for online banking purposes and has now delivered online banking through the Internet. Until Arkansas Systems developed this product, community banks could not deliver these services from their own data center; they had to rely on competitor large institutions to provide outsourced services and were at their competitors mercy.

Under his leadership, clearing systems were developed to help the Central Bank of Russia (Federal Reserve), the Peoples Bank of China, and the states of Arkansas, Louisiana, and Ohio and numerous financial institutions in over 65 countries. He supervised the development of the first automated outpatient tracking and analysis system for the VA Hospital system. The system was used in over 14 VAHospitals. He also supervised and designed the very first financial accounting systems on Personal Computers, when it was thought to be a nearly impossible task. Arkansas Systems received the Arkansas Business - Business of the Year award in 1987, Arkansas Systems was a finalist in the Earnst & Young Entrepreneurial Enterprise of the Year. Arkansas Systems was the second largest software firm in Arkansas and the largest software only firm in Arkansas.

Dr. Hendren founded a new dot com company eCountyInfo.com in 2000. He is president of this new dot com company which will supply "The eBridge to your Community". The company will provide local information and business access through a nationally known new portal for each county in the country.

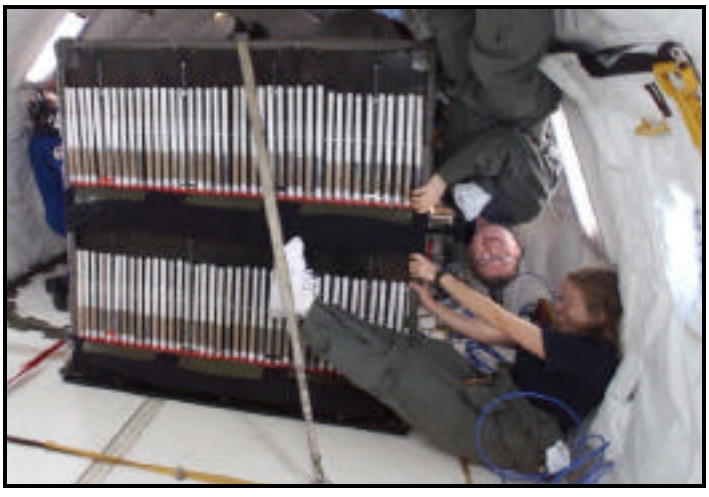
When asked how his physics training has helped him in his careers, his answer was "Problem Solving Skills!" Dr. Hendren says that his physics background has been a tremendous help to him. "The real 'tools' of a physicist are the yearning for continuous learning, the ability to recognize problems and possible solutions, and knowing how to systematically address problems, solve them and apply the results." Dr. Hendren said that he honed these skills while studying physics at the University of Arkansas at Fayetteville. The knowledge and confidence that, by applying enough work, time and energy, allows anything to be solved are valuable traits. He says that he has "a fantastically wonderful situation where I can apply problem solving tools to business, science, charitable works, and public processes and I really owe those abilities to physics and great teachers all along the way."

Dr. Hendren has published over 150 articles, reports, and manuals in the data processing and defense fields. He has been actively involved in community organizations and has played leadership roles in numerous state and national organizations. He is an Eagle Scout, an active adult member serving on the National Advisory Board, and President of the Quapaw Area Council, Boy Scouts of America. He is a Commissioner of the Arkansas Economic Development Commission, a charter member and past President of the Arkansas Association of Entrepreneurs, Chair of the International Development Council, a charter member and Vice President of Association of Knowledge-based Companies of Arkansas. From 1990-1998 he served as a member of the Arkansas Science & Technology Authority. He has also served on Advisory Boards of the University of Arkansas at Little Rock, including Computer Information Systems and System Engineering College and the College of Business along with the Curriculum and Selection Committees for IT Minor. He is on the Industry Advisory Committee of John Brown University. He is also a member of the Walton School of Business Arkansas Executive Forum on the Fayetteville campus.

Physics Majors in UA Reduced Gravity Team

By Ryan Godsey

University of Arkansas students Noel Napieralski, Ryan Godsey, Christy White and Katrina Bogdon participated in the March 2000 Campaign for the Undergraduate Gravity Flight Opportunity. Noel Napieralski recently graduated with her physics degree at the university, and Katrina Bogdon and Ryan Godsey are currently pursuing a physics degree. They were selected with 47 other undergraduate teams to do research aboard the KC-135A at NASA. The KC-135A (also called the "Weightless Wonder") does 30-40 parabolas with microgravity, lunar-g, and martian-g conditions. Microgravity is experienced for approximately 18-25 seconds per parabola. During their two week stay in Houston, Texas, they trained for the flight, met with NASAadministrators and astronauts, and participated in two flights. This was the first team to represent the state of Arkansas. The purpose of their experiment was to examine separation of fluidized particle beds in microgravity conditions. The practical applications of this research extend to exploration and possible mining of asteroids, satellites, and other planetary bodies. Their advisor was Dr. Derek Sears of the Cosmochemistry Department at U of A. The Physics Department supported this team, as they traveled to NASAto test their experiment.



Maurer Lecture 2000: Bloopers at Warp Speed

Maurer Lecture 2000: Bloopers at Warp Speed
The 2000 Maurer Lecture was delivered in Don Reynolds Center Auditorium on March 2 to a packed auditorium The excerpts from an article that appeared in Arkansas Democrat-Gazette follow.

....Lawrence Krauss, ... the author of The Physics of Star Trek, and chairman of the physics department at Case Western Reserve University in Cleveland. It's the mothership for his ongoing mission to use the show's many bloopers to teach the truth about physics, and the limitless possibilities it holds for us in the future. "I think what has really kept Star Trek going for more than 30 years now is that it is about possibilities," Krauss says, opening the talk with a short clip from The Next Generation. "That's really the mission of the Enterprise, ... to go out there and find out what's possible in the universe, and really that's what physics is all about." In a presentation March 2 at the University of Arkansas at Fayetteville, Krauss engaged a packed house of more than 200 students, faculty and Star Trek fans on the myriad questions of fact raised in the popular future created by Gene Roddenberry in 1966.

...Krauss is an unabashed aficionado of the fictional universe, using its appeal as a way to teach the true laws of physics, which have endured the test of time and will continue to hold fast well beyond the 23rd century. "Like every good physicist we have to learn that before you get to Einstein you got to get past Newton. And that's true for the Enterprise, in fact every time Jean-Luc Picard says 'Engage,' he's committing suicide, which is a problem." Krauss, 45, then starts an hour-long but lighthearted assault on the Enterprise and a number of impracticalities that guide the ship through the Star Trek universe. Among them is warp drive, the force of which would cause Picard and the rest of his crew to "turn into salsa." His first clip shows Picard in his quarters watching explosions occur in space. The noise causes the captain to wince. "Aliens got it right when they said in space no one can hear you scream," Krauss says. "Because in space sound can't travel. Now, not only did you see a number of explosions but you also heard them. Star Trek got it wrong and it's actually even worse than that. Notice you saw them and heard them at the same time. Of course sound travels much more slowly than light." ...Having explained sound waves, he travels through matters of warp speed and time travel, favorite subjects in the TV series. "Even at the speed of light, it'd take you 30,000 to 40,000 years to get to the center of our galaxy," Krauss says. But according to Einstein's Theory of Relativity, the closer you travel to the speed of light; the more time slows down. "That means in principle you could travel across the galaxy in a human lifetime," Krauss says. "If you were traveling from the sun to the center of the galaxy at the speed of light it would take you about 40,000 to 50,000 years, but if you're on the spacecraft, traveling at the speed of light, your clock is traveling slowly and that whole trip might just take two weeks." It's fine if you have a single spacecraft, but if [you've] got a federation over which you want command and control, [you've] got a problem: You send the Enterprise out on a five-year mission, it comes back 50,000 years later," he says with a laugh. And the amount of conventional rocket fuel to perform such a trip is a physical impossibility. Krauss says the amount required to propel a single atom to the speed of light would be more than the total mass of the known universe.

... "I predict the physics of the 23rd century will be far more interesting." Indeed. And surely that's why these students are crowded in the lecture hall's staircases and sitting on the floor. For more than an hour they've been held in rapt attention through discussions of negative energy mass, the profound search for intergalactic intelligence via a billion bands of radio frequency, the theory of controlled and uncontrolled time travel through wormholes, the warping effect of matter on space and how light speed movement is impossible but possible all at the same time. ...

courtesy Bret Schulte
ARKANSAS DEMOCRAT-GAZETTE

Laurent Bellaiche wins NSF-CAREER Award

Assistant Professor Laurent Bellaiche won the prestigious NSF sponsored CAREER award. The award will allow him to develop an academic research program aimed at understanding the structural, piezoelectric and dielectric properties of fundamentally and technologically important materials, namely the ferroelectric alloys, and to integrate this program into the educational experiences of both graduate and undergraduate students at the University of Arkansas. Bellaiche is the fourth physics faculty to win this award.

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towards the blue domain. The amount of the blue shift is more than 10 meV. This is his first direct observation of the blue shift with such large amplitude. He had observed blue shift in a similar structure in an earlier measurement. However in that case the donor-acceptor pair transition peak was superimposed on the excitonic transition peak. Therefore, the amount of the blue shift was obtained only after decomposing the entire lineshape into two peaks.

The results obtained above have potential applications in optical communications, remote sensing, and naval communications. Dr. Ding currently has one postdoctoral fellow and three PhD students working in his group.

Robert Maurer Awarded Charles Stark Draper Prize

The National Academy of Engineering (NAE) announced that Drs. Robert D. Maurer, Charles K. Kao, and John B. MacChesney - are the recipients of the 1999 Charles Stark Draper Prize for their work in developing fiber optic technology, a watershed event in the global telecommunications and information technology revolution. The $500,000 prize was presented at a dinner honoring the recipients last February during National Engineers Week. Maurer retired from Corning Inc. in 1989 and resides in Painted Post. Kao is chairman and chief executive officer of Transtech Services Ltd., Hong Kong, and MacChesney is a research fellow at Bell Laboratories, Lucent Technologies, Murray Hill, and New Jersey.

"The NAE is proud to honor these visionaries for the development of one of the most revolutionary inventions the world has ever seen," said William A. Wulf, president of the National Academy of Engineering. "Communication as we now know it, including the Internet, would not exist without fiber optics. Innovations such as videoconferencing, electronic commerce, and high-quality long-distance telephone service are a direct result of the work of these three engineers."

The Charles Stark Draper Prize, endowed by Draper Laboratory, Cambridge, Mass., was established in 1988 to recognize individuals whose outstanding engineering achievements have contributed to the well being and freedom of humanity. The once-biennial prize will now be awarded annually. This year's award celebrates fiber optic technology, which uses light to carry information through silica fiber material that is thinner than a human hair. Its low manufacturing cost and its ability to transmit vastly more information than copper wire has fueled the explosion in global communications. It is the "concrete" of the information superhighway. By the end of 1998 more than 215 million kilometers of optical fiber had been installed for communications worldwide, enough to stretch to the moon and back nearly 280 times.

Professor F.T. Chan Retires After 31 Years

Professor F. T. Chan, Professor of Physics is retiring in August 2000 after 31 years of research, teaching, and service at the Physics Department, University of Arkansas. Professor Chan joined the Physics Department in 1969 as an Assistant Professor and was promoted to Associate Professor in 1975 and to Professor in 1980. He received his B.S. from Sun Yatsen University in China and his Ph.D. from the University of California, LaJolla. He did his postdoctoral work for two years at Cornell University. Dr. Chan conducted important research in both theoretical and experimental physics, advancing knowledge in atomic theory with his investigations of electron-atom collisions, two photon emission processes and two-dimensional hydrogen atom. Although he is primarily a theorist, Professor Chan also contributed to experimental high temperature superconductivity with his studies of super conducting single and multi-layer thin films of ceramic materials. After retirement, Professor Chan and his wife Linda will move to California to be near their daughter. We all wish him an active and peaceful retirement.

Professor F.T. Chan

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News

THIS YEAR'S PHYSICS GRADUATES

LeAnn Brown, Bachelor of Science, will serve as a missionary in Peru for one year prior to attending graduate school.

Sherman Bui, Bachelor of Science, will attend graduate school at the University of Arkansas.

Ryan Coffee, Bachelor of Arts, is attending graduate school in physics at the University of Connecticut.

Phillip Hankins, Bachelor of Science, will attend graduate school in philosophy at the University of Rochester.

Joshua Hamblen, Bachelor of Arts, is attending graduate school in physics at the University of Rochester.

Kelly Jacobs, Bachelor of Arts, will enter the University of Arkansas Medical Sciences campus in Little Rock.

Kyle Marcrum, Bachelor of Arts, joined the Air Force and will be stationed in Fort Knox.

Noel Napieralski, Bachelor of Science, will attend graduate school in mechanical engineering at the University of Arkansas.

Michael Offenbacker, Bachelor of Science, will be working for Dr. Oliver during the summer.

Clint Ryan, Bachelor of Science, will attend graduate school in computer science at the University of California at Berkeley.

FROM THE CHAIR

June 15, 2000

Dear Friends,

Greetings from Fayetteville. It is my pleasure to bring you up to date on many exciting happenings of the past year.

Our undergraduate program continues to show strength against a national background of declining number of physics majors. The Department granted 15 baccalaureate physics degrees this year. Many of our majors participated in the National Science Foundation (NSF) sponsored Research Experience for Undergraduate (REU) programs around the country and won national and state scholarships and grants. These include NASA and SILO/SURF grants and Goldwater Fellowship.

We have also initiated a number of changes to our graduate curriculum to provide our students more flexibility and an early exposure to research. An applied physics MS Degree along with an interdisciplinary MS in Microelectronics-Photonics (microEP) was introduced last fall and a PhD in MicroEP has been approved by the Department of Higher Education.

Associate Professor Yujie Ding joined the physics department in fall 99. His expertise in optoelectronic and device physics adds further strength to our programs in optics and condensed matter physics. Professor F. T. Chan is retiring in August 2000 after 31 years of teaching and research. You may recall Prof. Z. Z. Sheng retired last year. Thus a glorious era in high temperature superconductivity research in the Department has come to an end.

Assistant Professor Bellaiche, who joined the department last Spring, won the prestigious NSF CAREER award. This brings the number of CAREER awardees in the department to three. Other significant awards include a $2.1 million NSF Integrative Graduate Education and Research Training (IGERT) grant to Profs. Len Schaper and Greg Salamo. We will be hiring one new faculty member next year.

Our biggest problem is the lack of space for our teaching and research. We have outgrown our current facilities. Our best chance to accomplish this in a reasonable time frame is the sponsorship of our planetarium by an outside sponsor. During the coming year we will explore this and other options to bring about an early completion of the second phase of the physics building.

The Maurer Lecture series supported by an endowment established by Robert Maurer has been a great success. We are grateful for your generous monetary support of the Physics Department. Your contributions allow us to offer academic scholarships and support many student activities which otherwise we would not be able to do.

Please keep us posted of 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. With my best wishes,

Surendra Singh, Chair

Steven Sandh, Bachelor of Science, will teach for one year in China.

Matthew Schaefer, Bachelor of Science, will attend graduate school in computer science at the University of Wisconsin, Madison.

Colin Shaw, Bachelor of Science, will attend graduate school in physics at the University of Arkansas.

William Squires, Bachelor of Science.

Jacob Stephenson, Bachelor of Science, will be working as a computer programmer.

Kjell Tengesdal, Bachelor of Science, will attend graduate school in physics at the University of Arkansas.

UNDERGRADUATE STUDENT NEWS

Laura Fields, Ben Hood, and **Steven Sandh** won an Arkansas Information Liaison Office (SILO) Grant.

Ben Hood won a **Tylenol Scholarship** based on leadership responsibilities in community, school activities, and GPA. He participated in the NASAAcademy 2000 At Research Center. Ben helped make the stars more accessible to UA astronomy students when he used his scholarship money to buy a $3,800 telescope for the physics department. He was also the recipient of the **Bryson Fellowship** for 2000-2001.

Tracy Hoke was chosen to participate in a NSF sponsored Research Experience for Undergraduates program.

Katrina Bogdon, Ryan Godsey, Noel Napieralski, and Cristy White were NASA's Reduced Flight Opportunity Project participants.

Laura Fields won the Barry Goldwater Scholarship. She participated in the Arkansas space grant consortium. She was also chosen to participate in a NSF sponsored Research Experience for Undergraduate program at CERN.

The following students were awarded the **Physics Faculty Scholarships** for the year 2000-2001: **Nadeem Akbar, Allen Doyel, Dominic DiMaggio, Denise Malan, AmberHolly, Greg White, and Haley Britt Beverburg**

Clint Ryan was awarded the **Lingelbach Prize** for outstanding physics major.

Nicholas Farrer and **Clint Wood** shared the **Richardson Senior Fellowship.**

Ronnie Toland was awarded the Paul Sharrah Scholarship for the year 2000-2001.

Nadeem Akbar, Bachelor of Science, was selected by India Abroad Center for Political Awareness to be an intern for Senator Blanche Lincoln (D-AR) this summer. Akbar completed his sophomore year and is from Russelville, Arkansas. In addition to Physics, he is majoring in Middle Eastern Studies and Math and minoring in Arabic. He is active in school, working as a research assistant in the biology department and tutoring students. He is also active volunteer in his community. In his free time, he enjoys playing the tabla.

GRADUATE STUDENT NEWS

Stephen Highland was awarded the first Lloyd Hamm Outstanding Teaching Assistant in Physics prize sponsored jointly by the Physics Department and the American Association of Physics Teachers for the year 1999-2000.

Al-Yacoub, Ahmad attended the American Physical Society Meeting held in Minneapolis, Minnesota last March and presented a paper entitled, "Quantum Effects in Ga Inx As 1-y Ny Semiconductor Alloys." Currently, he is working on first principle Calculation of the Piezoelectric Anomalties of Nitride Alloys.

Daniel Bullock published one Physical Review Letter and presented papers at the 1999 American Physical Society Meeting in Atlanta, GA, and the American Vacuum Society Meeting in Seattle, WA. Another Physical Review Letter has been accepted for publication. He attended the Arkansas Academy of Sciences Meeting in Hot Springs, AR and was awarded first place for graduate presentations.

Christi Emery began her training in the Molecular Beam Epitaxy/Scanning Tunneling Microscopy lab. She has been involved in various projects throughout the year that resulted in three papers.

Dorel Guzun published one paper in Optics Letters and another in Physical Review Letters. He also presented two papers at conferences in Baltimore, MD.

Fuad Rawwagah was awarded a $6,000 fellowship by the World Laboratory based in Lausanne, Switzerland.

NEW GRADUATE STUDENTS

Abdullah Al-Brakaty, B.Sc. UMM Al-Qura University, Kingdom of Saudi Arabia
Sherman V. Bui, B.S. University of Arkansas at Fayetteville
Brian C. Elliott, B.S. University of Arkansas at Pine Bluff
Daniel B. Erenso, B.Sc., M.Sc. Addis Ababa University, Ethiopia
Aaron M. George, B.S., Texas A & M University
Andre'Guerin, B.S., Rose-Hulman Institute of Technology
Stephen R. Highland, B.S., University of Minnesota, Duluth
Jones, Eran J.
Oleg Nadiarnykh, B.A., Russian University of Chemical Technology
Fuad Rawwagah, B.Sc., M.Sc., Yarmouk University, Irbid, Jordan
Xiaoyong Wang, B.E., M.S., Tianjin University, China
Ioulia B. Zotova, B.S., Russian University of Chemical Technology

Physics Major wins Barry M. Goldwater Scholarship

Laura Fields, a physics major, won the prestigious Barry M. Goldwater scholarship. With Laura and two other undergraduate students winning this award, the University of Arkansas has once again ranked alongside top Ivy League and private institutions, producing multiple winners in the Barry M. Goldwater Scholarship competition.

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. Furthermore, the scholarship committee looks for prior involvement in research or experience working in a lab environment. Students who meet these qualifications must then submit a research proposal, outlining a project that not only fits the applicant's field of interest for the scientific community as a whole.

Laura Fields submitted a proposal that will help shed light on the shape and structure of specific proteins. Using a technique called Dynamic Light Scattering, Fields and her mentor shine lasers into a protein solution and observe the pattern produced as the light passes through. As the proteins in the solution unfold, the pattern of light changes, allowing Fields to determine the conditions under which the proteins change shape. "In order to create life, proteins have to fold into a very specific shape," Fields explained. "How they 'know'shape to assume is one of the great mysteries of modern science."

In addition to earning the Goldwater Fellowship, Fields also won a SILO grant for undergraduate research and a National Science Foundation Research Experience award, which will allow her to conduct research this summer at CERN - the European Laboratory for Particle Physics, located near Geneva, Switzerland.

ALUMNI NEWS

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

Roslan Abd-Shukor (PhD 91) is professor of physics at the School of Applied Physics, University of Kebangsaan, Malaysia. He was given the "National Young Scientist Award" for 1999 by the Malaysian Government recently for his research contributions to high temperature superconductivity.
Email: ras@pkrisc.cc.ukm.my

Paul Glezen (BS 88, PhD (USC) 95) was selected as Distinguished Alumnus in computer science, University of Arkansas for 1999. He is currently employed at IBM Software Solutions.
Email: pglezen@us.ibm.com

Brian Monson (PhD) has been appointed Director of Arkansas School for Math and Science in Hot Springs, Arkansas beginning fall 2000.

Colleen Wilson-Hodge (BS 92) completed her Ph.D. in physics from the University of Alabama in Huntsville on May 23, 1999. The public relations people there decided to do a web story about her which can be accessed at http://www1.msfc.nasa.gov/NEWSROOM/news/releases/1999/99-093.html There is a similar story on the kids web page: http://kids.msfc.nasa.gov/News/NewsWilsonHodge.asp She took a vacation to West Virginia which included a visit to (free public tour) the National Radio Astronomy Observatory at Green Bank. Currently she is working to determine the orbit for one of the X-ray pulsars in the web story!
Email: Colleen.Wilson-Hodge@msfc.nasa.gov

John Qu (PhD 94) writes that the job market in computer software area is very dynamic. He is currently working as a senior consultant for a small consulting firm, Freddie Mac, and provides software development service, including design, implementing/developing software applications for different projects utilizing Java, and distributed programming Internet. He likes being exposed to different business areas and getting challenging opportunities to help his clients.
Email: John_Qu@freddiemac.com

Alan C. Tribble (BS 83, PhD (Iowa) 88) served as a space environment specialist at Boeing Space Systems Division providing analysis to spacecraft design teams, including the Global Positioning System (GPS) and the International Space Station. He has authored 20 technical publications and several books including the Princeton Guide to Advanced Physics. He returned to Iowa in 1996 where he is manager of Software Applications Development for Rockwell Collins in Cedar Rapids, Iowa.

FACULTY NEWS

Yujie Ding published seven refereed journal papers. He also gave two invited talks at Photonics West. He successfully carried out several projects during the past year which included: pulse broadening and shaping by parametric amplification of short pulses in transverse-pumping geometry; explored the possibility of achieving ultrabroad-bandwidth electro-optic modulator based on a cascaded Bragg grating; investigated a novel cascaded waveguide phase-matching configuration; efficiently generated coherent blue and green light based on frequency conversion in variety of novel configurations and structures; second-order nonlinear materials for efficient generation and amplification of temporally-coherent and narrow-linewidth terahertz waves. He also set up a state-of-the-art laboratory for his group to design and characterize optoelectronic devices.

Art Hobson became Professor Emeritus in May 1999, but he's not really retired. He comes to work every day—it's just that nobody pays him for it. During its first year of publication, the second edition of his textbook sold about 10,000 copies and was adopted on 78 campuses. A translation is nearly ready for publication in China. His article "Teaching Societal Topics in Introductory Physics" was published in the Chinese journal Science. During the past year, he presented invited talks in Szeged, Hungary; Guilin, China; Austin, Texas; Tuebingen, Germany; Dresdon, Germany (German Physical Society); and Long Beach, California (APS). He presented contributed talks in San Antonio,Texas; Tulsa, Oklahoma; Washington, DC; and Orlando, Florida.

Claud Lacy has four publications resulting from work on eclipsing binary stars that have appeared in the past year, two of these publications were co-authored by (undergraduate student Kyle Marcrum and graduate student Jeff Sabby). He has been awarded a major grant by the National Science Foundation (with local matching, $80K) to fund creation of an autonomous web-based telescope observing system (the URSA Telescope, an acronym for Undergraduate Research Studies in Astronomy). The telescope is being built on top of Kimpel Hall out of standard commercial components. The key elements needed are the web interface and telescope/dome control program that will be written by his graduate student Jeff Sabby and an undergraduate honors major Ben Hood. Students will then be able to request observations from the system and later retrieve their results over the Internet. This capability will enable a new teaching style emphasizing research projects as a major component of every level of astronomy classes. He hopes this will improve learning and motivation in our courses.

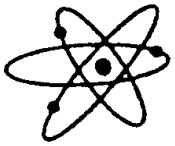
Michael Henry, William Oliver and **Laurent Bellaiche** had our NSF-funded Research Experience for Undergraduates Site for "Modern Optics and Optical Materials" renewed for another three years.

Gay Stewart was awarded a grant for Preparing Future Physics Faculty at UA. This makes our department one of four pilot sites in the nation for this program striving to help graduate students to be better prepared for all aspects of a faculty position. She is strongly involved in improving undergraduate education and was elected to the Executive Board of the APS Forum on Education. She has been chosen to be the chair of the Advanced Placement Physics Curriculum Development Committee, which has a national impact on what is required of students in high school physics, and is a contributer to a proposal made jointly by the APS, the AAPT and the AIP called PhysTEC, for Physics Teacher Education Coalition. If funded, the 5-year $4.6M project would allow six institutions in the nation (including UA) to develop working models of K-12 physics teacher preparation. This year, she has been invited to give talks on these efforts at the national meetings of the APS, the AAPT and the Association of American Colleges and Universities.

Paul Thibado completed seven publications, two in the prestigious Physical Review Letters journal. He gave 18 talks at various conferences and institutions, which included nine invited talks. Results were highlighted in various journals including: Science News, Inside R&D, Vacuum Solutions, EE Times, Microelectronics Alert, $\sum$. He initiated a highly interactive teaching methodology in College Physics. Students now use remote control units during class to answer questions. Each unit sends out a unique signal so all 200 student responses can be recorded for grading purposes, which resulted in nearly 100% attendance, 100% participation, and significant improvement in learning.

Ken Vickers is the Director of the microEP Program. The Microelectronics-Photonics (microEP) interdisciplinary graduate program hosted by the Physics Department (with faculty from Physics, Chemistry, Electrical Engineering, Mechanical Engineering, and Chemical Engineering) is now an established program with its first MS microEP graduates this spring/summer. It won the support of a $2.1 million NSF Integrative Graduate Education and Research Training (IGERT) grant for Ph.D. microEPstudent support in June 1999, received state approval for the MS microEP degree in July 1999, and received final state approval for the Ph.D. microEP in July 2000. With the fall 2000 enrollment, the program will have over thirty graduate students following this interdisciplinary curriculum path (many of them working with Physics faculty). He continues to work with students to integrate team-based soft skills training with traditional graduate academic curricula with the goal of increasing students' effectiveness in the workplace after graduation. He is interested in migrating these educational innovations into the Physics graduate programs, and has submitted a proposal to the Department of Education for funding to support that effort.

Laurent Bellaiche published 6 refereed publications, including 2 Physical Review Letters, 1 Applied Physics Letters and 1 Physical Review B, on ferroelectrics and semiconductors. He and his collaborators gave seven research talks, including four invited presentations in Albuquerque (NM), Aspen (CO), Atlanta (GA) and Golden (CO). He also won the CAREER award from the National Science Foundation, and received two other grants from the Office of Naval Research and the Petroleum Research Fund. The main objective of the CAREER proposal is to develop an academic research program aimed at understanding the structural, piezoelectric and dielectric properties of fundamentally- and technologically-important materials, namely the ferroelectric alloys, and to integrate this program into the educational experiences of both graduate and undergraduate students at the University of Arkansas.



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