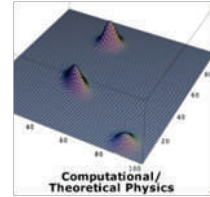


NEWSLETTER OF THE DEPARTMENT OF PHYSICS  
FULBRIGHT COLLEGE OF ARTS AND SCIENCES



# REFLECTIONS

Volume XIV, issue 1

Summer 2010

## UNIVERSITY OF ARKANSAS

### Contents

- Alumnus Profile: Robert W. Gruebel, pgs.1-3
- Goldwater Scholars, pgs. 2&10
- Gupta Retirement, pg. 4
- Research, pg. 5
- News, pgs. 6-7
- 2010 Maurer Lecture on Bioterrorism, pg. 8
- 50th Anniversary of Ph.D. Program, pg.8
- Physics Education, pg. 9
- Hughes Fellows, pg. 9
- Arkansas Professor of the Year, pg. 9
- REU, pgs. 10-11
- Letter from the Chair, pg. 11
- Donors, pg. 12

### ALUMNUS PROFILE: (ROBERT W. GRUEBEL)

Where did he come from..., when was he here..., and where has he been since? Bob Gruebel was born in La Crosse, Wisconsin in the 1920's and attended public schools until the 11<sup>th</sup> grade, when he dropped out in April 1941 to join the Navy. Before joining the navy, he followed the steps of his father and was a journeyman tool and die maker; however, because of his intense interest in aviation, he became an Aviation Machinist Mate and radio-gunner in a Torpedo squadron, which joined the *USS Enterprise* Air Group in the Pacific. The *USS Enterprise* took part in 20 of the 22 major naval battles during WW II. She was returning to Pearl Harbor from Wake Island on December 7, 1941, and was too late for the Battle of Coral Sea because she had escorted the *USS Hornet*, which launched Jimmie Doolittle and his B-25 raiders to attack Tokyo in April of 1942. He flew in torpedo planes in Torpedo Squadron Ten off *Enterprise* from 1942 through 1944 and was in 14 of the *Enterprise's* 20 naval battles. At the Battle of Santa Cruz he shot down one Zero fighter and assisted in the destruction of another before being shot down and rescued by the *Destroyer USS Preston*. The *Enterprise* was severely damaged and unfit to sail to the defense of Guadalcanal and nine TBF Avengers (one contained Gruebel) were dispatched to Henderson Field, code name Cactus, to join the rag-tag Cactus Air-Force on Guadalcanal in November, 1942. He flew repeated attacks against the Imperial Japanese Navy from Guadalcanal. In the naval battles off Guadalcanal in November, 1942, his Torpedo Squadron sank the *IJN Battleship Hiei* and four troop transports in a crucial battle that kept the Japanese from landing 50,000 troops



Bob Gruebel and grand-daughter Katie Gruebel-Williams after award of the Purple Heart for wounds received in 1942, awarded 2 July 2003 at the unveiling of the Purple Heart stamp by the USPS.

with food and ammunition that would have reinforced their 18,000 troops already on Guadalcanal. The 1<sup>st</sup> Marine Division defending the airfield on Guadalcanal numbered approximately 8,000. Fewer than 2000 Japanese troops survived to land without food or ammunition. The Japanese Navy never seriously challenged the US Navy again. The number of US and Australian ships sunk in the November battles led to the region between Tulagi, Guadalcanal and Savo Island being named "The Iron Bottom Sound."

The loss of the *USS Hornet* at Santa Cruz left *Enterprise* as the only US carrier afloat in the Pacific. After refit in the fall of 1943, she joined Admiral Mitscher's Task Force 58 to begin the campaign to conquer the Pacific Islands and force the Japanese back to their homeland.

In April, 1944, Gruebel was shot down

at Truk Lagoon and was rescued, along with 21 other aviators, by the submarine *USS Tang*. He finished out that war patrol on the *Tang* before she returned to Pearl Harbor. His picture on page 2 (left 2<sup>nd</sup> row) appeared in a full-page spread in a May 1944 issue of *Life Magazine*. During the period from 1941 to 1945, Gruebel was shot down at sea or crash landed 8 times.

Gruebel's crew returned to *Enterprise* from Pearl Harbor in time to fly in the conquest of the Marianas Islands and the Marianas Turkey Shoot. His crew (Nelson, Livingston, and Gruebel) made the initial contact with the Japanese fleet, which was moving to crush their landings on Saipan and Tinian. The largest carrier battle in history ensued, the Battle of the Philippine Sea. He was awarded the Distinguished Flying Cross, Purple Heart, Air Medal (with 5 gold stars in lieu of Air

(continued on pg. 2)

Photo from the May 1944 issue of Life Magazine. Gruebel is 2nd row on the left.

Medals), the Presidential Unit Citation for service on the *USS Enterprise* and a second for service in the First Marine Division at Guadalcanal, a Navy Unit Commendation, the Combat Action Ribbon, Medal for Humane Action, Navy Occupation Medal with Japan and Europe bars, several campaign medals, and several letters of commendation from Task Force commanders and the Chief of the Bureau of Naval Weapons. In addition, he wed Eleanor Jane Perry in San Francisco in July, 1944.

Gruebel studied law in Hawaii and was a "sea lawyer" until 1952 when the Unified Code of Military Justice barred him from serving as defense counsel. He took the 1<sup>st</sup> Year Bar Exam in California in the mid-1950s. He remained in the Navy after the war and continued to fly in the Naval Air Transport Service. He was one of 30 promoted to Chief Petty Officer in 1949 as the result of a navy-wide examination. He flew in China, the Berlin Airlift, Korea, and delivered small arms and ammunition to the French forces at Dien Bin Phu. On duty with the Military Air Transport Service, he was Chief Flight Engineer Examiner and Aircraft Performance Engineer for the Lockheed Constellation and the Boeing Strata-Cruiser. For several years he flew to service the US Embassies worldwide and acquired a remarkable collection of tribal art from Africa, SE Asia, Japan, Australia, Oceania, and the Northwest Pacific Coast. He taught electro-magnetic theory, aerodynamics, thermodynamics and engine theory to pilots and flight engineers in a squadron flying the Mars flying boats. In 1954 he established and directed the Constellation 12-week ground school for pilots and flight engineers. In 1957, he joined the Navy Bureau of Aeronautics Representative at Lockheed Aircraft Corporation, serving as the Assistant Bureau of Naval Weapons Representative and acceptance/flight test engineer for the Navy at Lockheed Air Services.

Then Gruebel asks: "My goodness, what shall I do now, accept a management position with Lockheed or the Bureau of Naval Weapons? Should I use my Commercial Flight Engineer certification to join an airline or Lockheed Flight Ops, my Master Tool and Die-maker experience to open a Tool & Die Shop....?" He realized, "Opportunities were rife, but, ah no.... In the Navy, I was with my family about one week a month. What better way to honor Jane and my children than to use the GI Bill and create someone new? Pomona College? UCLA? CalTech? Harvey Mudd? Reed College? UC Riverside? All were prospects, all attractive, all too expensive. My parents lived at Red Bluff, on the Buffalo River near Gilbert, Arkansas. I visited them and the



Physics Department in Fayetteville in December 1960, where I chatted with Paul Sharrah. The Ph.D. program was approved, and Frank Biggs, Bill Pendleton, and John Petz, among others, were prospective candidates. After talking with undergraduate and graduate students, I knew there was a place for me in Fayetteville. I was admitted in the fall of 1961."

He and his family lived on Lakeside Drive, just a short distance from the homes of Professor Zinke and Professor Cordes. His children attended Root School and Fayetteville High School. Ralph and Bob were in Scouting, and Barbara was completely devoted to learning. The children were positively influenced by seeing their Dad studying and reveling in the new world opening to him. Education became a real goal for them and they excelled in engineering and medicine.

Finances were extremely tight and Professor Sharrah offered him employment organizing and maintaining demonstration equipment. Mr. George Lingelbach supervised his work, and they became good friends. Lingelbach told him of Dr. Hamm's acoustics work and, Gruebel says, "Of course, we used Dr. Hamm's book of experiments in lab and it still enjoys a prominent place on my bookshelf."

Liberal Arts and mathematics posed no real problems for him, however, it was immediately clear to him that the pace set by the Whiz Kids... Jack Swift, Bill Evans, David Ross, Ben Doughty, David Kaye, and others "would tax me in Physics ... and it did."

Professors Glen Clayton and Otto Zinke were both navy men, and Gruebel found them to be kindred spirits as they offered encouragement and support (and swapped sea stories). Prof. Clayton accepted him in his research group and under his tutelage, by way of John Petz.. Gruebel became immersed in diffraction research. His tool and die making skills served him well as he built cryostats, sample holders, temperature

controllers, counting systems, bent and ground crystal X-Ray monochrometers and a new programmable diffractometer with a solid state counting system; each of these was a new and challenging research problem for him. At that time, the Physics shop was primitive and Professor Clayton arranged that he could use the Engineering Shop for precision work.

Gruebel says, "I was given full run of the shop, but for safety reasons could not work alone. Professor Clayton scheduled significant blocks of time to sit with me as I built equipment. That time with him... talking of Physics, research problems, academics, language, the goals of our research group, philosophy of teaching and life, and of course, machine work, was and is precious to me. The acme of my undergraduate physics was my presentation of diffraction studies of carbon tetra-chloride at the Annual American Physical Society meeting in 1964. Professor Jones' Symon Mechanics course opened a new world for me, as did E&M Fields and Waves out of the just published text by Corson and Lorraine. Professor Zinke's Thermodynamics by Zemansky, was a precious meld of mathematics, concepts, and useful applications. Professor Hughes' Optics course has been for me the most interesting and useful of courses."

In January 1964, Gruebel was awarded his baccalaureate degree with "High Honors in Physics" and was elected to Phi Beta Kappa. The exhilarating experience with undergraduate research led him into graduate school. He and Ben Doughty received NASA Fellowships.

Graduate school was the customary mix of long hours in the research lab and preparing for lectures. Of the research, he says, "The lower floor of the department was never quiet. There among the intellectual and hands-on activities, Gruebel found a wonderful new world. Exciting things were happening in Dr. Hughes' atomic lab and Dr. Zinke's lab, where a variety of experiments were in progress, Dr. Day's NMR lab, and in Dr. Anderson's lab across the hall from the diffraction lab's noisy water chiller. Professor Hobson's office door was always open for discussion of puzzling theoretical concepts.

I was able to help with equipment and absorb much of the research in other groups. It was all fascinating, but best of all was the interaction with my fellow students. Chronologically, I was an old man, but intellectually I was very much in tune with David Ross, Ben Doughty, Ray Dawson, David Kaye and his brother, Canada, Daryl Collier, Ray Higdon, Frank Biggs, Bill Pendleton, John Petz, Bob Graham, Charlie Rogers, Carl Rutledge, James Hendren, and so many others. My colleagues inspired confidence and my quest for competence in physics and life was a thrilling experience. I took every physics course that was offered and, in graduate work, since the NASA Fellowship paid tuition, I repeated courses when a new or different faculty member taught the course. The different perspective was invaluable, in particular that perceived in Dr. Art Hobson's Jackson E&M and Stat Mech, as well as Dr. Plummer's group theory approach to Solid State." (continued on pg. 3)

## G R U E B E L ( C O N T . )

Gruebel reflects that the U of A was the best choice for him. The faculty was encouraging, and he felt as if he was "the Little Engine that Could." Glen Clayton and Otto Zinke were always willing to talk physics or offer advice on any number of other areas. Gruebel was active in diffraction research as both an undergraduate and graduate student. He says, "Glen Clayton was a wonderful research director... he allowed me great latitude in choosing systems to investigate. I found complex molecular systems both difficult and fascinating. Dr. Clayton and I were regular participants in the Pittsburg Diffraction Conference."

The language examinations and the candidacy examination were important milestones to Gruebel. There had been rumors about eliminating the candidacy exam and using continuing evaluation. He found that the preparation for the candidacy exam was an excellent capstone for him. The weekend before the candidacy examination, his family attended the Black Hawk Folk Festival where he met several physics faculty members. He says, "Dr. Zinke, in particular, was concerned that I was not busy preparing. My remarks: '... if I was not prepared after 4 years of study, two more days could not make much difference...' astonished him."

His MS and Ph.D. research were each a joy, he says, and he reveled in writing his thesis and dissertation. He demonstrated he was supremely confident that he could work at the research frontiers of physics.

And success did come. Gruebel relates that "May 29, 1968 was a red letter day for the Gruebels. My son Robert received the BSEE and I handed the Librarian my dissertation."

Soon after, Gruebel accepted an assistant professor position at the Stephen F. Austin State College. The chairman, John Decker, was a

product of the U of A, and the rapid growth of the department there was an attractive challenge for Gruebel. The research facilities in the new science building impressed him. He says, "The faculty has grown from three to nine, and the department offers the BS and MS degrees. Glen Clayton joined us as Professor of Physics and Dean of the College of Sciences and Mathematics in 1974 and he later became Graduate Dean. He was a tremendous asset to our department and the university."

Gruebel joined Halliburton Services during a leave of absence in 1982 and 1983 to serve as Corporate Radiation Safety Officer with an office in San Antonio, Texas. He established and maintained a Radio-active Materials Management Program in Texas, including collateral duty as supervisor of the use of RAM in oil well servicing. He and a Halliburton engineer patented a machine for injecting radio-active sand down oil wells in the fracturing processes and another for injecting liquid radio-active isotopes down a hole for sub-surface tracing of fluids. Gruebel was instrumental in establishing the protocols for cleaning equipment and structures (including nuclear reactors) contaminated by radio-active materials for Halliburton's Heavy Industrial Cleaning Division. He says, "Although this was a valuable experience for me, I realized teaching was my first love, and I returned to SFASU in 1983 as Director of Hazardous Material Control with a half-time teaching assignment. In 1996, I returned to full-time teaching."

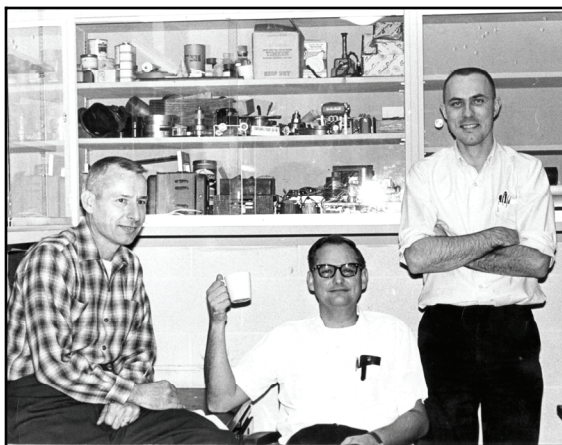
In 1988, he joined a team of 40 physicists, engineers, and reactor operators invited to the People's Republic of China to review the operating and safety procedures of their Nuclear Power Reactor Program. His contributions dealt with reactor decontamination.

Gruebel says he acquired an impressive collection of tribal art when flying to Africa, Oceania, Australia, and the Northwest Pacific Coast. His late wife, an artist and art historian, taught the Tribal Art course. When she died in 1990, the Art Department approached him about teaching it. The Deans of College of Science and Math and the College of Fine Arts supported the interdisciplinary effort. In 1995, the Southern Association of Colleges and Universities objected to his teaching Art History because he had not completed 18 hours of graduate Art History. Instead of seeking a waiver, for which there was sufficient grounds, he returned to his love of education and elected to complete the required 18 hours of graduate Art History courses. He says, "Ah.... The return to Graduate School and the exhilaration of new ideas was mind expanding. I enjoy a joint appointment as Professor of Physics and Professor of Art History. The course is taught off campus in my loft where the art is available to the students. Perhaps this will be the only time the students will ever have the opportunity to examine the art without a glass case between it and them. They physically handle the art pieces, even trying on the masks, to their delight."

Today, Gruebel and his current wife, Jo Ellen, contribute to historic restoration in Nacogdoches, Texas. They have purchased and restored 14 historic buildings in the downtown area. All of the structures, save one, were built in the 1800's. They live in a loft in the first building they restored. Recently they purchased and are currently restoring an 1897 Victorian residence in which they will reside.

He is active in the AAPT, and teaching is still his passion. When asked when he will retire, Gruebel replies: "When I can find something that gives me more joy than teaching."

—by Bob Gruebel



Bob Gruebel, Glen Clayton, and Bob Graham in the diffraction lab ca 1967

## G O L D W A T E R S C H O L A R S

**Kristin Watson**, a physics major and Sturgis Fellow here at the University of Arkansas won a prestigious Barry M. Goldwater Scholarship for 2010. This is one of the most competitive national awards that undergraduates in science, mathematics, or engineering can win, and they include a \$7,500 scholarship. These scholarships are awarded by the Barry M. Goldwater and Excellence in Education Foundation, which was established by the U.S. Congress in 1986 to honor the late Senator Goldwater of Arizona after 30 years of service in the U.S. Senate. Quoting from the Barry M. Goldwater website, "The purpose of the Foundation is to provide a continuing source of highly qualified scientists, mathematicians, and engineers by awarding scholarships to college students who intend to pursue careers in these fields." Each university is allowed to put forward no more than four candidates per year, and thus the University of Arkansas has an internal competition each fall to determine which four candidates will be put forward. Candidates must be either a sophomore or junior, and once selected, the candidates must complete an application, which includes official high school and college transcripts; letters of reference; a research proposal on original research in which they are involved; and a series of personal statements in which they

(Continued on pg. 10)

P R O F E S S O R   E M E R I T U S :   R A J   G U P T A



**Raj Gupta**  
at his retirement  
colloquium

After thirty-two years of service to the UA Physics Department in particular, and the world of physics in general, Professor Rajendra Gupta is the latest to hold the title "emeritus faculty." And, according to his students and colleagues, past and present, he has earned that right with grace.

So, in retrospect, who is Raj Gupta? Ask around the department and talk to former students and faculty, and you will hear inspiring stories, funny tales, and heart-felt reminiscences.

Raj is a gentleman colleague. Ask his colleagues about him and, without fail, you will hear that he is a gracious gentleman with unfaltering integrity and patience. In a literal sense, one colleague says that if Raj and anyone else – faculty, staff or student – should come to the same door at the same time, Raj always "backs out of the doorway and motions you first." His colleagues agree that Raj always opens the door for others through his support, insights and counsel. He shows his caring for the people around him with his willingness to sacrifice for their welfare. Students say that Raj gave them opportunities, that he placed their futures above his own.

Raj is also a leader. Colleagues say he leads by example, through service and responsibility. He served as department chair from 1989 to 1995 and has unselfishly volunteered for numerous time-consuming tasks on many committees. Among his substantial achievements, colleagues cite the renovation and expansion of the building from the 1990s, the department's centennial event of 2007-2008, and the historical equipment display he has gathered in the first-floor lobby. Still another colleague says that Raj's support for Prof. Sharrah's book *Physics at Arkansas* was the deciding factor of making it happen.

All of his achievements reveal a man who is organized and attentive to even the smallest detail, while always keeping people and their concerns in his mind. Current staff can also attest to both the genuine kindness and solid guidance of his leadership. One colleague says Raj has always been the one to stand up when facing what others perceive to be hopeless challenges.

One of Raj's favorite memories – the triumph rather than the hardship -- centered on the renovation of the physics building. He recalls how wonderful it felt to receive the sought-after grant and the two-year process that finally awarded the contract. The renovation took two years, and this was done at a time when they did not evacuate the building before renovating. Raj led the department through the challenges of continuing research and work in a building under construction. It was worth the effort, but there were many hurdles. He says, however, that the biggest hurdle he ever faced was the lack of lab space when he first arrived. Compared to that, renovation was fun!

Raj is a beloved teacher. His colleagues say he has always been "extraordinarily dedicated to student education." He is admired for being unwilling to sacrifice quality for popularity. He has made numerous contributions to the graduate student program and the modern physics labs. Students say he accepts nothing less than their very best. Raj is most pleased with his contributions to education, especially the revisions of the graduate curriculum and courses and his efforts in recruitment. Nothing makes Raj happier than when a student says he or she has enjoyed a course. This makes it all worth the effort.

His funniest memory centers around a lecture demonstration, an activity he always enjoys. This particular time, he was using a fire extinguisher to demonstrate conservation of momentum for a University Physics honors class. The first time he practiced the demonstration, he used a nearly

spent extinguisher, and the blast barely moved the cart he sat on. Before the class, he got his extinguisher recharged with CO<sub>2</sub>. In the class, he first picked a petit young lady to try it out, but she declined. A larger young man enthusiastically volunteered and pressed the extinguisher full throttle. The extinguisher went crazy, and he did not let go. He flew up in the air and bounced around.

Raj is a researcher and mentor. His students speak of his patience and his quick smile, despite setbacks. One mentioned a time when he broke out a window in the Physics Dept. building trying to run an exhaust vent. The same student said he reacted too slowly to a broken water jacket in a dye laser to save the proprietary electronics, but that Prof. Gupta took such setbacks in stride, "offering words of encouragement to the miscreant." They say he is a professional who "encouraged, pushed, and challenged" them to do their very best. In relating his research experiences, Raj spoke of frustrations, of attempting a reasonably simple experiment and spending years on it. He reflected then that some long shots, in comparison, worked right away. Success, he says, always brings elation.

When asked what he would most like to convey to his colleagues and students, Raj addressed those he has worked with: "Thank you for being part of my professional life." To all the graduate students who completed their thesis or dissertation with him, a very special thank-you. Especially to the first students who faced bare walls and long hours of experiment set-up. He is grateful for every contribution made to his research and is indebted to all of you for helping build his career with your efforts.

True to form, he is also grateful to all of his colleagues, both current and retired, as well as staff for so many years of unflagging support.

When asked what they think of Raj Gupta, everyone agrees: he's irreplaceable.

**Gupta Group**  
Centennial Photo

**Paul Glezen**

**Raj Gupta**

**Karen Williams**

**Allen Rose**

**David Pyrum**

**Brian Sawyer**

**Qifang He**

**Kevin Tennal**



## RESEARCH IN THE YEAR OF ASTRONOMY

**Julia Kennefick  
In the Planetarium**

The International Year of Astronomy (2009) celebrated the 400th anniversary of Galileo's first viewing of the heavens with a telescope. He was the first to notice that the Milky Way, the streaky band across the night sky, is made of thousands of individual stars and suggested that the stars themselves could be much further away than anyone had yet imagined. Fast-forward to 1920, when Arthur Eddington was the first to suggest that stars produce their energy by the nuclear fusion of hydrogen into helium. Then, in what was called "undoubtedly the most brilliant Ph.D. thesis ever written in astronomy", Cecilia Payne established in 1925 that the major constituent of stars is hydrogen. Over the next several decades, many astronomers and physicists went on to explain how most of the elements that we find here on Earth are produced in the interior of stars and how stars themselves are formed and die, only to have the gas that comprised them recycled into new generations of stars in our Milky Way galaxy.

The really big question in early 1920's astronomy, however, was: how big is our galaxy and are there others like it? Once they were using telescopes, astronomers saw small "cloudy" objects dotted around the heavens. These were given the name "nebula", and indeed, some of them even showed structure.

But were these objects contained within our own galaxy and therefore was our galaxy the whole of the Universe, or were these nebulae other galaxies outside our own? In 1920, many astronomers gathered at the Smithsonian to debate just this question in what came to be known as "the great debate". Harlow Shapley, an expert on globular star clusters and their distances, argued that our galaxy, the Milky Way, is quite large and that any other little smears of light we see could easily be contained within it. Heber Curtis, an expert on nebulae showing some spiral structure, argued that the Milky Way is



**Photo: Russell Cothren  
© University Relations 2009**

small and therefore the nebulae could easily lie beyond its boundaries and were indeed other "island universes" like our own Milky Way. As the meeting broke up, a consensus had not been reached.

This question was finally decided by Edwin Hubble, who determined the distance to the Andromeda Nebula using a special class of star that he could actually resolve in the outer reaches of that galaxy using the 100-inch Hooker telescope at the Mt. Wilson observatory north of Los Angeles. He underestimated the distance as 900,000 light years (we now know it's more like 2.5 million light years), far greater even than the large size suggested (correctly) by Shapley for our own galaxy. So, Andromeda was another large galaxy like our own, one of many. Shapley and Curtis were both proven correct - the galaxy is large and there are many more large galaxies far beyond its reaches. Hubble went on to determine the distance to many nearby galaxies and was the first to notice that once a galaxy was sufficiently far from us, they all seemed to be racing away from us, the more distant ones going proportionately faster. It was quickly suggested that the Universe must be expanding at a rate now known as Hubble's constant. The accurate determination of this constant was the main driver for the launching of the Hubble Space Telescope, so it is fitting that the telescope named for the man that first started to answer the big questions about galaxies and the structure of the Universe.

While we now know that there are over 100 billion galaxies in our observable Universe, we still lack an understanding of how galaxies form, evolve with time, and end their lives. The situation bears

an analogy with the state of Astronomy at the beginning of the twentieth century. At that time astronomers could see far more stars than had been possible throughout most of history, but they had no idea what made stars shine, why they didn't collapse under their own gravitational pull, how long they lived, or what happened to them when they died. Just as the 20th century saw the birth of a complete and sophisticated science of the star, so the 21st century is shaping up to be the century in which we come to know and understand galaxies.

The first clue that galaxies, like stars, evolve with time came with the discovery of quasars, the very energetic centers of some galaxies, in the 1960s. Theorists were stimulated by this discovery into studying the stages of advanced gravitational collapse, which gave birth to the notion of black holes, now thought to power quasars through matter falling into them. Astronomers now have evidence that most well formed galaxies have a black hole in their centers, but some of them have gone quiet. Our own Milky Way galaxy is thought to harbor a black hole with mass equal to four million Suns. In addition, it has been observed in recent times that there are interesting correlations between the size of the supermassive black hole and certain gross features of their host galaxies. One possible link between the entities is the dark matter halo which astronomers now believe is a feature of all galaxies and which also probably played a central role in their evolution.

Thus, in the 21st century, astronomy has gone beyond the message of starlight, to study the mass in the Universe that does not shine: black holes and dark matter. This mass seems to be much more plentiful than the mass that shines, and may play the dominating role in how galaxies have formed throughout the lifetime of our Universe.

— by Julia Kennefick  
professor and alumna

**Faculty News**

- **Greg Salamo** won the Arkansas Case Professor of the Year Award.
- **Gay Stewart** has been elected Fellow of the American Physical Society. Gay's citation will read "For her work preparing teachers at the University of Arkansas, and for her leadership in the Physics Teacher Education Coalition and on the College Board Advanced Placement Physics Test Development Committee and the AP Physics Redesign Commission." The APS is the premier international society of professional physicists. Election to APS fellowship is limited to less than 0.5% of its membership in a given year. Dr. Gay Stewart's election to fellowship brings the number of APS fellows on the current physics faculty to six.

**Alumni News****IN MEMORIAM**

**Edward A. Halter, Jr.**, BS 1950, passed away July 4, 2009.

**James Watson, Jr.**, Ph.D. 1976 with Dr. Anderson, passed away December 2, 2009. Jim was Emeritus Professor of Physics and Astronomy at Ball State University (1976-2007). While formally trained as an experimental physicist, he devoted most of his professional career to science education and, specifically, science teacher training. He was a member of the American Physical Society, the National Science Teacher's Association, the American Association of Physics Teachers and the Hoosier Association of Science Teachers, Inc. In recognition for his active service to his profession, he received a Distinguished Service Award from AAPT in 2004.



**James Watson, Jr.**

- **Karen Williams**, Professor of Physics at East Central University in Ada, OK (MS 1987) received an AAPT Distinguished Service Citation for nearly 30 years of extremely active service and her influence on "thousands of future physics teachers."
- **Shawn Ballard** and **Josiah Walton** were married in the spring of 2010 at Canaveral National Seashore.

Want to know what many are doing these days? Check out [http://www.uark.edu/depts/physinfo/wiki/index.php?title=Physics\\_Alumni](http://www.uark.edu/depts/physinfo/wiki/index.php?title=Physics_Alumni).  
Want to tell us what you're doing? Enter your information or email your news and updates to [dojohnso@uark.edu](mailto:dojohnso@uark.edu) or [centphys@uark.edu](mailto:centphys@uark.edu).

**Of twenty-three 2010 graduates, 10 graduated with honors!**

- **Adam Barito**, BS, graduated Summa Cum Laude and won the NSF Graduate Fellowship. (More on pg.7)
- **Jazmin Berlanga-Medina**, BS, graduated Cum Laude and will pursue a career as a high school teacher.
- **Andrew Blanchard**, BS, graduated Summa Cum Laude and will attend graduate school in physics at the University of Illinois.
- **Scotty Bobbitt**, BS, graduated Magna Cum Laude and will attend graduate school in chemical engineering at UT-Austin.
- **Alex Browning**, BA
- **Keith Cassidy**, BS, will attend graduate school in physics at the University of Illinois.
- **Michael Shane Carey**, BA
- **John Carson**, BA, will spend a year working with inner city youth in Houston before entering seminary school.
- **Zach Coats**, BS, graduated Magna Cum Laude and will attend graduate school in physics at the University of Arizona.
- **Nathan Culbersson**, BS, graduated Summa Cum Laude and will attend medical school at UAMS.
- **Holly Jackson**, BS, graduated Summa Cum Laude and will attend physical therapy school at the Mayo Clinic.
- **Alex Kareev**, BS, will attend graduate school in the microEP program at the University of Arkansas.
- **Rachel Lee**, BS, graduated Summa Cum Laude and will attend graduate school in physics at the University of Maryland. (More on pg.7)
- **Matt McKnight**, BS, will attend graduate school in chemical engineering at the University of Arkansas.
- **Matt Naglak**, BS, graduate Summa Cum Laude in Classics Studies, Physics, and Mathematics and will attend graduate school in the classics at the University of Kansas. Matt won the Goldwater Scholarship.
- **Colin Paul**, BS, received an Honorable Mention in both a Goldwater and NSF Graduate Scholarship Competitions. He will attend graduate school in chemical engineering at John Hopkins.
- **Tiffany Redding**, BA, will pursue a career as a high school physics teacher.
- **Clint Riley**, BS, will apply to medical school this August.
- **Joseph Snow**, BS, will attend graduate school at Louisiana Tech in an interdisciplinary program combining physics and computer science.
- **Marshall Scott**, BS, will enter the Master of Arts in Teaching program with a Noyce Scholarship and begin a career teaching high school physics.
- **Ricardo Urquidi**, BA
- **Sid Winford**, BS, graduated Magna Cum Laude and will attend medical school at UAMS.
- **Andrew Miles Winstead**, BA

**Student News**

- **AJ (Amee) Salois** (Lacy) was accepted into the NSF-funded REU program at the Cerro Tololo Inter-American Observatory in La Serena, Chile for the Spring 2010 semester. She was also awarded a Student Undergraduate Research Fellowship (SURF) for 2010.
- **Kristin Watson** is a 2010 Goldwater Scholar.
- **Christine Stith** is an HHMI Scholar in Membrane Transport.
- **Wesley Clawson** is an HHMI Scholar in Protein Dynamics.
- **Clint Riley** was recognized for his university leadership at the Graduating Student Leaders Breakfast Program. The Division of Student Affairs created the program nine years ago in order to formally thank the graduating seniors instrumentally involved in co-curricular programs during their academic careers. The Dean's Council granted permission for medallions awarded at the breakfast event to be worn over their robes during commencement.

Twelve (total) UA students, 7 College of Engineering and 5 Fulbright College, a record number, won National Science Foundation Graduate Research Fellowships for the upcoming academic year, and four more received honorable mentions. This is a dramatic increase, progressing over the last couple of years. Students and their mentors have engaged in cutting-edge scientific research and excelled. The graduate fellowship program is one of the NSF's oldest and most highly competitive, with roots in the foundation's original 1950 charter. Winners are promising young mathematicians, scientists and engineers who go on to pursue careers that make significant contributions to research, teaching and industrial applications in their fields.

The awards carry a \$30,000 per year stipend and are renewable for three years. In addition, the NSF provides the fellowship institution a cost-of-education allowance of \$10,500 per year. Fellows also receive a \$1,000 one-time international travel allowance. Fellows and those who receive honorable mention receive access to the supercomputer TeraGrid for their research. **Rachel Lee** (Salamo) and **Adam Barito** (G Stewart and Gordon), last year's Goldwater Scholars, received fellowships this year:

- **Adam Barito**, from Arkadelphia, graduated this spring with a bachelor's degree in mechanical engineering. He was a Bodenhamer Fellow and a member of the Honors College. His research mentors include Prof. Gay Stewart. Barito will pursue a doctorate in mechanical engineering at the University of Michigan at Ann Arbor.
- **Rachel Lee**, from Gentry, was a Bodenhamer Fellow. She graduated this spring with bachelor's degrees from two different colleges: one in chemical engineering and the other in physics. Last year, Lee was also selected as a Goldwater Scholar. She completed an honors research project with Prof. Greg Salamo and plans to pursue a doctoral degree in physics at the University of Maryland, College Park. Rachel also received the Harold D. Hantz Departmental Scholar Award. Recipients are determined by the combination of GPA, honors hours and thesis scores. One is awarded to a 4-Year honors scholar, one to a Departmental honors scholar, and the service award is for community or honors program service. In 1955, The UA Honors Program was founded by Harold Hantz, Professor of Philosophy, and Ben Kimpel, Professor of English in 1955. Harold Hantz was involved with the Honors Program in Fulbright College until his death, providing his unique vision, clear perspective, and unwavering commitment. The Hantz legacy continues today with all of our graduating seniors and their thesis directors.
- **Colin Paul**, Physics and Chemical Engineering, received an NSF Grad Research Fellowship Honorable Mention.
- **Thomas Rembert** (G Stewart) and **Jim Sloan** (Biology and Physics) received NSF Research Experience for Undergraduates (REU).
- **Lorie Hess**, **Brittany Johnson** and **Tiffany Redding** received PhysTEC Noyce Scholarships for Future Physics Teachers.
- **Arturo Figueroa** won Outstanding System Design, Second Place, in the Solar Splash Competition Sprint Event.
- **Adam Barito**, **Holly Jackson**, **Matt Naglak**, **Omar Salem**, **AJ Salois**, **Kristin Watson** and **Sidney Winford** received State Undergraduate Research Fellowships (SURF).
- **Matt McKnight** and **Colin Paul** won the WERC Environmental Design Contest.
- **Bryon Western**, Microelectronics and Photonics, was part of the team that took first place in the Tri-State Donald W. Reynolds Cup business plan competition held in Las Vegas, Nev., May 17-19.



**Robert Maurer**

In 1983, Dr. Robert Maurer (BS 1949, LLD 1980) made his first gift to establish the *Robert D. Maurer Physics Research Fund*. More than 27 years later, with continuing support of Dr. Maurer and his wife Barbara, the fund has grown to more than \$200,000. To celebrate the Maurer's philanthropy benefitting the department of physics and Fulbright College, the Maurers were named *Towers of Old Main*, and took their place among the University of Arkansas' most prestigious benefactors.

On behalf of Chancellor Gearhart, Dina Wood, director of development for Fulbright College, presented the Maurers with their *Towers of Old Main* medallions at their home in Eugene, Oregon. This is an honor bestowed upon individuals whose giving to the University of Arkansas is at least \$100,000.

The *Robert D. Maurer Physics Research Fund* continues to support undergraduate and graduate student research achievement as well as notable visiting lecturers and serves as a legacy to the innovation and lifetime career achievements of Dr. Maurer.

2010 ROBERT D. MAURER DISTINGUISHED  
LECTURE: STEVEN BLOCK ON BIOTERRORISM



**Steven M. Block**  
S.W. Ascherman Professor of Sciences  
Departments of Applied Physics and Biology  
Stanford University

Steven Block, professor of both applied physics and biological sciences at Stanford University and member of the independent scientific advisory group JASON, spoke on "Facing the Growing Threat

of Bioterrorism" as the 2010 Robert D. Maurer Distinguished Lecturer. In his lecture, Prof. Block discussed how the extraordinary pace of modern biotechnology makes it necessary to contemplate a whole new generation of biological weapons, including those based on genetically-engineered pathogens. The United States, along with the world at large, struggles to cope with ongoing threats posed by the current generation of biological weapons and also by naturally occurring infectious diseases, which he says are by no means under control. Thinking behind our effort to limit biological weaponry has been influenced by a legacy of nonproliferation approaches developed during the past half-century to limit the spread and use of nuclear weapons. Because nuclear and biological weapons of mass destruction differ in fundamental ways, so do the most effective strategies to counter them. Recent legislative efforts to regulate pathogens seem to be doing more to damage the country's ability to muster nimble defenses against bioweaponry than to inhibit the access of a potential adversary to these same weapons. He proposes that the key to countering threats posed by bioweapons, as well as emerging infectious diseases, will come from developing a powerful national health infrastructure rather than from an ability to preclude or preempt most future attacks.

After the public lecture, Prof. Block presented a colloquium entitled "The Biophysics of Gene Regulation, Studied One Molecule at a Time." He focused on studies of single-molecule systems that his group has carried out in laser-based optical traps. Using high resolution instrumentation his group has developed, they can explore nanomechanical properties of individual macromolecules down to the atomic level and monitor, for example, the motions of RNA polymerase molecules in real time as these step from base to base along DNA.

50<sup>TH</sup> ANNIVERSARY OF PHYSICS PH.D.

Physics celebrated the 50<sup>th</sup> anniversary of our Ph.D. program on October 16, 2009 by organizing a symposium and a banquet honoring its emeritus and former faculty members. Among those honored on this occasion were Emeritus Professors Raymond Hughes, Otto Zinke, Arthur Hobson, and Charles Richardson, and former professors Stephen Day and Richard Anderson. Professor Raymond Hughes was the primary author of the successful proposal to start the Ph.D. program in Physics fifty years ago, and then oversaw and helped nurture it for over 15 years. Other honorees, who joined the department between 1959 and 1966, helped lay the foundations for the development of the department's graduate program and continued growth of the undergraduate program.

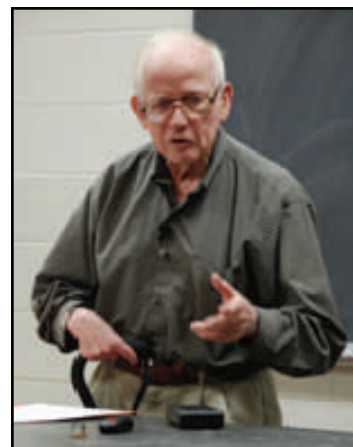
Former faculty members came from the East and West Coasts to participate in these celebrations. The first Ph.D. in Physics was granted to William Pendleton in 1964, under the direction of Professor Hughes. Pendleton, now an Emeritus Professor of Physics at Utah State University, traveled from Utah to join in the celebrations.

Professors Pendleton, Hughes, Zinke, Day, Hobson, Richardson, and Anderson gave talks reminiscing about the early days in their tenure. The symposium

was attended by physics faculty, post-docs, graduate students, physics majors, and guests. The audience got a glimpse of the past events that provided the building blocks for what the department is today. Currently 40+ graduate students are enrolled in the Physics Ph.D. program. The department offers over 80 courses and conducts research in lasers, quantum and nonlinear optics, nano-science and condensed matter physics, biophysics, astronomy, and physics education. We are internationally recognized for research in these areas. Research conducted in the department has appeared in prestigious journals such as *Science*, *Nature* and *Physical Review Letters*. In the past three years alone, faculty, students, and postdocs have published more than 200 papers and books and accumulated over 3,000 citations to their work.

The symposium was followed by a banquet in honor of the Emeritus/Former Faculty, where they were individually recognized for their contributions to the department. Associate Dean Patricia Koski represented the Graduate School and Associate Dean Jeannine Durdik represented Fulbright College of Arts and Sciences at the banquet.

**Raymond H. Hughes**  
(Photo courtesy of Ken Vickers)





## P H Y S I C S   E D U C A T I O N

**John (PI) and Gay Stewart** received a 5-year \$599,899 NSF S-STEM grant in support of ARK-PHYS: Physics Scholarships to build technical capacity in Arkansas. ARK-PHYS will offer at least 20 academic achievement/need-based scholarships that provide up to \$10,000 per year to students pursuing a physics degree here at the university. Scholarships are awarded on the basis of both academic achievement and financial need. These scholarships will support academically talented students who, due to financial constraints, would have to work to support themselves, allowing them to become full-time students and continue to excel academically.

## R A Y M O N D   H .   H U G H E S   F E L L O W S

**Utsab Khadka** has been an outstanding teaching assistant (since 2006), dedicated researcher (since 2007), and service-minded graduate student. In addition to receiving the AAPT Outstanding Teaching Assistant Award in 2007 and the Lloyd Ham Memorial Research Award to an Outstanding Physics Teaching Assistant in 2008, he has earned the Raymond H. Hughes Fellowship for 2010-11.

Professor Min Xiao tells us that Utsab joined his research group early in 2007. Working with Dr. Yanpeng Zhang, a research associate, Utsab assisted with a project involving multi-wave mixing with multi-level atomic systems. Utsab set up the hardware and wrote the program that started an experimental system to provide a high-resolution time delay between two laser beams with a nanometer resolution in distance displacement, which was used to perform an experiment on temporal and spatial interference between four-wave mixing and six-wave channels. The work led to the successful experimental demonstration of the novel interference between two high-order nonlinear optical processes. Results from their experiments produced two research papers, one published in *Applied Physics Letters* and the other in *Optics Letters* (2007 and 2008).

Since 2008, Utsab has worked independently, performing experiments and analyzing the data to understand multi-dark states in the four-level atomic systems. His study has led to a publication in *Physical Review A* (81, 023830 2010) called "Control of multi-transparency windows via dark-state phase manipulation." Utsab developed a formalism to explain the experimental data in his work, which can be extended to explain other phenomena in systems with multi-level atoms interacting with multiple laser beams. Currently, he is working on another experimental study to understand the competition between different four-wave mixing processes.

Congratulations to Utsab, who has done well in his coursework, teaching duties and research projects!

**Jian Liu** is a talented, independent researcher with strong interests, motivation and curiosity. He excels in academics and research and is a service-minded member of the department, helping with endeavors such as INBRE and the centennial. In fewer than three years, he has produced eight publications, with several more in the final stage of preparation before submission.

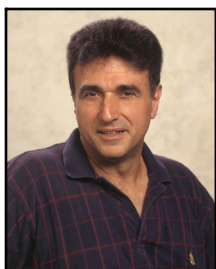
Professor Tchakhalian also tells us that Jian is capable of performing all his group's experiments, from synthesis of nanofilms to all in-house characterizations to advanced measurements at the National Synchrotron facilities. Jian has been supported by both the NIST Center for Neutron Research and the Argonne National Laboratory to learn and perform neutron and synchrotron experiments for his Ph.D. work. Being capable of not only using each technique but also understanding the physics has solidified his success. Through his understanding combined with his creative thinking, he is often able to extend the capability of instrumentation and extract additional insights.

Because of Jian's desire to learn different techniques, he participated in the prestigious National School for Neutron and X-ray Scattering to gain exposure to advanced techniques that are widely used in cutting-edge research. In addition, he is actively collaborating with a Scan Tunneling Microscopy (STM) group from Argonne National Laboratory on the first cross-section STM for oxide heterostructures.

Jian leads other students by example, guiding undergraduate students in the lab. He teaches the undergraduate researchers and makes certain they understand what to do and how to interpret the measurements they make.

Congratulations to Jian, whose results keep coming!

## A R K A N S A S   P R O F E S S O R   O F   T H E   Y E A R



**Distinguished Professor Greg Salamo**, the Joe N. Basore Professor in Nanotechnology and Innovation, was named Arkansas Professor of the Year.

The Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education evaluated nominees on their dedication to teaching, their positive effects on students and their ability to advance undergraduate teaching.

Prof. Salamo has been teaching for forty years. Thirty-four years ago, with the help of the National Science Foundation (NSF), he created Physics for Architects. The course, now serving around 120 students, helps motivate and engage freshman architecture majors and helps them learn the principles of physics.

In addition, Prof. Salamo created classes in Laser Physics, Nonlinear Optics, and Nanofabrication with NSF support. Recently, he and other colleagues recognized that one approach to undergraduate research did not fit all students. They developed "Studio-N," which provides a complementary

pathway to the more traditional one student-one faculty member approach with a combination of classroom and laboratory interdisciplinary teams of faculty members, freshmen and sophomores.

Prof. Salamo, Fellow of the Optical Society of America and winner of the 2007 Baum Teaching Award for Excellence, continues to pursue the development of interdisciplinary research and education through creating new courses and degree programs to provide greater career opportunities for both students and faculty. As the principal investigator for an NSF Research Experience for Undergraduates grant, a GK-12 NSF Graduate Student Fellowship program, an NSF Partnership for Innovation program for spin-off small businesses and a Hughes Grant for an undergraduate research center in nanoscience, he continues to push the cutting edge of education for our students.

**G O L D W A T E R**  
( C O N T . P G . 3 )  
B Y L I N O L I V E R

describe their current and past research activities, motivations for a career in science, personal information, and professional aspirations.

A total of 43 University of Arkansas students have won Goldwater Scholarships since the first UA winner in 1990. In 2000, Laura Fields became the first UA physics major to win this award. After graduation, Laura completed a Masters degree at Cambridge University and went on to obtain a Ph.D. in physics at Cornell University. She is now a postdoctoral fellow at Northwestern University. The physics department has been extremely competitive in producing Goldwater Scholars since 2000. Kristin Watson, our 2010 winner, is the eleventh UA physics major, which means that the physics department is averaging one winner per year over the last decade and now accounts for just over 25% of the total Goldwater awards made to the University of Arkansas campus.

It is important to identify potential Goldwater candidates in their freshman year. If their academic progress remains solid, they should get involved in research as early as possible, but no later than their sophomore year or the summer right after it, in order to be competitive by their junior year. Active participation by faculty in directing undergraduate research, advising, and assisting the students with their application packages

has been an essential ingredient in our department's remarkable string of success with producing Goldwater Scholars.

Past Barry Goldwater Scholars from our physics department include:

**Kristin Watson:** Physics/Chemistry, 2010. Kristin will be a senior at the University of Arkansas and will be applying to graduate programs in physics and competing for the NSF graduate research fellowship this fall.

**Rachel Lee:**† Physics 2009, Rachel graduated in 2010 and will pursue a PhD at the University of Maryland.

**Matt Naglak:** Physics, 2009. Matt graduated in 2010 and will attend graduate school at the University of Kansas.

**Hannah DeBerg:**† Physics, 2006. Hannah is currently a graduate student in the physics department at the University of Illinois in Urbana-Champaign, where she is pursuing a PhD in biophysics.

**Justin Vines:** Physics, 2005. Justin is currently a PhD student in physics at Cornell University.

**Rebecca Claus:** Physics/Mechanical Engineering, 2004.

**Ashley Altom:** Physics 2003. Ashley has a graduate degree in mathematics from the University of Oklahoma and is currently married and working in Conway, Arkansas.

**Michael Barnes:** Physics, 2002. Michael graduated in 2003, and is now completing a PhD in physics at the University of Maryland.

**David Norris:**† Physics, 2002. After graduating in 2003, David taught English in Japan for two years. He is now in the PhD program in physics at the University of Maryland.

Turkey with his wife, who works for the U.S. State Department. Ben is teaching at the Istanbul Technical University.

**Ben Hood:**\* Physics and Computer Science/Engineering, 2001. Ben obtained a PhD in astrophysics from St. Andrews University in Scotland, studying on a Marshall Fellowship, and is now living and working in Istanbul, Turkey with his wife, who works for the U.S. State Department. Ben is teaching at the Istanbul Technical University.

**Laura Fields:**† Physics, 2000. Laura received a Masters degree from Cambridge University in England and a PhD from Cornell University. She is currently a Postdoctoral Fellow at Northwestern University, where she is working on neutrino experiments at the Fermi National Accelerator Laboratory.

†These past Goldwater Scholars went on to win the National Science Foundations prestigious Graduate Research Fellowship, which funds their graduate studies. Two other recent UA physics students also won the NSF-GRF, though they were not Goldwater Scholars and one other received an honorable mention.

\*Ben Hood won the prestigious Marshall Scholarship, which funded his graduate studies in Scotland.

## R E S E A R C H E X P E R I E N C E F O R U N D E R G R A D S

This summer marks the 15<sup>th</sup> consecutive year that the physics department has hosted a Research Experience for Undergraduates (REU) Site funded by the National Science Foundation (NSF). Prof. Oliver has been director or co-director from the beginning and has been sole director for the past nine years. Originally, this program focused on *Modern Optics and Optical Materials*; however, it has evolved with the department to include new research areas, such as the physics of nanostructures and biological materials. Optical properties of materials and optical methods for studying condensed matter systems, as well as fundamental non-linear and quantum optics remain strong areas of emphasis for the program.

Ten students from around the nation are recruited to the University of Arkansas physics department each summer for 10 weeks of summer research and other activities. Each REU participant is matched to a faculty mentor who directs his or her research project, and both experimental and theoretical projects are available. Participants are housed in a university dormitory alongside participants of several other summer REU and internship programs.

The REU grant provides a substantial research stipend as well as funds for housing, a meal plan, travel and other activities. Additional activities include an ethics class that meets once a

week for lively discussions of all aspects of scientific ethics, a field trip to high-technology industrial sites in the Dallas, Texas area, an annual float trip down the scenic Buffalo National River here in Arkansas, and weekly social events.

In addition to the physics REU program, two other summer NSF-funded REU programs are directed by physics faculty in interdisciplinary programs of which they are a part. These include an REU program in the Microelectronics and Photonics program, directed by Prof. Ken Vickers, and an REU program in the Arkansas Center for Space and Planetary Sciences, directed by Prof. Julia Kennefick. Some student participants in these other REU programs also work under physics faculty each summer. Thus, the impact that our physics department is having on providing research experiences for undergraduates through the NSF REU program is truly exceptional.

Approximately 150 undergraduate physics students have been involved in cutting-edge research within the physics department over the past fifteen years through the REU program. While several of these students have been recruited from research universities, such as the University of Oklahoma, Florida State University, Rensselaer Polytechnic Institute, Cornell University, Notre Dame University, and others, nearly two-thirds have been recruited from colleges or universities that do not offer graduate degrees in physics and have little opportunity for

undergraduate research. Furthermore, our recruitment activities have been successful at reaching out to underrepresented groups over the past 15 years: approximately 30% of our REU participants have been women, nearly 25% have been African American and 5%, have been Hispanic American. Over the years, many of these research opportunities provided by our department have resulted in presentations at regional and national

(continued on pg. 11)



**2009 REU Student Marshall Scott doing a gravitational experiment during the REU Buffalo National River float trip in June of last year.**

## R E U ( C O N T . )

meetings and several have resulted in publications for the REU participants. Five or our current graduate students in physics are alumni of our REU program and other former REU participants are currently pursuing graduate degrees in one of the interdisciplinary graduate programs on our campus.

—by Lin Oliver



REU director, Dr. Lin Oliver (on the right), with the student interns of the 2008 Physics REU Program outside the physics building.

#### REU: Binary Star Systems to Active Galaxies and Black Holes

This summer, thanks to an \$273,750 NSF grant, undergraduate students are doing research in astronomy, including studying black holes, water on Mars, spacecraft instrument design, moon rocks, asteroids and meteorites under



REU director, Dr. Lin Oliver (on the right), with the student interns of the 2009 Physics REU Program at the Texas Instruments Digital Light Processing Center.

the direction of Julia Kenefick, Claud Lacy and Daniel Kenefick. Students have the opportunity to work with an array of researchers in astronomy, engineering, biology, geosciences, chemistry and biochemistry. The program is hosted by the Arkansas Center for Space and Planetary Sciences in collaboration with the Honors College and Graduate School.

In addition to completing a research project and presenting the research in posters and oral presentations, the students will take trips to learn how space and planetary science research is performed elsewhere. Students will visit the Johnson Space Center in Houston, the Oklahoma Aquarium, the Badlands of Western Oklahoma, Space Photonics and a local observatory. Students will be able to observe how research is performed on a government base, a public outreach facility, in the field, in industry and in an observatory.

#### Letter from the Chair

Dear Friends,

Greetings from Fayetteville! It is my pleasure once again to bring you up to date on the events of the past year. Continued economic slowdown necessitated some cutbacks this year. However, the department and the University have fared relatively well compared with other state universities.

This year the Department granted 23 baccalaureate degrees, 10 of those with honors. Our students have continued to do well in nationally competitive programs. Kristine Watson, a junior physics major, was one of two UA recipients of the highly competitive Goldwater Scholarship for top students in mathematics, science and engineering. Adam Barito and Rachel Lee, both physics majors, were among twelve University of Arkansas graduates who won National Science Foundation Graduate Research Fellowships for the upcoming academic year. Many others have been accepted in the National Science Foundation sponsored Research Experience for Undergraduate (REU) programs around the country and have won national and state scholarships and grants. Graduate student Haibin Wu won the Aubrey E. Harvey Graduate Research Award offered by the UA Chapter of Sigma Xi for his outstanding research, and Utsab Khadka and Jian Lu were named Ray Hughes Graduate Research Fellows by the department's Graduate Affairs Committee.

Faculty members have also received national recognition by their peers. Gay Stewart was elected a fellow of the American Physics Society, which brought the number of APS fellows on physics faculty to seven. Greg Salamo was named Arkansas Professor of the Year by the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education (CASE). Profs. John Stewart and Daniel Kenefick joined the physics department as tenure-track assistant professors in July 2009. After 32 years with the physics department, Professor Raj Gupta retired at the end of AY 2010. During his tenure as department chair and a faculty member, Prof. Gupta made wide-ranging contributions, which span all spheres of the department's activities in teaching, research and service. We wish him a happy and peaceful retirement. The department is stronger and better for his contributions.

Donna Johnson, Physics Office Manager, works hard throughout the year to gather information and put together this newsletter and deserves commendation for doing a fine job. We appreciate your continued support of the Physics Department. Please keep us posted on the progress of your careers and write to us about job opportunities for new graduates and share your memories and anecdotes of colleagues and teachers and yourself while at the University. You can contact us at centphys@uark.edu or Donna directly at dojohnso@uark.edu.

With my best wishes and sincere regards,

Surendra Singh  
Professor and Chair



The generosity of many of our former students and friends enables the department to award scholarships, invite distinguished lecturers, etc., that cannot be funded through our normal budget. Below are the names of contributors from July 2006 through June 2008. Please forgive any oversights, as we have had a complete staff position change over since the last newsletter! All of you have made a difference. The funds are indicated by (B)=Admiral Bryson scholarship fund, (H)=Hughes Graduate Research Fund/Fellowship, (L)=Lingelbach Memorial, (M)=Maurer Research Fund, (S)=P.C. Sharrah Scholarship Fund. Those for which no fund is indicated donated to the general departmental fund.

Dr. and Mrs. John Allgood  
 Ms. Christine and Mr. David Bell  
 Mr. William Bryson (B)  
 Dr. Thomas Callaway  
 Dr. Darrell Collier  
 Colonel Gary Culp  
 Mr. John Dixon  
 Dr. William Evans  
 Dr. and Mrs. Julio Gea-Banacloche  
 Mrs. Dorothy Halter

Dr. and Mrs. Allen Hermann  
 Dr. Alan Hughes  
 Dr. and Mrs. Philip Hurley  
 Mr. and Mrs. Clyde Lingelbach (L)  
 Dr. and Mrs. Robert Maurer (M)  
 Dr. and Mrs. Mansour Mortazavi (S)  
 Dr. and Mrs. David Ross  
 Dr. Jim Spann  
 Mr. George Wallace (H)

*Reflections is published by the Department of Physics, University of Arkansas, Fayetteville, AR 72701, and distributed free to alumni and friends. This issue was edited by Surendra Singh, Chair, and Donna Johnson, Office Manager, centphys@uark.edu. For additional copies or to report your news and updates, please email us at that address. See our website at <http://www.uark.edu/depts/physics/>. The University of Arkansas is an equal opportunity/affirmative action institution.*

NON-PROFIT ORGANIZATION  
 U. S. POSTAGE PAID  
 FAYETTEVILLE, ARKANSAS  
 PERMIT NO. 278

Return to:  
 Department of Physics  
 Physics Building, 226  
 University of Arkansas  
 Fayetteville, AR 72701