Newsletter of the Department of Physics, University of Arkansas

REFLECTIONS

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Paul Sharrah, 1914-1996

Following 40 years of service to the department, Paul retired in 1982 at the age of 68. Sixty-eight was the mandatory retirement age at that time. Paul was not ready to retire at all. He had too much energy. He wanted to continue, but University policies did not allow him to continue. In fact, Paul could not even be employed on a temporary basis after retirement.

Paul loved this department. It was a major part of his life. He just could not stay away even 15 years after his retirement. In fact, if I did not see him for a few weeks, I got concerned about him. In an effort to channel his energies to the department's advantage, in 1989, I asked him to write a history of the department. He was very interested in this subject, and had already done some work on it in the early eighties. Paul was thrilled, and approached the project with great enthusiasm. Little did I know that this project would take seven years to complete, partly because he was so meticulous. It bothered him a great deal if he was not absolutely sure about things, and he also worried about the history having his personal bias.

The history book was published just a few weeks before he passed away. We all are indeed gratified that he was able to see the fruits of his labor before his death. No one else could have done this project. It wasn't simply that he had personally witnessed the history of the department for over half a century, or that he had played a major role in its development, but was rather his deep love for this department. This project was truly a labor of love.

Paul was born in Jamesport, Missouri on October 31, 1914. Jamesport is a small town in northern part of Missouri with a 1990 population of 570. He once told me, with some satisfaction, that he was from the Unionist part of the state. Paul received his AB degree from William Jewell College in Liberty Missouri in 1936. He was married the same year to Cordelia Randall. They had two children, Ronald and Paula. Paul went to Brown University for graduate studies in 1936 but returned to Missouri in 1937. He received his Ph.D. from the University of Missouri in 1942 with a dissertation on x-ray diffraction of liquids under the guidance of Professor Newell Gingerich. While a graduate student at University of Missouri, he was also an instructor at his alma matter, William Jewell College, from 1938 to 1940, where he taught physics and mathematics.

Immediately after graduation in 1942 Paul joined our department as an Assistant Professor. As far as I can tell there were only two full-time teachers in the department at that time, Lloyd Ham and Paul Sharrah. Let's look back: 1942--the middle of World War II! Although the regular student population was down because most young males were in the military, the University was heavily involved in training cadets. The teaching loads were up to 21 credit hours/semester, and still they did some research during spare time! In that period most physicists were involved in the war effort in one way or the other. Paul was no exception. He worked at the Navy Ordinance Laboratory in Washington, D.C., from 1944 to 1946, on developing torpedo steering mechanisms.

Paul was promoted to Associate Professor in 1947 and to full professor in 1955. His research interest remained x-ray diffraction, mostly in liquids. He spent the 1954-55 academic year and all summers from 1951 to 1956 at Oak Ridge National Laboratory where he did research in neutron diffraction. In some of his publications, he has combined the results of neutron diffraction at Oak Ridge with the x-ray diffraction work done at the University of Arkansas.

In 1957 Paul became the first chairman of the Physics Department. (This was the time of the change from the head to the chairman system of governance). Paul was to remain chairman for 12 years, until 1969. This was the period of rapid growth for the department. The department grew from 3 or 4 faculty in 1957 to 11 in 1969, in spite of the difficulty in recruiting in that post-sputnik era. Most significantly, the department developed the Ph.D. program during this period.

While research in the Department flourished, Paul's own interest shifted to teaching. From 1963 to 1971 he directed summer institutes for science teachers on the campus. He would bring 20 science teachers to the campus for six week courses. These institutes were funded jointly by the National Science Foundation and Atomic Energy Commission. These institutes began to get national attention. Paul even carried this work outside the country. He spent the summer of 1967 at an institute for training high school physics teachers at Sardar Patel University in the state of Gujarat, India. The Institute was funded jointly by the Government of India, NSF, and the U.S. Agency for International Development. Paul maintained a deep and abiding interest in teaching throughout his career. He was a founding member of Arkansas-Oklahoma-Kansas Section of the AAPT.

Paul developed interest in teaching astronomy, and took over teaching it in 1967. He was the original member of the committee that recommended the purchase of a planetarium 1950, and the Planetarium was set up in 1951. Originally it was located between the Union and the Library. Paul became Planetarium Director in 1967 and continued until his retirement. The Planetarium was moved to the physics building in 1972, and was dismantled in 1992 to make way for our renovation. Several thousand school children used to visit the planetarium shows each year. Paul served as president of the Southwest Association of Planetariums.

Most people when they reach retirement age are afraid of new technologies. It was just the opposite with Paul. He loved new technologies. Soon after scientific calculators came on the market Paul offered a course on calculator physics. As soon as personal computers became available, he got heavily involved in it.

Last July, my family and I were going to Atlanta to watch some of the Olympic games. We were going to be there during the 2nd week of the games, and were leaving on a Saturday morning. Paul knew that we were going to the Olympics but did not know exactly when and for how long. I believe that it was Thursday when he walked into my office and said abruptly, "How come you are still here? Haven't you heard, Olympics have already started?" Those in the audience who knew him will recognize that this was Paul's characteristic style. After a short conversation, he left wishing me a good trip. On that Sunday, Dr. Singh reached me in Atlanta to inform me that Paul had passed away. On my return I kept feeling that one of these days Paul is going to walk into my office and in his characteristic style would ask, "Did you win any medals?"

Paul once told me "I want to go standing up." Nature was indeed very kind to him and granted him his wish.

Based on comments given by
Rajendra Gupta, Professor of Physics,
at the Paul Sharrah memorial colloquium

Throughout his long career at Arkansas, Paul did much to shape the development of the Physics Department. He was a master of the concept described in managerial seminars as "delegation of responsibility." He had the uncanny ability to convince his faculty colleagues that it was in their best professional and personal interest to give the third grade class from Washington Elementary School a tour of their research laboratories, to rearrange the chairs in the planetarium for a public showing to the Bella Vista Astronomy Club, or even to paint the table tops in the elementary physics laboratories to conserve precious physics maintenance-fund dollars. Faculty responded to his requests because they realized that whatever he asked was ultimately in the best interests of the department and its students. Paul taught not only physics principles, but also the importance of the human relationships that are necessary for any teacher to succeed in their chosen profession. I sincerely hope that this important legacy will continue to be transmitted to all future students and faculty of the Arkansas Physics Department as it has been transmitted to me by Dr. Paul C. Sharrah.

Excerpted from a letter from
Richard J. Anderson
Head, Experimental Program to Stimulate Competitive Research
National Science Foundation
(Dr. Anderson is a former member of the Physics faculty.)

From the Chair

Dear Friends:

Greetings from Fayetteville. Another year has past. A lot has happened since we communicated last. The department has continued to make progress in all of its varied activities in research and teaching.

During the 1996-97 academic year, the department's share of external grant support was the highest in the college. A citation study by the Associate Vice Chancellor for Research revealed that, of the 30 most-cited researchers on this campus, 8 are from the physics department. Furthermore, among the 30 most-cited papers from this campus, 11 were written by physics faculty. During the last three years our faculty has presented more than 100 papers and presented 90 contributed and invited talks at national and international conferences.

My congratulations to Professor Lin Oliver who won an NSF CAREER Award. Another younger faculty, Professor Paul Thibado, joined the department in Fall 1997. A graduate of the University of Pennsylvania, he came to us from the Office of Naval Research where he spent two years as a National Research Council Fellowship. Professor Thibado and Professor Salamo are setting up a state-of-the-art molecular beam epitaxy facility. This will be a big boost to our condensed matter physics, as well as our optics program.

We have continued revamping our undergraduate program. An ad hoc faculty committee appointed to study our BS curriculum has made recommendations for major changes to that curriculum. These recommendations, currently being discussed by the faculty, call for more laboratory experience and computer skills for our graduates. We are excited about this and hope that the new program will be in place by next fall.

After many years of valuable service to the Department as teacher, researcher, and Chair, Professor Charles Richardson has decided to retire at the end of the current academic year. He was recently honored by the Fulbright College with a Master Teacher Award for his dedication to teaching. We all congratulate him on this well-deserved honor and wish him well in his retired life. Professor Richardson has donated $20,000 in support of our teaching program.

Finally, I must share with you the sad news of Professor Paul Sharrah's unexpected and sudden death last July. Paul Sharrah served the department with distinction and dedication for more than 50 years. He stayed involved with the department even after his retirement. He worked hard to finish *Physics at Arkansas*, a history of the Physics Department. I am happy that he was able to see *Physics at Arkansas* in print a few weeks before his death. This book will serve to remind us of Paul and his dedication to the department. A copy of this book was mailed to all alumni for whom we have current addresses. If you have not received a copy of the book please write to us and we will be happy to send you one.

I thank you all for your continued support to the department. We would love to hear from you about your careers, job opportunities for new graduates, and any comments you might have about your studies at Arkansas. Please stay in touch and keep us informed of your current addresses. With my best wishes.

Surendra Singh, Chair

Robert D. Maurer Lecture 1997
Life on Mars?

The 1997 Maurer Lecture was delivered by Professor Richard N. Zare, Marguerite Blake Wilbur Professor of Chemistry at Stanford University, on April 24 in Giffels Auditorium to a standing-room-only crowd.

In his public talk entitled Life on Mars?, Professor Zare discussed the evidence that a team of scientists at Stanford University and at the NASA John Space Center led by Professor David McKay has uncovered that strongly suggests primitive life may have existed on Mars more than 3.6 billion years ago. Zare began his talk by noting that our conception of life is strongly influenced by what we find on Earth. We know that life needs water. Mars does not have water now but photographs of Martian surface showing effluvial action, polar ice caps and volcanoes clearly point to a once warm and wet planet. We also know that Mars does not have an atmosphere because its gravity is too weak to hold gaseous atoms too long. He said that we have learned a great deal more about Mars from optical astronomy and from the two Viking Lander Missions of 1976. For example, we know such isotopic abundances as the hydrogen to deuterium ratio, and that it is different from that found on Earth. The Viking Lander Missions also tested Martian surface soil for signs of life. No organics were found. This put a damper on the search for life on Mars.

In 1984 scientists found a meteorite in Antarctica. This meteorite, labeled ALH840001, is about the size of a loaf of bread. Its isotopic composition, determined by laser mass spectrometry, clearly point to a Martian origin of this meteorite. A radioactivity analysis shows that the meteorite is more than 3.6 billion years old. Examination of this meteorite under an electron microscope reveals an unusual pattern of organic molecules and several mineral samples that are known products of primitive microscopic organisms on earth such as nanobacteria. Zare said that nanobacteria are the simplest kind of life. He said that the concentration of these substances was sparse on the meteorite surface but much higher in the interior suggesting that the compounds were not the result of terrestrial contamination. He said that only a few years ago no one would have imagined this kind of life possible but recent discoveries in paleo-biology of Earth bacteria that feed on sulfur rather than on sunlight and chlorophyll have changed our conception of life.

Professor Zare said that the evidence for life was not based on any one finding but on a combination of things. These include the discovery of the first organic molecule (carbonates) of Martian origin, mineral features characteristic of biological activity and possible microscopic fossils of primitive bacteria-like organisms inside the same meteorite. All of these findings strongly suggest primitive life on Mars more than 3.6 billion years ago. He said that the negative finding of the Viking Mission did not rule out existence of life on Mars because even on earth every rock would not exhibit life forms. He added that his speculation was that there was lots of life on Mars because if life was really rare on Mars the probability that a piece of Mars containing life would hit earth would be indeed small.

Professor Zare emphasized, however, that he maintained a certain air of skepticism. He said that these conclusions are the most reasonable and simplest explanation of the evidence, but not proof. Research is a process and not an end result. A consensus that life does exist on Mars would require more experiments and solid findings such as colonies of organisms, or signs of cell division showing the life cycle of such organisms. It is good to question, that is what the scientific method is all about.

Professor Zare is renowned for his research in laser chemistry. By experimental and theoretical studies he has made seminal contributions to our understanding of molecular collision processes and contributed significantly to solving a variety of problems in chemical analysis. He is a graduate of Harvard University, where he received his BA in physics and chemistry, and his Ph.D. in chemical physics in 1964. After holding faculty positions at MIT and the University of Colorado, he joined Columbia University in 1969 where he became Higgins Professor of Natural Science. In 1977 he moved to Stanford.

Professor Zare is a member of the National Academy of Sciences. He has received numerous national and international awards and honors. These include the National Medal of Science and the National Academy of Sciences Award in Chemical Sciences, the Earle K. Plyler and the Langmuir Prizes of the American Physical Society and the Peter Debye Award of the American Chemical Society.

Surendra Singh

Charles Richardson Retires

Professor Charles Richardson is retiring this month after 31 years in the physics department. He, his wife Janet, and daughter Joan came from Seattle to a Fayetteville in which Sears had only a catalog store and the downtown square was ringed with shops, stores, and banks. About half the present campus buildings didn't exist, including Mullins Library and the Arkansas Union. David Mullins was president of the University of Arkansas and Paul Sharrah was chairman of the Physics Department. Daughter Martha was born two years later.

His first teaching assignment was University Physics, and those since have included most of the courses offered by the department, some 21 total. A special interest has been laboratory courses, and over the years he has developed such courses in electronics, astronomy, modern physics, and general physics. Some unusual teaching opportunities were planetarium shows for the public, shared with Paul Sharrah and Michael Lieber, and a special project at the time of energy shortages. The energy project involved travel to sites where alternative energy sources were being researched, and preparation of teaching materials based on this research. One such site for example was the Geysers where electricity is produced from steam produced deep underground.

Dr. Richardson includes, among the high points of his teaching career, the time he came to his College Physics class to find a note on the table saying "For the teacher." It was held in place by an apple. Among the low points was an astronomy lab with telescopes set up in winter on the floor of Razorback Stadium. The wind chill factor was in the single digits.

His research at Arkansas has been mainly in optics, much of it involving the scattering of light from single microscopic particles levitated electrically. This work has been with several graduate students over the years. One, Chuck Kurtz, was investigating changes in a lithium iodide particle exposed to water vapor at low pressures. At sharply defined vapor pressures the particle changed phase, or rearranged atoms to accommodate the entry of water molecules. Shortly before a scheduled trip by Dr. Richardson to talk about the work, he and Chuck found a phase in which 5 water molecules were in place for each 3 lithium iodides, a phase never seen before. A phone call to Chuck on the morning of the talk confirmed that the 5/3 phase was reproducible, so it was reported.

Besides working with students, Dr. Richardson has had fruitful research collaborations with colleagues at Brookhaven National Laboratories and the Naval Research Lab. He has traveled to Corfu, Greece, Corsica, Vienna and many places in the U.S. to report on research.

Following his retirement, Dr. Richardson will remain involved with teaching activities in the department. For recreation he has tennis, mountain biking, cooking (especially bread baking), gardening, and British car maintenance. And he tells us that there are countless places for him and Janet to travel.*

Faculty Profile: Paul Thibado
The Surface Physics of Semiconductor Growth

Paul Thibado joined our department in August 1996. He received B.S. degrees in both physics and mathematics from San Diego State University in 1990, and a Ph.D. in physics from the University of Pennsylvania in 1994. He has co-authored more than 20 refereed journal articles and a chapter in a book on semiconductors, given six invited talks, and presented his work at more than 40 conferences. One of his research results was honored on the 1996 American Physical Society (APS) calendar.

Dr. Thibado describes his research as follows:

In 1982, researchers at the IBM Zurich Research Laboratory in Switzerland announced the development STM, which exploited quantum mechanical tunneling to resolve individual atoms at the surface of a material. This was a giant step in high magnification microscopy. Every university, most colleges, and many high schools now has at least one of these instruments. When I began graduate school at the University of Pennsylvania, I joined a surface physics group and had my first exposure to STM. By the time I left Penn, I had designed and built three STM systems, developed a deep appreciation for the tunneling process, and made a contribution to the understanding of how metal atoms grow on semiconducting surfaces.

After finishing my dissertation, I received a National Research Council Post-Doctoral Fellowship to work at the Naval Research Laboratory NRL. I had the benefit of being part of an effort that brought together four NRL divisions: Condensed matter, electronics, materials science, and chemistry. This type of research was unprecedented. The goal was to combine into a single facility two exceptionally powerful scientific instruments: STM and MBE. MBE is a form of vapor phase epitaxy (growth) which allows the artificial fabrication of semiconductor structures with deposition control at the level of a single atomic plane. The effort combines the highest precision in semiconductor growth with the highest precision in semiconductor characterization. No research effort prior to this had combined these two techniques to study the particular semiconductor system we were studying for the Navy. Consequently, we were uncertain of what we would uncover and what research issues we would address. After about six months of customizing, the first results were obtained. Thereafter, we uncovered more exciting projects than we could ever possibly pursue.

The year I began seeking a faculty position happened to be the same year that the University of Arkansas was starting a new program to combine a new MBE chamber and a new STM chamber into a single multi-chamber facility! At the time I interviewed, there were only a few people in the world who had attempted this type of research and even fewer who were successful. Furthermore, there was no other university offering a new MBE-STM facility to a new faculty member. Needless to say, the University of Arkansas and I were a great match! Our MBE-STM effort at Arkansas is unique in that it is the only such system which will grow semiconductors containing phosphide. The phosphide-based semiconductors are a member of the III-V compound semiconductors (since they contain elements from the III and V columns of the periodic table). I have extensive experience within the III-V semiconductors in general, but no experience in the III-P compounds. When Greg Salamo, University Professor of Physics, mentioned to me that his interest was in the III-P compounds, I conducted a literature search to determine what characteristics are unique to these compounds. Much to my surprise, the fastest transistors in the world are made from the III-P compounds. They are of primary interest to the military, but a commercial interest is developing in portable and high-speed communications such as direct broadcast satellite TV, cellular phones, and global positioning systems. In addition, InP-based materials are the *only*suitable system for optical fiber applications. These materials can emit and absorb laser light at the 1.3 and 1.55 m wavelengths, which correspond to the low-loss and low-dispersion regions of conventional optical fibers.

Historically, artificially fabricated semiconductor structures were introduced more than 20 years ago with some spectacular consequences, both in basic physics discoveries and in commercial applications. Quantum well lasers, for example, are now found in practically every compact disc (CD) player. The quantum well laser is a prime example of what has been termed "first generation quantum devices," a device which reproduces the function of a similar conventional bulk device, but with higher performance specifications.

My long-term goals are to develop "second generation quantum devices," which are still in the research stage. These structures are multi-functional. A single structure can accomplish a task which would normally require as many as ten conventional devices. A factor of ten reduction in the number of components naturally leads to a significant increase in speed, as well as a reduction in power consumption. For this class of devices, one designs semiconductor structures that take advantage of the wave nature of the electron to produce electrical or optical properties that could not be duplicated using conventional electronics (without a large number of components).

These novel quantum structures may have as few as 10 atomic layers of one type of semiconductor sandwiched between two other types of semiconductors. Consequently, these systems are very different from bulk grown equilibrium structures, which would randomly mix the different semiconductor layers together. These materials must be artificially fabricated with precise composition control of each atomic layer. Structural flaws, such as a missing atom or a wrong atom type, near the interface of two adjacent materials are thought to be the weak link in developing second generation devices. Identifying the origins of these structural or compositional defects can be quite difficult because the disorder may be driven by atomic-scale phenomena and typically occurs during the fabrication process itself. By combining MBE semiconductor growth with STM atomic-resolution characterization during the growth process, we can uncover the fundamental parameters governing growth dynamics, such as atom diffusion rates and potential energy barrier heights for diffusion. We now have an opportunity to identify origins of atomic-scale disorder and begin to seek solutions to these problems.

One of the most significant factors associated with the MBE-STM facility is the creation of a broad range of exciting scientific career opportunities for our physics graduates. Not only can our graduates study the fundamental atomic processes of semiconductor growth, but they can also obtain hands-on skills in semiconductor growth and processing that industry demands in today's competitive job market. In addition, the possibility of designing new semiconductor structures with market potential is now a reality, which may ultimately lead to the origination of high-technology businesses in the Fayetteville area--a goal strongly supported by the department, the university, and the state.*

Faculty Profile: Michael Henry
Nonlinear Materials for Photonic Devices

Michael Henry joined our department in the Fall of 1995. He comes to us from the U.S. Virgin Islands by way of Cincinnati, Ohio, where he acquired a Bachelor's degree from Xavier University, and also by way of Huntsville, Alabama, where he earned a Ph.D. from Alabama A&M University. At Alabama, he specialized in nonlinear optics, concentrating in organic materials. He used such experimental techniques as four wave mixing, second harmonic generation, self-focusing, self-phase modulation, self-diffraction, spectroscopy, and Langmuir-Blodgettry.

Dr. Henry is interested in research that can be directly applied to industries, for example communications and computers. However, like all physicists he is driven to understand the underlying physical process of any system which may be useful for a particular application. Research with direct application to industry will train students to contribute to private industry, will help open the job market to new physicists, and will appeal to physicists who desire to work on projects in private industries having applications in today's world.

Dr. Henry is studying nonlinear materials and systems which may be used in photonic devices. Some of the possible photonic devices are image processors, multiplexers, optical switches, optical modulators and optical logic gates. At the present time, these devices are electronic. However, photonic counterparts may have advantages over the electronic devices. The possible advantages are similar to the advantages of replacing copper cable with fiber optical cables in the communications industry.

There is a quest to find efficient materials for photonic devices, materials that will play much the same role that silicon and gallium arsenide play in electronic devices. In this effort, research is taking place on two fronts. New materials are being synthesized with the hope of finding an efficient material. And experiments are being carried out in order to better understand the nonlinear interactions. In understanding the nonlinear process the materials can be successfully manipulated to achieve more efficient results.

Several techniques are used in the lab to identify and characterize nonlinear materials. These techniques include four-wave mixing, self-phase modulation and third-harmonic generation. In order to characterize and efficiently utilize the materials, the nonlinear system must be fully understood. Dr. Henry's lab studies the various nonlinear effects that take place in the materials such as quantum starks confinement, saturation absorption, and excited state absorption. Once the materials have been identified and characterized, they are used in systems that will lead to devices. Presently, Dr. Henry is working with dye-doped organic thin films and multiple-quantum-wells thin films. These films will be tested in image processing, modulation and logic systems.

On the second front, Dr. Henery is examining the various nonlinear interactions of the materials in the hopes of manipulating the interaction in order to make it more efficient. The effects of optical feedback on the nonlinear processes taking place in the materials are being studied. Optical feedback can stem from processes such as fluorescence distributive feedback. The process is dependent on the physical material. This work should give a clearer view of nonlinear process in these thin films.

There is also an effort to begin a research program in optical fibers. Dr. Henry is interested in nonlinear processes in fibers. These nonlinear processes include four-wave mixing, and Raman and Brillouin scattering. These nonlinear effects are sometimes useful in lightwave communications, for example in wavelength conversion in wavelength division multiplexing. In some cases the nonlinear effects are harmful. These nonlinear effects can lead to the generation of wavelengths different from the wave that contains the transmitted information, leading to improper data transfer. The ability to control these effects by turning on and off the nonlinear effect is of interest. Hopefully this research effort will lead, in the classroom, to the development of a fiber and planar waveguide course.*

News

You can find the physics department's new, revamped Web site at http://www.uark.edu/depts/physics/.
Much of the site was designed and put together by **Tamara Snyder** (MS 1993).

GRADUATE STUDENT NEWS

Kim-Fook Lee presented a paper based on his work at the March 1997 American Physical Society meeting in Kansas City.

Ron Adams won the Excellence in Teaching Award offered by the university's teaching and faculty support center. He was also won the physics department's Outstanding Teaching Assistant Award for 1996-97.

NEW GRADUATE STUDENTS

Marwan Albarghouti from University of Jordan.

Ahmad Al-Yacoub from University of Rajasthn Jaipur, India.

Colleen Cafferty from University of New Mexico

John Carter from East Texas Baptist University

Albert Estevez from Auburn University.

Ditta Gallai from Janus Pannouius University in Peis, Hungary.

Kai He from Fudan University, China.

Junho Lee from Kyunghee University, Korea.

Laura Wessels from Mary Washington College.

UNDERGRADUATE STUDENT NEWS

Four students won freshman scholarships for the coming year: **Nicholas Farrer**from Fordyce High School in Fordyce, Arkansas, **Kjell Tengesdal** , **Travis Wages**from Fayetteville High School in Fayetteville, Arkansas; and **Dustin Walker** from Cotter HS in Gassville, Arkansas.

Four students won upper class scholarships for the coming year: **Winfred Byrd, James Clem, Josh Hamblen,** and **Jeremy Massey** . Byrd, Clem, and Hamblen are also physics scholarship holders for the past academic year.

James Clem won the Admiral Bryson scholarship for astronomy for the second year in a row.

Josh Hamblen was the first winner of the new Paul C. Sharrah scholarship.

The Society of Physics Students (SPS) plans a year full of physics activities. SPS officers were elected for the academic year 1997-98. They are: President, Steve Skinner; Vice President, Noel Napieralski; Secretary, Brian Hart; Treasurer, James Buffington.

ALUMNI NEWS

Calling all alumni! Email (ahobson@comp.uark.edu) or write to us and tell us about the interesting things you've been doing!

Arlis Dodson (MS 1994) joined the TVR Company in Norman, OK.

Galen Durree (PhD 1995), Assistant Professor, Northwest Nazarene College, Nampa, Idaho was awarded a Research Corporation grant in support of his project.

Kevin Fandre (BS) joined E-Systems located in Dallas, TX.

Greg Fox (MS 1996) joined E-Systems located in Dallas, TX.

James Hendren (BS 1969, MS 1971, PhD 1972) and his company Arkansas Systems have made a significant contribution as matching funds for Dr. Min Xiao's grant that required the matching money. Hendren is also interested in interviewing students that have an interest in employment in a applied problem solving environment using computing tools.

Robert Maurer (BS 1948), now retired from Corning Glass Company, was elected Fellow of the American Physical Society.

David Mooney (PhD) moved back to Denver from Washington, DC to take a job as Chief of Staff at the National Renewable Energy Lab. A few months into that job, he accepted an offer from Superconducting Core Technologies (SCT) to become their Vice President for Administration. He will run daily operations and work with the scientists and engineers how make up about 30 of the company's 50 people. SCT's product is a thin-film high temperature superconductor-based microwave filter that will be incorporated into cellular and PCS telephone base stations. This will be the first product that commercializes high temperature superconductivity material on a large scale.

Yujiang Qu (PhD 1995) joined Versatility, Inc, a Telecommunication company that develops software used in CALL Center.

C. Wang (PhD 1994) joined McDonald Software System in Dallas, TX.

Marvin Young (PhD 1986) joined Worldcom, Inc, a transmission optics and new technology company located in Tulsa, OK.

FACULTY NEWS

Julio Gea-Banacloche published a review article last year in the *Advances in Atomic, Molecular and Optical Physics* series, and has been developing educational Java applets for use on the World-Wide Web.

Mark Filipkowski is studying the boundary between equilibrium and nonequilibrium thermodynamics in macroscopic magnetic particles. In a novel teaching approach, he has also used the motion of these magnetic particles in the study of motion in his Analytical Mechanics course, thereby connecting classroom study with frontier research.

William Harter has developed two new and improved simulation programs for quantum dynamics and discovered some intriguing results concerning violations of Bloch symmetry in super lattices. Also, new programs for class C++ projects to help learn classical mechanics and complex variables were developed.

Art Hobson's textbook *Physics: Concepts and Connections* (Prentice Hall, 1995) has received favorable reviews in *Physics Today, American Journal of Physics, Contemporary Physics,* and *Science, Technology and Society Today* , and has now been adopted on over 70 campuses. A second edition is in the works for next year.

Claud Lacy spent his sabbatical leave at the Harvard Smithsonian Center for Astrophysics, and has published or had accepted 6 refereed publications in the last 7 months, an all-time record for him. The publications are all about his binary star research.

Michael Lieber co-authored a paper in *Physical Review* presenting an improved approximate wave function for the quantum three-body coulomb problem.

William Oliver was awarded the prestigious NSF CAREER award last May, and gave an invited talk at the Fall 1996 Materials Research Society meeting in Boston on "Relaxation Phenomena in Complex Systems at High Pressure."

James Bradford Shue has enhanced the department's community outreach by putting on an increasing number of public demonstration shows and involving more graduate and undergraduate students to give them experience.

Surendra Singh presented invited talks at the Chinese Academy of Sciences and at the 26th Winter Colloquium on the Physics of Quantum Electronics.

Gay Stewart has been developing a new field of education research called educational engineering. This allows educational objects to undergo a model-measure-iterate cycle, helping to bring the precision of physical science to education research.

Reeta Vyas gave an invited short course on "Some Recent Advances in Quantum Optics: non-classical light and its interaction with a single atom," at the Third Escola Mario Schonberg de Pos-Graducao Workshop at the Paraiba Federal University in Joao Pessoa, Brazil.

Min Xiao has carried out several experimental research projects on applications of electromagnetically induced transparency in nonlinear optics. He has also gotten interesting results on the properties of certain self-consistent theoretical quantum phase operators.

Almost all faculty contributed to the year's total of 49 published journal papers, 26 additional papers published in conference proceedings, 6 invited talks, and 35 contributed talks.

Thank You!

The Paul C. Sharrah Scholarship Fund.

To date we have collected approximately $11,000 for the Paul C. Sharrah Scholarship fund. Our goal is to build this endowment to $15,000. We are grateful to all of our friends and alumni who have contributed to this fund in the past and who have continued their support of this. The first Sharrah Scholarship was awarded to Josh Hamblen who is a third-year physics major with a 4.0 GPA. Paul C. Sharrah Scholarship Fund contributions were received from:

Mr. & Mrs. Richard Anderson, Mr. & Mrs. Robbin C. Anderson, Mr. & Mrs. James J. Billings, Billy B. Bryan, Mary M. Burton, Thomas o. Callaway, Partricia F. Campbell, Mr. & Mrs. James L. Dale, Sharon Davidson, John W. Dixon, Mr. & Mrs. Robert E. Feighner, Mr. & Mrs. Julio Gea-Banacloche, Mr. & Mrs. Paul F. Glezen, Marcella Grider, Mr. & Mrs. Raj Gupta, Billy E. Haney, William Helbron, Allen Hermann, Mr. & Mrs. Wallace A. Hilton, Mr. & Mrs. H.P. Hotz, Raymond H. Hughes, Anthony Hui, Clarence G. Leonard, Mr. & Mrs. Wilson Lee Logan, Paul E. Long, Mr. & Mrs. William H. Overby III, Mr. & Mrs. John L. Philpot, Arthur W. Pillow, Mr. & Mrs. Noble L. Randall, Carl T. Rutledge, M.L. Sharrah, Betty Howard Siegel, Mr. & Mrs. Surendra Pal Singh, Candace J. Skoreski, George K. Wallace, Richard Waring, Gregory L. Westbrook, Karen A. Williams, Mr. & Mrs. Glen Wing.

Other Gifts

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