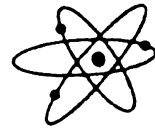




REFLECTIONS



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WE'RE BACK! *Reflections* was not published from 2003-2005, so we have a lot of catching up to do. We can only capture the highlights of the highlights of the past four years. -- Mike Lieber (editor) mliieber@uark.edu [NOTE: see www.uark.edu/depts/physics/alumni.php for an archive of previous issues.]

The Physics Department is on a Roll!

Each of the last four years has seen the department exceed the expectations of the year before. In 2002 we had no endowed professorships, now we have three (Salamo, Bellaiche and Xiao). The streak of

outstanding performance by our undergraduates continues: we have had a winner of a prestigious Goldwater Fellowship every year for the past seven years; those who desire to go to graduate school con-

tinue to get into top graduate programs. And last, but not least, our research funding continues to grow year-by-year. Details on all these items may be found below.

PHYSICS DEPARTMENT CENTENNIAL!

The academic year 2007-8 will mark the 100th year of Physics at the University of Arkansas. We are planning a variety of exciting events – check the web site www.uark.edu/depts/physics in the spring for details as they emerge.

APPEAL FOR SUGGESTIONS: One idea for celebrating the Centennial is to have some sort of permanent display – a monument or fixture that would illustrate physics to the public. We are hoping for something that would grab

and hold the attention of passersby. Assuming it is weather-proof, it would most likely be placed in the plaza near the entrance to the building. Please send your ideas to rgupta@uark.edu by March 1, 2007.

THREE NEW FACULTY MEMBERS JOIN THE DEPARTMENT

The department added two new faculty members in 2006 who will strengthen our research in nanomaterials and in biophysics, and one who will enhance our program in physics education research.

Jacques Chakhalian joined as an assistant professor in January 2006. A native of Russia, but a Canadian citizen, he received his Ph.D. from the University of British Columbia in 2003 and then served



as a Max Planck Society Fellow at the Max Planck Institute for Solid State Physics in Stuttgart, Germany. Jak's research interests center on fabrication and characterization of artificial quantum materials with particular emphasis on strongly correlated oxide nanostructures. This includes: (1) Fabrication of novel tailor-made superlattices composed of ferroelectric-ferromagnet, ferromagnet-superconductor, band insulator-Mott insulator oxide nanostructures (films, wires and dots) and organic conductor-ferromagnet heterolayers. (2) Advanced characterization of nanostructures with synchrotron based X-ray spectroscopies and polarized neutron reflectivity. (3) Theoretical investigation of multiscale electronic phenomena in oxide

nanostructures with a goal to fabricate nanomaterials with predicted properties.

Eitan Gross joined as an assistant professor in July 2006. A native of Israel, Eitan received his Ph.D. degree in physics from Bar-Ilan University in 1993. As a Rothschild postdoctoral fellow he did research in biophys-



ics at the University of Connecticut and at Case-Western Reserve University. In 1998 he became an instructor to the staff at the Cleveland Clinic Foundation and the University Hospitals of Case-Western Reserve until moving to Fayetteville. His current research is on experimental as well as theoretical biophysics of neuronal networks in the brain. Eitan writes:

The neuronal cells in our brain are connected via synapses to form neural networks. How particular tasks, or "computations", are implemented by neural networks to generate behavior, and how patterns of activity are stored during learning are two questions that are still un-answered. Today we know that the neuronal dendrites which integrate their synaptic inputs to define the input-output relation of the neuron, are capable of a processing vast amounts of spatio-temporal information rap-

idly using a variety of linear and non-linear algorithms. Additionally, signaling mechanisms recently discovered in dendrites provided new means by which patterns of network activity could be stored and transmitted. These recent advances have refocused attention on how single neurons contribute to information processing and storage in the brain. In our lab we are utilizing new experimental and theoretical techniques to link single-cell processing with higher levels of neuronal network function.

John Stewart, as a visiting assistant professor, has been assisting his wife Gay in developing our nationally-recognized program in physics education. Beginning with the fall semester, John, whose background is in



condensed matter theory and computer software, has officially joined the department as a tenure-track assistant professor. He will carry out his own independent research program in physics Education Engineering. This is his term for a new discipline, whose goal is to produce reliable, cost-effective, reproducible and efficient educational systems. He is also the Co-PI of the Arkansas PhysTEC grant (see below).

OTHER FACULTY NEWS

Art Hobson, professor emeritus received one of the most prestigious awards in physics education - the 2006 Robert A. Millikan Award from AAPT. This award, established in 1962, recognizes physicists who have made notable and creative contributions to the teaching of physics; it includes a check for \$7500. Art was cited for his efforts to bring societal issues into physics education and for emphasizing the importance of developing a scientifically literate public. Art presented a talk at the Summer AAPT meeting which will be published in the American Journal of Physics, along with the full citation. In addition, the 4th edition of his textbook, *Physics: Concepts and Connections*, was published. It is now used at 120 schools in the U.S. and has been translated into Chinese. (I have no information on number of Chinese schools adopting the text.)

Laurent Bellaiche was promoted to professor (2006) and then was named 21st Century Professor for Nanotechnology and Science Education. The 21st Century Professorships are funded by income from the successful Campaign for the 21st Century, which raised over one billion dollars for the university endowment.

Huaxiang Fu received the first John Imhoff Award from the local chapter of Sigma Xi (2005). This award, created by John Imhoff, late professor of Mechanical Engineering, goes to the faculty member who is a member of Sigma Xi, and who has published the most significant paper during the previous year.

Jacques Chakhalian received the second Imhoff Award from Sigma Xi (2006).

Julio Gea-Banacloche was elected a fellow of APS in 2005. He continues

as associate editor of Physical Review A for the area of quantum information theory.



Greg Salamo was named Distinguished Professor and Joe N. Basore Professor of Nanotechnology both in 2005.

Surendra Singh was elected a fellow of the APS in 2004. He resumed the chairmanship of the physics department in 2005 after Lin Oliver stepped down

Gay Stewart was elected chair of the APS Forum on Education (2004 -5). She received the UA Faculty Fellowship Mentoring Gold Medal Award (2003). This follows Lin Oliver's receiving the same award in 2002, resulting in our department being honored with the first award for Departmental Mentoring. Last, but certainly not least, she was named Arkansas Master Advisor in 2006.

Paul Thibado was promoted to professor (2005).

Min Xiao was named Distinguished Professor in 2004, and 21st Century Professor for Nanotechnology in 2006. In November 2004 he was elected a Fellow of both APS and OSA.

Lin Oliver stepped down as department chair in order to devote more time to research and teaching.

UNDERGRADUATE STUDENTS

Our undergraduate programs continue to grow and flourish with a total of about 100 majors, which puts us on a par with such larger institutions such as UT-Austin or the University of Illinois. We continue our unbroken string of having at least one winner of the pres-

tigious Goldwater Fellowships every year for seven years. The Goldwater fellowships were created by Congress in 1962

Goldwaters: **Hannah DeBerg** (2005-2006), **Justin Vines** (2004-2005), **Rebecca Claus** (2003-2004), **Ashley Altom** (2002-2003)

Graduates: 2006: 6 BS and 1 BA (not counting summer 06, which will be in next year's Reflections), 2005: 17 B.S. and 2 B.A., 2004:17 B.S. and 6 B.A., 2003:11 B.S. and 6 B.A. All recent graduates have found employment or gone on to graduate or professional school. With over 70 in the past four years there is not space to list them all, their subsequent destinations, and their accomplishments. I apologize for any omissions or errors – please contact me with any corrections.

ALUMNI

[Send news items to mliieber@uark.edu]

Palmer Hotz (B.S. 1948 (Phi Beta Kappa), Ph.D., Washington University St. Louis, 1953) was named a Distinguished Alumnus of Fulbright College in 2006. After teaching at Auburn, Oklahoma State, Marietta College (Ohio) and U. Missouri at Rolla, Palmer left academe to join industry. He retired in 1991 but serves as a consultant to Hotz Associates in Burlingame, CA. He is a member of APS and AAAS.

Keith Andrew (Ph.D. 1987) has assumed the chair of the Physics department at Western Kentucky University. He previously was chair at Eastern Illinois University.

Collin Condray (B.S. 1995) is now employed by 3M Company in Bentonville.

Message from the Chair

Dear Friends,

Greetings from Fayetteville. I am delighted at this opportunity to be in touch with you after a gap of four years. Many exciting things have happened during this period in the. More than 40 bachelors, 20 masters and 14 PhD Degrees were granted. Several of graduate students have won the Harvey award for their outstanding thesis research. Physics majors have excelled in nationally competitive programs as judged by their acceptance into the Research Experience for Undergraduate (REU) programs around the country and their success in winning national and state scholarships and grants, including SILO/SURF (Undergraduate Research) grants, Goldwater, and NSF Graduate Fellowships for graduate study

Such student success is a reflection of a dedicated faculty. Several faculty members have been recognized by election to fellowship by the American Physical Society (Gea-Banacloche, Singh and Xiao) and the Optical Society of America (Salamo and Xiao). The Arkansas Master Adviser Award was presented to Prof. Gay Stewart. Three of our faculty members (Bellaiche, Salamo, and Xiao) now hold Chaired positions or Professorships. The awards for research exceeded \$4 million last year. This success reflects the stature of our faculty and the quality of their research at the national level. Three new faculty members, Dr. Jak Chakhalian (nano-materials) Dr. Eitan Gross (biophysics) and Dr. John Stewart (physics education) have joined the department since the start of 2006.

Our biggest challenge continues to be the lack of adequate space for teaching and research. We must meet this most critical need if we are to continue to compete at the highest levels, and recruit the kinds of productive, talented faculty and students you see featured in these pages. There is some room for optimism here as there is some talk of a new nanoscience building, which may accommodate some of our needs.

We appreciate your continued generous support of the Physics Department. Your contributions allow us to offer academic scholarships and to support many student activities, which we would not otherwise be able to do. Please keep us posted on the progress of your careers. Write to us about job opportunities for new graduates and share your memories and anecdotes of colleagues, teachers, and yourself while at the University of Arkansas.

With my best wishes,
Surendra Singh, Chair

MAURER and other LECTURES

2003: Nobel Laureate Leon Lederman, former director of Fermi-Lab, gave a stimulating talk entitled "How does the universe work?" Lederman, who won the 1988 Nobel Prize for the discovery of the "bottom" quark, described how the physics of the smallest objects of which matter is composed is tied into the structure of the largest objects – galaxies and the universe itself.

2004: Well-known astrophysicist Mike Turner, former chairman of the University of Chicago's physics department and, when here, director of the NSF's Assistant Director of Mathematical and Physical Science gave a talk entitled "The dark side of the universe: beyond stars and the starstuff we are made of." He described the problem of "dark matter," which appears to make up a much larger portion of the total matter in the universe than the matter which we see.

2005 marked the "World Year of Physics," a celebration of the centennial of Einstein's "annus mirabilis". In keeping with this theme our 2005 Maurer lecturer was John Stachel, Prof. Emeritus at Boston University and director of the Center for Einstein Studies. His talk was entitled "Albert Einstein: The Man Behind the Myths." After discussing some of the prevalent myths about Einstein, Stachel reviewed the nature of Einstein's scientific work and major contributions to physics. He also discussed



NFO TELESCOPE

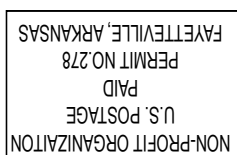
The NFO WebScope is a collaborative astronomical observatory built by the Universities of Arkansas at Little Rock & Fayetteville, the Arkansas School for Mathematics and Sciences, and the NF Observatory located near Silver City, NM. It is a web-based observatory, so requests for images may be made by authorized users at any time. An email message is automatically sent to the user when their images are ready. It is in regular use by undergraduates, graduate students, and faculty at the participating institutions. It has been used to study variable stars, including eclipsing binary stars, asteroids, and middle and high school educational projects. It is funded by the National Science Foundation, the American Astronomical Society, and the Space Telescope Science Institute.

Contributed by Claud Lacy

Einstein's views on education and various political and social issues, as well as Einstein's reaction to his own fame.

In addition we had a special lecture by John Rigden, 2005 AAPT Millikan Award winner (see the article about Art Hobson), former editor of American Journal of Physics (1975-1985), and Director of Physics Programs at AIP. Rigden gave a talk entitled "Einstein 1905, 1999: Legacy and Hope." Another public lecture to mark the World Year of Physics celebration was "The Science of Optics: The History of Art" by Prof. Charles M. Falco, University of Arizona. Using a wealth of optical evidence that Prof. Falco's collaboration with renowned artist David Hockney has uncovered he discussed the intriguing possibility that optical instruments were in use – by artists, not scientists – nearly 200 years earlier than commonly thought possible, and account for the remarkable transformation in the reality of portraits in Western Art that occurred early in the 15th century.

2006: Carl Wiemann, winner of the 2001 Nobel Prize for his work on Bose-Einstein condensates, presented a talk on Bose-Einstein Condensate: Quantum Weirdness at the lowest temperature in the universe." Wiemann, who just left his position at the University of Colorado and JILA to accept a position in Canada, gave a colorful lecture on his Nobel prize-winning work. He discussed how atoms can be cooled with lasers to temperatures of 100 billionths of a degree above absolute zero. Once chilled, the atoms can then be held and manipulated with light. This new technology has made possible the construction of ultra-precise atomic clocks, atom interferometers, and the achievement of "Bose-Einstein condensate," a new state of matter in which a large number of atoms lose their individual identities and behave as a single quantum entity called the "superatom."



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THANK YOU!!

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 2003 through June 2006. The funds are indicated by **B**= Admiral Bryson scholarship fund, **H**=Hughes graduate research fund, **M** = Maurer research fund, **S**= P.C. Sharrah scholarship fund. Those for which no fund is indicated donated to the general departmental fund.

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