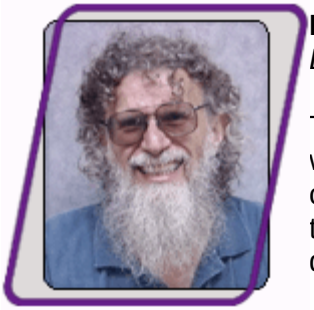

Dean Zollman

Department's Head Corner
Dean Zollman

The past year had some significant ups and downs. The downs involved the weather, the budget, and the departure of some long-time faculty. The ups were continued excellence in learning, teaching and research, outstanding students, and the arrival of two faculty who are taking our condensed matter research in a new direction.

During the night of June 11 a serious tornado moved through Manhattan. Major damage but no serious injuries occurred in the western side of town before the tornado "skipped" and came back down near the western edge of the campus. Cardwell Hall was directly in the path of the storm. We lost about 40 windows, a couple of ceilings, part of a roof and some of the air handling system. Internal damage was somewhat small but certainly very annoying. The University responded quickly. Windows were boarded over and then replaced within a few days. A temporary and then permanent roof replacement was finished by the end of the summer. The faculty, staff, and students took a very positive approach and helped get things back together quickly. (Well, a few tempers did flare when the University Safety Office closed the building for two days to test for asbestos. Physicists don't like to be forced out of the lab.)

As with most of the country Kansas is experiencing serious financial problems. We, as a University, are now working to maintain the essential features of our teaching and research programs while responding to decreases in State funding. So far, the University has been very supportive of our Department. We are one of the few departments who are being allowed to hire new faculty this year. At the end of the summer Hongxing Jiang and Jingyu Lin moved to Texas Tech where they will be the basis of a new multi-million dollar research and development effort in semiconductor research. Each of them holds an endowed professorship in the Texas Tech College of Engineering.

Their departure enabled us to make a major change in the direction of the Condensed Matter research effort. Except for semiconductors, most of our condensed matter research has been in soft condensed matter. Building on the soft matter theme we have hired two people who bring research related to biological systems. Bret Flanders joined us as an Associate Professor. He was previously on the faculty at Oklahoma State. Robert Szoszkiewicz came from a post-doc position at Columbia. They are off to a good start. More information about them and their research is contained in other articles in this newsletter.

We occasionally have hosted get-togethers for alumni in particular geographical areas. However, you are scattered throughout the country and the world), so very few parts of the country have a sufficient number to warrant organizing such an affair. One of our alumni has suggested that we should have a combination reunion and conference at K-State. We could learn about each other's work after many (or a few) years and generally catch up. If you would be interested in coming to Manhattan for such an affair, please let me know.

Our students continue to do well. Once again two of the four students who have been nominated by KSU for the national Goldwater Scholarship competition are physics students. All science, math, and engineering students are eligible for this nomination, so physics students make up less than 1% of those eligible. Yet, frequently 25-50% of the nominees are physics majors or minors. Even better, more than 10% of K-State's recipients have been physics majors or minors.

Our alumni and friends continue to play a major role in the successes of our students. Your support of undergraduate scholarships and research forms the foundation for the funds that we can provide to students. With the difficult economic times ahead, we plan to maintain our scholarship program as close to our past levels as possible. Because of your continued generosity we should be able to maintain our student support. Once again, thank you.

Editor's Corner
Michael O'Shea

Several pieces of news really stand out at KSU in 2008. In May, President Jon Wefald announced that he would retire at the end of the 2008-2009 academic year. When he retires his time as KSU's President will span 23 years. He is credited with transforming KSU into a nationally ranked top 10 land grant university. Under his leadership enrollment has increased, private giving has increased, and competitive research awards have increased. A search was done in the fall of 2008 and the 13th President of KSU will be Kirk Schulz. He comes to us from Mississippi State University where he was vice president for research and economic development.

The tornado of June 2008 that touched down in several places in Manhattan destroyed homes in Manhattan and did significant damage on campus. Fortunately the tornado moved through the city and campus very late in the evening when few people were around and there were no fatalities reported anywhere in Manhattan. Significant damage was done to Weber Hall, the Engineering complex, Waters Hall, Call Hall, Cardwell Hall and Ward Hall, and the Wind Erosion lab was destroyed. In Cardwell where Physics is located, windows were blown out, the roof was damaged and the line of trees northeast of Cardwell was pretty much removed.

Towards the end of 2008 we began to learn that budgets are being cut – this of course came as no surprise! The unusual thing is that they are being cut in mid fiscal year due to the difficult financial climate in Kansas and throughout the US. It will be a challenge to maintain the high quality of teaching and research but faculty and staff feel they are up to this challenge.

Still there is good news. A few weeks ago K-State was selected as the preferred site for the National Bio and Agro Defense Facility (NBAF). This will be a half billion dollar animal health facility and it is expected that this facility will be the best in the world.

Kansas State Director of Athletics Bob Krause announced earlier this year that Ron Prince will not return as the school's head football coach for the 2009 season. Bill Snyder, the architect of the greatest turnaround in the history of college football during his previous tenure at Kansas State, was named the Wildcats' 34th head football coach.

Atomic Physics Research News
Itzik Ben-Itzhak

The J.R. Macdonald Laboratory has now firmly established AMO (Atomic, Molecular and Optical) ultrafast laser physics as its research theme. Four of our faculty, Lew Cocke, Zenghu Chang, Uwe Thumm and Itzik Ben-Itzhak, were invited to present their research in the central ICOMP-08 conference held in Heidelberg, Germany. Also, we were selected to host the attosecond physics international conference in July 2009. Chii-Dong Lin and Zenghu Chang, the co-chairs, are leading our efforts to organize this meeting. Our work also received some attention by the media (see http://www.kstate.edu/media/newsreleases/oct08/laserlab102808.html).

The Kansas Light Source (KLS) continues to serve as our main workhorse, now scheduled essentially 24 hours per day 7 days per week. This laser delivers 25 fs, 800 nm pulses with 3 mJ of energy at one kilohertz. The pulse can be shortened to 6 fs and the phase of the "carrier" of the laser relative to the

envelope can be stabilized. Zenghu Chang's group has been working hard to keep up with the high demand for laser time, while continuously developing new capabilities such as 140 attosecond laser pulses. A "Dazzler", a device capable of generating "designer" pulses by slicing out or modifying user-chosen slices of the wavelength range of the pulse, has been used by Brett DePaola's group and by Eric Wells, from Augustana College, to control reaction dynamics of atoms and molecules. We were excited to see Lew Cocke's collaborative research on the interaction of light with simple molecules in the prestigious Science magazine (Vol. 320.p.920 and Vol. 322.p.1081). Lew's group is conducting similar cutting-edge experiments in our laboratory, in which a train of attosecond pulses is generated and used to probe atoms and molecules. Igor Litvinyuk's group used intense laser pulses for time-resolved imaging of molecules – Coulomb explosion imaging with COLTRIMS and angle-resolved photo-electron spectra with their new velocity map imaging setup. Vinod Kumarappan has completed the development of his new lab space for molecular alignment and orientation studies. In collaboration with Steve Lundeen from Colorado State Univ. we installed a new permanent-magnet ECR ion source, which has been used already by Itzik Ben-Itzhak's group in crossed-beam studies of molecular ions and intense laser beams.

The JRML theory effort paralleled our experimental work. For example, Chii-Dong Lin's group focused on retrieval of target structure information from laser-induced measured rescattered electron momentum distributions, Uwe Thumm's group focused on time-series analysis of vibrational nuclear wave-packet dynamics in D_2^+, and Brett Esry's group focused on a general theory of carrier-envelope phase effects.

After many years in leadership, Distinguished Professor Pat Richard retired and moved with Dea to Florida. Horst Schmidt-Böcking from the Univ. of Frankfurt, Germany, the Davisson-Germer Prize Recipient 2008, was the keynote speaker at Pat's farewell party, which brought back to K-State many of Pat's former collaborators. We have had many additional changes in lab personnel. As new postdocs, Jesus Hernandez, a former K-State undergraduate student, has joined Brett Esry's group after receiving his PhD from Auburn University, Chenghua Zhang from Purdue University has joined Uwe Thumm's group, Feng He and Kamal Singh from the Max Planck Institute for Complex Systems, Dresden, Germany, have joined Uwe Thumm's and Lew Cocke's groups, respectively, and Kun Zhao from the University of Nebraska-Lincoln will join Zenghu Chang's group soon. A couple of our postdocs moved to new jobs: Chengquan Li now at Coherent Inc., and Goga Veshapidze now at the Institute for Molecular Science in Okazaki, Japan. Five of our graduate students (advisor) received their PhD's and moved to postdoc or industry positions: Eric Moon (Chang) now at Quantronix Corp., Rajesh Thapa (Corwin) now at IMRA America, Marc Trachy (DePaola) now at Lockheed Martin, Max Sayler (Ben-Itzhak) now at Jena University, Germany, and Predrag Ranitovic who recently received his PhD from Stockholm University on research he conducted at JRML under Lew Cocke's guidance is still at K-state. New graduate students (advisor) in the JRML include: Michael Chini (Chang), Rajesh Kadel (Washburn), Xiao-Ming Ren (Kumarappan), and Mohammad Zohrabi (Ben-Itzhak).

The groups of Kristan Corwin and Brian Washburn specialize in nonlinear optics and photonic crystal fibers, and their use for infrared frequency metrology. We have stabilized, for the first time, a fiber laser based on carbon nanotubes which provide the saturable absorber. This frequency comb has been used to characterize an acetylene filled fiber reference. In addition, we further developed the Chromium:forsterite laser comb and improved the sealing of gas in photonic crystal fibers. We have two new Department of Defense funded projects: one to create a molecular gas-filled hollow optical fiber laser, and the second, jointly with Precision Photonics and the University of New Mexico, to develop and commercialize gas filled fiber lasers.

We have had a long parade of excellent colloquium speakers in AMO this year. Leading this group was Nobel Laureate William D. Phillips from NIST/Univ. of Maryland who also presented the PETERSON PUBLIC LECTURE. Thomas Pfeifer from UC-Berkeley, Hiromichi Niikura from the National Research Council, Canada, Mette Gaarde from the Louisiana State Univ., Eleftherios Goulielmakis from the Max Planck Institute for Quantum Optics, Germany, Katsumi Midorikawa from RIKEN, Japan, Min Xiao from

the Univ. of Arkansas, Barry Dunning from Rice Univ., Horst Schmidt-Böcking from the Univ. of Frankfurt, Germany, Donald Umstadter from the Univ. of Nebraska-Lincoln, and the NEFF LECTURE IN PHYSICS speaker Philip Bucksbaum from Stanford University. Outside speakers at our AMO seminar this year have included Danielle Braje from NIST, Alan Fry from Coherent Company, Barry Dunning from Rice Univ., Kun Zhao from the Univ. of Nebraska-Lincoln, Chang Hee Nam from KAIST, Korea, Akira Suda from RIKEN, Japan, Jeff Nicholson from OFS Labs, Matt Bohn from the Air Force Institute of Technology, and Robert Lucchese from Texas A&M Univ.

Activities of the Physics Education Research Group
Sanjay Rebello & Dean Zollman

The Physics Education Research Group completed yet another productive year. In addition to the ongoing projects, our group recently secured funding for three more projects.

Our ongoing projects include collaborations with research groups at Carnegie Mellon, Alabama, Missouri, San Diego State and Wisconsin. Our research focused on the themes of transfer of learning and the use of technology in teaching and learning.

In the past year, the Physics Pathway project, in collaboration with Carnegie Mellon pursued two different research and development efforts. Both are based on sophisticated video database and natural language technologies which were development at Carnegie Mellon. The original Pathway (http://wwww.physicpathway.org) provides teachers with just-in-time help on the pedagogy of physics. It now can answer over 7500 questions asked by physics teachers.

This same technology is being used in a research effort to understand how various components of modern technology can be used to provide a tutoring environment for students. The first steps in this effort are to develop and test instructional materials for online use by high school students. These materials use research based pedagogy to integrate text and video of experiments with the video database and search engine. Ph.D. student Christopher Nakamura developed and pilot tested these materials with students in high schools and will be doing more testing in preparation for the research part of the project..

The Modern Miracle Medical Machines project completed its final year of research, materials development and testing. The focus of the final phase of the project was investigating student understanding of the physics which is the basis of wavefront abberometry – a relatively new diagnostic technique for the human eye. In addition to investigating how students transfer their learning from a standard learning of optics to wavefront abberometry, Ph. D. student Dyan McBride completed research that led to a new technique of characterizing student understanding that has the potential to be applied in other projects. Dyan also developed and tested instructional materials with introductory college students. Dyan will be completing her Ph.D. research this year before she moves on to a faculty position in Pennsylvania. Post-doc Sytil Murphy is also involved in this effort and will complete a research-based learning unit on Magnet Resonance Imaging this summer.

Our collaboration with the faculty at University of Alabama and San Diego State involves work on effects on student learning and classroom practice of different approaches to teaching University-level science courses taken by future elementary teachers. Toward this goal Ph.D. student Mojgan Matloob and post-doc Sytil Murphy collected data from several schools. They are in the process of developing a rubric for characterizing student

understanding as gleaned from their responses to written questions. They will be further developing this scheme and analyzing data from more schools in the years to come.

Over the past couple of years our group has made forays into the important area of problem solving. In collaboration with researchers at University of Missouri, we developed and pilot-tested strategies to enable students in introductory physics to become expert-like problem solvers. Ph.D. student Fran Mateycik has completed significant research in this area. Last year, she developed a protocol for group problem solving sessions that can help students develop better problem solving skills. She compared the performance of students who participated in these sessions with the rest of the class and obtained some interesting and promising results. She will be completing her Ph.D. this coming year before she moves on to greener pastures.

Although the focus of our group has been primarily on post-secondary and high school education, recently we have been collaborating with the faculty at University of Wisconsin to develop and test materials that will be used with middle school students. The CoMPASS project creates a design-based learning experience that integrates hands-on materials, hypertext and more recently computer simulations to enable students to learn physics concepts. Ph.D. student Jackie Chini has been working to adapt the materials to instruction for undergraduate students. She has been investigating how students apply their physics as well as their everyday knowledge to the design tasks. Jackie has also been investigating the extent to which each of the various elements of the curriculum has a role in student learning.

In addition to the ongoing projects described above, our group recently secured funding to work on three new projects. The first project builds on the ongoing work on problem solving. The new project investigates students' trajectories of learning how to solve problems as they proceed from mathematics to physics to engineering. The second project builds on the work done on the CoMPASS project by focusing more specifically on the use of multiple representations and its impact on student learning. Finally, yet another project is targeted at learning in the upper-division – particularly in the 'Physical Measurement and Instrumentation' and 'Advanced Lab' courses. These projects will certainly be keeping us busy for a long time to come.

The work done by our group earned us several peer-reviewed publications at conferences and journals this past year including the Physics Education Research Conference, National Association of Research in Science Teaching as well as a host of contributed talks at the national meetings of the American Association of Physics Teachers along with a few invited talks.

We have had a few new additions to our group this year. Sytil Murphy and Ashok Mody joined us as post-docs this fall. Sytil completed her Ph.D. in Physics with a specialization in Experimental Optics from Montana State University. Ashok completed his Ph.D. in Physics with a specialization in Theoretical Physics from the University of Bombay. Both Sytil and Ashok have become involved in several projects of the group over the past several months.

Spartak Kalita finished his PhD in December and has joined the faculty at Moscow State University on the Black Sea. Todd Leif, Professor of Physics at Cloud County Community College, completed his PhD in November. Brian Adrian, former post-doc, completed work on the Pathway project and has relocated to San Diego.

Overall, it has been a promising year in terms of our research and new funding. We hope to explore new ideas and expand the horizons of Physics Education in the year ahead.

If you would like any additional information about any of our research, please go to our website at http://web.phys.ksu.edu/ or send email to kim@phys.ksu.edu.

Dr. Uwe Thumm Finds a Way to Steer Electrons in a Molecule Using Laser Pulses

Theoretical physicist **Uwe Thumm** and his colleagues Feng He and Andreas Becker not only work with some of the smallest molecules in the universe, but they now have found a way to control the motion of the molecules' building blocks, electrons and nuclei.

Thumm is a professor of physics at Kansas State University. Feng is a research associate at the K-State physics department, and Becker is a professor at the University of Colorado in Boulder. The collaborators have found a way to steer the movement of electrons in a hydrogen molecule using ultrafast laser pulses. These pulses are so short that their duration is measured in attoseconds -- that's one billionth of a billionth of a second.

In a recent research paper, the three collaborators explained how attosecond laser pulses can be used to direct the motion of an electron inside a hydrogen molecule, and what the measurable consequences of this control over the electron would be. The paper appears this month in Vol. 101 of The Physical Review Letters.

As theoretical physicists, Thumm and his colleagues do not perform experiments, but instead simulate the outcome of present and future experiments by developing mathematical models. These models explain the nature of atoms, molecules, light and their interactions in terms of mathematical equations that are solved with the help of powerful computers.

The researchers' model describes experiments that are currently being performed at various laboratories worldwide, including the J.R. Macdonald Laboratory at K-State.

For the past few years, Thumm and his colleagues studied what happens with the hydrogen molecular ion when it interacts with short laser pulses. They used hydrogen because it's the simplest molecule, although they have now extended their research toward the imaging and control of the much faster moving electrons.

The hydrogen molecular ion has two protons and just one electron that "glues" them together. A few years ago, by performing computer simulations, they found that laser pulses can control the motion of the protons by setting them in motion or slowing them down.

The researchers use a first ultrafast laser to pump the molecule with infrared pulses. The protons vibrate and move apart slowly, but the electron still tries to hang on. The second part of their model uses the laser to probe the particles with a second delayed light pulse to see what happens when the electron fails to keep the protons glued together. The infrared laser pulses create an electric field that puts a force on the electron. Eventually, Thumm said, the electron has to choose which proton it will stick with.

Thumm and his colleagues were surprised to find that for certain laser pulses the electron can move in the opposite direction from what they anticipated.

"Our naive expectation was that the electron would follow the laser electric force," Thumm said. "That's what other simulations predicted, and they agree with classical physics and common intuition."

For instance, if you're pulling on a shopping cart, the cart will move in the direction of the force -- in this case, toward you. But at the quantum level, the rules are different.

The researchers found that sometimes the electron moves in the direction of the force, but sometimes not. Thumm, He and Becker found that the electron picks the proton on the left or the one of the right depending on the intensity of the laser pulse. Knowing which intensity will make the electron move to

the left or the right gives physicists the ability to steer the electrons by setting the laser pulse to a specific intensity.

Thumm said this finding is not only a contribution to basic physics research, but it also could help chemists better understand and possibly control chemical reactions.

"We would like to see a 'molecular movie' that shows the redistribution of electrons in time -- within attoseconds -- during a chemical reaction," he said. "It would promote our understanding of basic processes that eventually enable life: electrons bind atoms to simple molecules, such as the hydrogen molecule or water. Through many chemical reactions, these simple molecules react with each other and eventually form huge bio-molecules that make life, as we know it, possible."

One possible commercial application of the finding, Thumm said, could be helping companies become more efficient in producing a desired chemical compound while minimizing unwanted byproducts in the reaction.

More information about K-State's James R. Macdonald Laboratory is available at: http://www.k-state.edu/media/newsreleases/oct08/laserlab102808.html

Summer Undergraduate Research Thrives
Kristan Corwin

Two-thousand eight marked a high point for participation in the Research Experience for Undergraduates, funded by the National Science Foundation. Fourteen students came to Kansas State for 10 weeks to participate in research projects with our faculty. The places they call home range from New York to Oregon, from Minnesota to Texas, and from Missouri to Zimbabwe. Their research topics were also wide-ranging. In nanoscience, one student created nanoparticles and studied their formation, while others used the same particles to study the way they change color or the way they interact with polarized light on a solution's surface. Some students worked with lasers, including the properties of a fiber laser that pulses because it has carbon nanotubes in the cavity. Others designed spectrometers to measure the momentum of molecular fragments after a molecule dissociates in an intense, ultrashort laser pulse where the electric field of the laser is precisely controlled. Finally, four students traveled to Japan at the end of the summer to participate in on-going neutrino oscillation experiments.

The summer was memorable for more than research. When the campus and particularly Cardwell Hall were struck by a tornado on June 11th, students pitched in enthusiastically to clean up the campus. Incidentally, this is not unprecedented, because in 1993, our REU student helped clean up from a major flood. Fortunately we were back in the building pretty quickly, aside from a brief closure for asbestos testing. Students also met to discuss the ethical issues that physicists frequently confront, from graduate school selection to authorship in publication and even scientific fraud, led by Philosophy Professors Bruce Glymour and Amy Lara. They also attended information sessions on applying for graduate school, led by the graduate school SUROP program. And of course, they found time for ice cream socials, a trip to the Cosmosphere, a tour of the K-State Nuclear Reactor, and a day-long canoe trip.

Dr. Larry Weaver has led this program since it was first funded in 1993 and Dr. Kristan Corwin joined the project in 2006. The year 2008 marks the end of a 3-year grant cycle, and we are delighted to have been recommended for funding for the next three years by the National Science Foundation. For more information, please visit www.phys.ksu.edu/reu.

New Faculty

Brett Flanders
Associate Professor
http://www.phys.ksu.edu/research/condensed-matter.html
Ph.D.: University of Chicago, 1999

Dr. Flanders is working in the area of soft matter nanotechnology and biological physics. Dendritic solidification is the growth of a needle-shaped crystal in a surrounding liquid phase and is governed by the stationary diffusion equation. The process pervades alloy crystallization, solidification from supercooled melts, and electrochemical deposition. It underlies snowflake growth, and it bears a fundamental similarity to viscous fingering in hydrodynamics. We have developed the directed electrochemical nanowire assembly (DENA) technique for fabricating crystalline and amorphous nanowires on micro-electrode arrays. DENA harnesses the dendritic solidification process to induce and direct the growth of these wires. Currently, we grow metallic and polymeric wires. We are working to extend the approach to bio-polymeric materials that are prohibitively difficult to study in their natural environments. The wire-laden electrode arrays are of potential use for cell physiological studies. Work on this application is ongoing, as well.

Robert Szoszkiewicz
Assistant Professor
http://www.phys.ksu.edu/szoszlab/
Ph.D.: Swiss Federal Inst of Tech., Lausanne, Switzerland, 2003

Dr. Szoszkiewicz is working at the interface of biology, chemistry and physics. We would like to address quantitatively issues spanning from mechanics and mechanochemical reactions of single molecules under force, up to mechanics of systems of biomolecules. We want as well to translate certain structure-functionality relations (and in particular those dwelling on cellular functionality) into man-made surfaces and devices, and to start with by working with the nanopatterned templates for controllable assembly of single molecules.

Physics Undergraduate Club
Jennifer Pratt, President

The physics club is more active than ever this year. With approximately 18 active members and several others on our mailing list, we are working on many projects and becoming more active in the community. We've got a lot of big ideas, but for right now we are focusing on four main projects: a rail gun, a lifter (ionic wind generator), a Beowulf computer (cluster computer), and rebuilding the physics club trebuchet. We get together every Saturday afternoon to work on these projects. Our goal is to have these projects ready to display at open house on April 18th.

In addition to these projects, we have been asked by several elementary schools to give physics demonstrations. So far we have preformed two shows and are scheduled for two more in the coming

weeks. We focus on hands-on activities and prompting the kids to ask why something is happening. Everyone in the club enjoys doing this and the kids have responded very well to our shows. This is something the physics club is interested in continuing and possibly seeking out opportunities instead of having them find us.

We are also trying to get involved with recycling projects. Since we have a lot of computer scraps left over from the Beowulf project we are planning to take the leftover plastic and metal to Big Lakes Developmental Center where they have a recycling program specifically for computer waste.

Once a month we schedule a "movie night" where we watch science fiction movies and discuss them. Anyone is welcome to come.

Undergraduate Scholarships Awarded

K-State Physics undergraduates were awarded scholarship in the spring of 2008 at the annual Scholarship Luncheon hosted by the Physics Department. A list of the students as well as their hometowns and the scholarships awarded is shown below.

Student	From	Scholarship
Isaac Barber-Axthel	Hillsboro, KS	Hamilton
Benjamin Berry	Wichita, KS	Dragsdorf
Jacob Belden	Wichita, KS	Huidburg/Hamilton
Thomas Burke	Salina, KS	Hudiburg/Hamilton
Kevin Classen	Andover, KS	Hamilton
Alexa Cooper	Lenexa, KS	Hudiburg/Hamilton
Sara Crandall	Cheney, KS	Hamilton
Nicole Crouse	Omaha, NE	Hamilton
John Flynn	Wichita, KS	Hamilton
Samuel Fahrenholtz	Goddard, KS	Macdonald/Shenk
Samuel Haugland	Lenexa, KS	Hamilton
Nels Hotvedt	Lawrence, KS	Hamilton
Jeremy Ims	Overland Park, KS	Hudiburg/Hamilton
Scott Jones	Derby, KS	Hudiburg/Hamilton
Jeremy Kemberling	Lawrence, KS	Hamilton
Chelsi Kovala	Manhattan, KS	Bearman
Henry Lamm	Colby, KS	Parks
Philip Lucas	Burns, KS	Hamilton
Frank Male	Eudora, KS	Curnutte & Hudiburg
Matthew Metivier	Leavenworth, KS	Hamilton
Joshua McIlvain	Madison, KS	Cardwell
Daniel Moeder	Wichita, KS	Cardwell
Jennifer Pratt	Manhattan, KS	Giese
Cory Refett	Olathe, KS	Hamilton
Jacob Ritter	Rosalia, KS	Hamilton
Nicholas Sndburg	Overland Park, KS	Hudiburg/Hamilton
Travis Scott	Liberal, KS	Hamilton
Daniel Simonson	Wakefield, KS	Hamilton
Mark Smith	Wichita, KS	Hewitt
Erik Stalcup	Wellington, KS	Branson/Ellsworth
Andrew Vonfeldt	Larned, KS	Dragsdorf

This Year's Graduates and What They are Doing Now

Bachelor of Science Degrees
Chris Borjas -Teaching, Polytechnic High School, Fort Worth
William Heinson - Graduate School, Kansas State University
Aaron Pung -Graduate School, University of North Carolina - Charlotte, Optics
John Patrick Stewart
Zachary Warren - Graduate school

Masters of Science Degrees
Eli Gilbertson - Teaching at Manhattan High School, Manhattan, KS

Doctorate Degrees
Matt Berg - NRC Postdoctoral Fellow, US Army Research Laboratory
Rajan Dhaubhadel - Intel Corporation, Oregon
Ahsan Mahsana - Postdoc, Univ. of Texas/Dallas, Atlas experiment at CERN
Eric Moon - Field Service Engineer/R&D Laser Scientist Quantronix Corporation
Max Sayler - Postdoc, Institut fuer Optik und Quantenelektronik
Mansoora Shamim - Postdoc, Univ. of Oregon, Eugene, Atlas experiment at CERN
Marc Trachy - Lockheed Martin
Chris Ugolini - Kansas Semiconductors, manufacturing semiconductor substrates

Peterson Lecture

The Peterson public lecture was given on March 3, 2008 by Nobel Laureate Dr. William D. Phillips form NIST/University of Maryland. He presented a very informative and highly entertaining talk entitled, "Time and Einstein in the 21st Century: The Coolest Stuff in the Universe" at the K-State Alumni Center. The audience learned about atomic clocks, the global positioning system and how very cool temperatures can be used to improve the accuracy of atomic clocks. The cooling of these atoms allows clocks to be made that are accurate to better than a second in 60 million years and allow testing some of the strangest predictions of Einstein's theories of time and space. Dr. Phillips won the Nobel prize in 1997 for development of methods to cool and trap atoms with laser light.

The Peterson lecture series is funded by Chester Peterson, Jr. for publicizing and presenting an annual public lecture series on a continuing basis concerning cosmology or quantum mechanics. http://www.phys.ksu.edu/alumni/news/2006/peterson-chet.html

Neff Lecture

The 2008 Neff public lecture was given by Dr. Philip Bucksbaum of Stanford University March 31 on 'Ultrafast Quantum Control'. Dr. Bucksbaum is director of the Ultrafast Science Center at Stanford University.

The atomic bond rearrangement involved in chemistry can take less than a picosecond, and the electrons that make these bonds move in a few femtoseconds. Lasers can more than keep up with this: the shortest laser pulses are high harmonics at about one-tenth of a femtosecond. This means that ultrafast laser pulses can be strobe lights to freeze motion of atoms in molecules, and electrons in

atoms. We take this notion one step further, illuminating molecules with intense and carefully shaped ultrafast laser pulses, which cannot only image, but also control basic quantum processes in atoms and molecules.

This lectureship is funded by an endowment established with a bequest from Dr. Neff. The James R. Neff Lectureship "shall perpetuate and honor Everett and Florine Neff, parents of James R. Neff, and Janice K. Neff Standish (sister). It is further intended to represent Dr. Neff's gratitude for the opportunities and education that he received at Kansas State University and to verbally acknowledge Florine and Everett Neff as benefactors of the institution of higher learning." http://www.phys.ksu.edu/alumni/neff-lecture.html

Christopher Sorensen

The world of physics continues to fascinate Christopher Sorensen, University Distinguished Professor of physics and chemistry (adjunct) at Kansas State University.

With a passion for physics, Sorensen began teaching at K-State in 1977. He was named Outstanding Doctoral and Research Universities Professor of the Year in 2007 by the CASE/Carnegie Foundation for the Advancement of Teaching. He is a native of Omaha, Neb., and received a bachelor's degree in physics at the University of Nebraska at Lincoln in 1969. Sorensen was drafted into the army for two years and served in Vietnam. He returned to school to receive master's and doctorate degrees in physics from the University of Colorado.

Sorensen has pursued research in light scattering, optics, water and aqueous solutions, phase transitions and critical phenomena, metastable liquids, nanoscale particles, combustion physics and aerosol physics. He has received numerous research grants, published more than 180 professional publications and holds two patents.

Besides researching, Sorensen has created, developed and taught several courses and workshops for K-State's physics department. As a K-State presidential lecturer, he speaks at five high schools per year about science. Sorensen is a member of many professional societies, including the American Physical Society, the American Chemical Society and the American Association for the Advancement of Science.

Sorensen has received numerous honors, including Phi Beta Kappa, Woodrow Wilson Fellow, Stamey Teaching Award (twice), Commerce Bank Undergraduate Teaching Award, Commerce Bank Distinguished Graduate Faculty Member Award, University Distinguished Professor, the Presidential Award for Outstanding Undergraduate Teaching and David Sinclair Award of the American Association for Aerosol Research. In 2008, he won a Higuchi-KU Endowment Research Achievement Award. Sorensen can be reached at 785-532-1626 or by e-mail at sor@phys.ksu.edu.

Courtesy of K-State Media Relations

K-State Professors Participate in Work at CERN

Two Kansas State University physics professors have worked for the past seven years helping bring to life the world's most powerful particle accelerator, known as the Large Hadron Collider at CERN, the European Organization for Nuclear Research in Geneva, Switzerland. K-State is one of 48 institutions from 22 states and Puerto Rico involved in this project. Approximately 2,300 international collaborators are working on the project.

K-State physics professor and project leader Tim Bolton said their work reached a key milestone Jan. 22 with the insertion of the final piece of the 1430 ton Compact Muon Solenoid detector into the 17 mile long circular tunnel of the Large Hadron Collider. The detector, in essence a giant high-speed digital camera, will provide snapshots of the violent collisions between beams of counter-rotating protons in the collider. Each of these collisions release up to 14 trillion electron-volts of energy, an amount about a million times that produced by the accelerators in K-State's James R. Macdonald Laboratory. Data taking with the new detector and accelerator should begin this summer.

Yurii Maravin, assistant professor of physics, has spent nearly a year in Geneva, Switzerland, working on the Compact Muon Solenoid detector. Maravin's team, including doctoral graduate student Ketino Kaadze, and post-doctoral researcher Dmitry Bandurin, has worked closely with colleagues at Minnesota, Princeton and Caltech to commission the key component of the Compact Muon Solenoid that detects electrons and photons known as the electromagnetic calorimeter.

Bolton has led a group of undergraduates with engineer Russell Taylor from the K-State Electronics Design Laboratory to test thousands of parts of the inner pixel tracker detector of the Compact Muon Solenoid in the physics department's high bay laboratory.

The United States' contributions to the experiment and the Large Hadron Collider are funded by the Department of Energy's Office of Science and the National Science Foundation.

Courtesy of K-State Media Relations

Ellen Williams Gives a Public Lecture at K-State

MANHATTAN -- The tiny world of nanoscience has opened broad frontiers in physics and microbiology, and one of its pioneering personalities will share her observations Friday at Kansas State University.

Ellen D. Williams, distinguished university professor of physics at the University of Maryland, will deliver the keynote address for a workshop arranged by Women in Science and Engineering. The address, "Seeing Atoms: The Beginnings of Nanoscience," is free and open to the public, although the weekend ADVANCE workshop is not.

Williams, who also directs the National Science Foundation's Materials Research Science and Engineering Center, will speak at 7:30 p.m. Friday, Feb. 15, in the Flint Hills Room of the K-State Student Union. She will concentrate on how the invention of the scanning tunneling microscope 25 years ago gave researchers the ability to observe individual atoms and even manipulate them.

"The nanoscale world is not a scaled-down version of the larger world," Williams said. "Nanoscale structures have special properties by virtue of their smallness alone, which include quantum confinement, high surface-to-volume ratio and susceptibility to fluctuations."

Such nano-talents are leading to applications such as microswitches and highly reactive powders that can decontaminate toxic environments.

In addition to talking about crossing physical frontiers, Williams also will reflect on the changing attitudes toward women' s participation in the sciences. For example, when she began graduate school at the California Institution of Technology, formal admission of women had only been allowed for a few years. She earned her doctorate in chemistry in 1981.

More information about Williams' presentation is available at http://www.phys.k-state.edu/advance/index.html

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Courtesy of K-State Media Relations

KSU Physics Undergrad, Samuel Fahrenholtz, Received Honorable Mention Honor for Goldwater Scholarship

MANHATTAN -- Three Kansas State University students are recipients of 2008 Barry M. Goldwater Scholarships, while a fourth student has been recognized as an honorable mention for the award. The winners are Michelle Higgins, **Manhattan**; William Carlson, **Overland Park**; and Scott McCall, **Parker, Colo**. Samuel Fahrenholtz, **Tribune**, received honorable mention honors.

The three K-State students are among 321 students from across the nation to receive the Goldwater Scholarship this year, which are awarded for academic merit. The scholarships are worth up to $7,500 annually for a student's final one or two years of undergraduate studies. This year's recipients were selected from a field of 1,035 mathematics, science and engineering students who were nominated by the faculties of colleges and universities nationwide.

"Congratulations to these superb K-State students, who continue this university's rich tradition of national scholarship excellence," said Jon Wefald, K-State president. "The Goldwater Scholarship places a high value on undergraduate research experience, and at K-State, we have long made opportunities for undergraduate research a priority. The efforts of our dedicated and supportive faculty also are helping our students achieve at this highest level."

With three Goldwater recipients this year, K-State students have now won 63 Goldwater Scholarships. K-State remains first in the nation among state universities in Goldwater Scholarship winners. Among all universities, K-State is tied for third place with Duke. Princeton has 68 and Harvard has 67 Goldwater scholars. All four K-State students plan careers in research.

Higgins, a senior in nutritional sciences and biochemistry, plans to pursue a doctorate in pharmacology. Her career goal is to conduct translational research in drug discovery and development at the university level.

Carlson, a junior who is majoring in mathematics, wants to do research in math analysis and teach at a university after earning his Ph.D.

McCall is a sophomore in biochemistry and biology. After earning his medical degree and doctorate in pharmacology, he would like to conduct novel pharmaceutical research, especially using synthetic medicine chemistry for clinical integration in clinical medicine.

Fahrenholtz, a senior in physics, plans to pursue a doctorate and conduct research in the area of medical physics, teaching at the graduate level and performing clinical work pertinent to his research.

Higgins is working in the K-State College of Veterinary Medicine's pharmacology program, looking for proof of concept by performing immunohistochemistry on prostate tumor sections from treated mice. At K-State, she also was a student lab assistant in 2005 for the department of human nutrition, assisting in a study researching the effects of diet and exercise on cancerous tumor development. She has worked

as a research technician in the K-State Nutrient Metabolism Lab, assisting in a glycemic index study investigating glucose absorption and insulin sensitivity. In 2007, she was a National Exchange Student at Oregon State University, where she gained biochemistry research credit by maintaining prostate cancer cell cultures and learning DNA extraction and Western blotting. She also had a Summer Undergraduate Research Fellowship at the University of Kansas Medical Center, where she tested pharmacologic interventions for prostate cancer. She is a member of the K-State women's rowing team, College of Human Ecology honors program, Alpha Chi Sigma professional chemistry fraternity and Phi Kappa Phi honor society. Her others honors include a 2007 Cancer Research Award; Gamma Sigma Delta Honor Society's Outstanding Junior Award in 2007; semester academic honors; Big 12 Conference Commissioner's Honor Roll for multiple semesters; 2007 Phi Kappa Phi Scholarship; K-State department of biochemistry scholarship, 2006-present; Kansas State University Foundation Scholarship, 2004-2008; and a K-State Women's Rowing Athletic Scholarship, 2004-2008. A 2004 graduate of Manhattan High School, she is the daughter of Mary Higgins, Manhattan, and the late Randy Higgins.

Carlson is currently conducting research related to the analysis of particular partial differential equations under the supervision of Ivan Blank, visiting professor of mathematics. A research paper he wrote was published in Quantum Information and Computation. Carlson is a member of several honor societies including Phi Kappa Phi, Pi Mu Epsilon national mathematics society and the National Society of Collegiate Scholars. He was awarded a K-State Presidential Scholarship, a Stromberg scholarship, a Foster scholarship, a Friends of Mathematics scholarship, an IBM Watson Scholarship and an I-Center Undergraduate Research Award. Carlson also participated in a summer 2006 undergraduate research experience at the State University of New York at Potsdam. His research was focused on graph theory and he co-authored the paper "Universal Mixing of Quantum Walks on Graphs" that was published in Quantum Information and Computation. Carlson is a member of several honor societies including Phi Kappa Phi, Pi Mu Epsilon national mathematics society and the National Society of Collegiate Scholars. He has also been a member of the Chess Club, the Physics Club, the Math Club and a founding member of both the Go Club and the KSU Airsoft Team. A 2005 graduate of Shawnee Mission South High School, he is the son of Ron and Diane Carlson, Overland Park.

McCall has received the K-State Legacy Scholarship and the Gamma Sigma Delta First Year Achievement Award. Since fall 2006 he has worked in the organometallic lab of Stefan Kraft, assistant professor of chemistry. McCall is currently researching the development and synthesis of novel ligands designed to use high oxidation state palladium as a catalyst for carbon-hydrogen bond activation, with the ultimate aim of converting natural gas into combustible methanol as an alternative fuel source. He is also beginning work on elucidating the mechanisms of corneal cross-linking as part of surgical healing after LASIK surgery. McCall will pursue that topic this summer with a fellowship at the Mount Desert Island Biological Laboratory in Bar Harbor, Maine. He is a member of the K-State National Intercollegiate Rodeo Association rodeo team. In addition, he represents K-State as a Colorado ambassador. He was a National Forensics League Academic All-American in high school, and recently the American Quarter Horse Youth Association reserve national high point calf-roper, and three-time Rocky Mountain Quarter Horse Youth Association champion calf-roper. A 2006 graduate of Cherry Creek High School, he is the son of Dr. Marc and Lori McCall, Parker, Colo.

Fahrenholtz has participated in undergraduate research with the research group of Itzhak Ben-Itzhak, K-State professor of physics. They are studying the physics of laser-ion and molecule-ion collisions. He is involved in the imaging of the team’s experimental measurements and is currently analyzing proton-water collisions. Fahrenholtz has received a Kansas State University Foundation Scholarship, a Linschied Scholarship, a Dragsdorf Physics Scholarship and a College of Arts and Sciences Scholarship. He also has been active in K-State Concert Band and Brass Ensemble. A member of Farmhouse fraternity and a 2005 graduate of **Goddard** High School, he is the son of Dr. Randy and Janice Fahrenholtz, Tribune.

Courtesy of K-State Media Relations

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