Kansas State University
Departmental Newsletter 2003

Editor's Corner
Mick O'Shea


Mick O'Shea

The new year has just begun and its time for another newsletter from our wonderful physics department. Our campus continues to change slowly. The alumni center has been completed, was dedicated on Nov. 19th, and looks very nice as you enter the campus from the south side. For more information on the Alumni center go to http://www.k-state.com/. A dedication ceremony for the new southwest gateway to campus, the Peine Gate, was held on Nov. 8, at the gateway site, on the corner of 17th Street and Anderson Avenue. You should take a look at this gate if you haven't seen it already, the limestone construction looks great.

The new addition to Ackert Hall is nearly completed and will be named in honor of John Chalmers, a longtime K-State administrator and former dean of the College of Arts and Sciences. Chalmers Hall will be formally dedicated in early 2003. This building will house research facilities for the Center for Basic Cancer Research and other facilities related to biology and biochemistry.

Budget cuts continue to occur in our monies from the state. The cuts this year are more significant than previous years making for a more challenging working environment. President Wefald has said

> *'The challenge now is to determine how we can recapture the funds that have been cut while minimizing the damage to our academic programs and maintaining the caring atmosphere of this campus. We will continue working with our campus leadership representing students, faculty and administration to identify every option available in meeting this challenge.'*

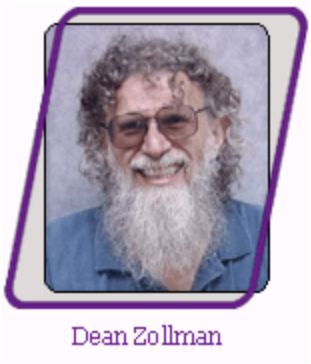
It should also be noted that K-State entered this fiscal situation already at the bottom of the Big 12 in per-student funding.

Despite these cuts KSU continues to set enrollment records. Total enrollment for fall 2002 is 22,762, compared with the previous record of 22,396, set last year. This is the fourth consecutive year K-State has set an enrollment record.

K-State accepted a bid to the Pacific Life Holiday Bowl and played Arizona State on Dec 27th. A recent article in the Manhattan Mercury suggested that this team (2002) is one of the best K-State has had and might equal the 1998 team. The Cats did a great job edging out Arizona State 34-27. It was an exciting game with K-State coming from behind to win late in the fourth quarter.

Department Head's Corner

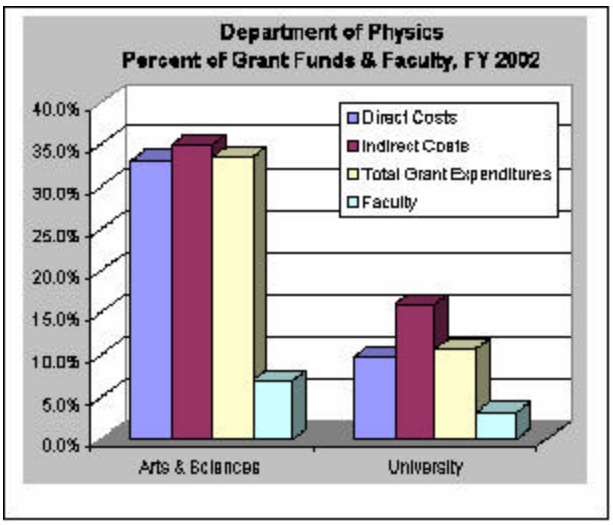
Dean Zollman


Dean Zollman

Recently I attended the annual winter meeting of the American Association of Physics Teachers. At the meeting I ran into many friends and colleagues whom I had not seen in one to two years. So, a frequent conversation opener was the question, "Well, how do you like being department head now?" My response always began with, "Well, you mean except for the budget, right?" Because most other states are in similar financial situations as Kansas, everyone immediately knew what I was saying.

In the spring, 2002, the Kansas Legislature worked long and hard to minimize the impact of the economy on all State agencies. By the time the Legislature adjourned, it had been able to patch together a budget for FY 2003 that in principle was identical for the institutes of higher education as the budget for FY 2002. At first glance it looked like the difference between the FY 02 and FY 03 budgets would be zero. However, inflation, increased medical insurance and several other costs quickly taught me that in the world of State budget accounting, zero can really be a negative number. So, we have spent this year attempting to find ways to meet our teaching, research and service obligations at lower costs. Fortunately, we have a strong and dedicated faculty who are contributing significantly to maintaining our quality at a time of some distress.

While the budget is the downside, our department has continued to have many positive components to our efforts. The funding for research that comes almost entirely from externally funded competitive grants remains at a very high level for a department of our size. The research funding for the past year exceeded $7 million, which is more than twice as much money as the State of Kansas provides for the department. For the past two years our department has had the largest grant income of any administrative unit on campus. This includes departments that have twice as many faculty members as we do.



Recently, for a report to the administration at KSU I did some comparisons of the productivity of our department to the faculty in the College of Arts & Sciences and at the University in general. In FY 2002 the Department of Physics received about $7 Million in Federal support for its research. As shown in the graph to the right, this amount is almost 11% of the total external research support granted to KSU and 33.5% of the amount coming to the College of Arts & Sciences for research. Most of our grants generate a rather large amount of indirect costs. In FY 2002 the Department's indirect cost income was $1.35 Million, 35% of the total indirect costs to the College and 16% of the total indirect costs coming to the University. We accomplish this with only 3.2% of the University faculty (7% of the Arts & Sciences faculty).

At the same time that the Department is a major player in the University's research, it is doing its fair share in teaching. In Fall 2002 the Department generated 14,733 student credit hours. These credit hours represent 2.8% of the University total and 5.0% of the Arts & Sciences total. Thus, our total teaching load is consistent with the fraction of faculty who are in physics while our external funding is extremely high.

This past fall we also had a very large incoming class of graduate students. Seventeen students began their first year of graduate studies in August, 2002. About one-third of these students had completed undergraduate work at a college or university in the United States while the other two-thirds came from all parts of the world. We now have a total of approximately 60 graduate students in our department. Likewise, the number of undergraduates increased slightly with the incoming class in the fall of 2002. We now have a total of about 40 undergraduate students and anticipate a relatively large graduating class in May of 2003.

On the faculty side, Bill Reay, University Distinguished Professor and leader of the High Energy Physics Group, retired during the summer, 2002. You may recall that Bill and Noel Stanton came to KSU about nine years ago to establish a high energy experimental research group. That group has flourished under Bill's leadership and is a significant factor in both our research and teaching efforts. Tim Bolton has now taken over most of the administrative tasks associated with the High Energy Group.

With Bill's retirement we were able to hire a new person in experimental high energy physics. Eckhard von Toerne received his doctorate from the University of Bonn in Germany and then completed a post-doc with the Ohio State High Energy Physics Group. During his post-doc he worked with the OSU group but was actually located at Cornell where he was involved in experiments on the CLEO silicon detector. Eckhard has now completed one semester at KSU and is well on his way to maintaining the quality that we have come to expect from the High Energy Physics effort.

An addition to our teaching program is Dr. David Van Domelen who has replaced Rebecca Lindell as Director of Laboratories. Rebecca has moved to a tenure-track position at Southern Illinois-Edwardsville. David completed a Ph.D. in Physics Education at Ohio State and then spent two years as a post-doc at Michigan State before coming to KSU this past summer.

Several of our faculty have received honors and awards during the past year to indicate that we are maintaining a rather high quality effort. As reported elsewhere in this newsletter, Chris Sorensen and Amit Chakrabarti received the KSU Presidential Award for Excellence in Undergraduate Teaching. Amit and Chris were cited for their overall efforts in teaching undergraduates and in particular for their work in revising the engineering physics course (this revision was described in last year's newsletter). Sanjay Rebello received a Faculty Early CAREER Development award from the National Science Foundation. This prestigious research grant is given by NSF to young faculty who show outstanding promise for a strong career in teaching and research. Sanjay is the second person (Bharat Ratra being the first) in our department to receive this award. To the best of my knowledge, Sanjay is the first person whose research specialty is physics education to receive this award. Three of our faculty, Itzik Ben-Itzhak, Brett DePaola and Bharat Ratra, were elected to Fellowship in the American Physical Society during the past year. Talat Rahman received the Olin Petefish Award for research achievement in the basic sciences. This $10,000 award from the Higuchi Endowment at the University of Kansas recognizes research excellence by faculty members at Kansas Regents institutions.

As usual, you, our alumni, have provided us with strong support in scholarship funds. Last spring in addition to our usual contributions, we received a generous gift that enabled us to create a newly endowed scholarship named for Leo Hudiburg who was a faculty member at KSU until 1947. We, of course, are very grateful for all of the support that you have provided and continue to provide.

During the past year we have had several distinguished visitors. As described elsewhere, Bill Porter who received a Master's degree at KSU visited in the early fall. Another alumna, Shanalyn Kiger Kemme, presented a colloquium on her research at Sandia Laboratories. Neal Lane, former director of the National Science Foundation and Science Advisor to President Bill Clinton, presented both a public lecture on Science in the White House and a physics colloquium in November of the past year. In early February, Eric Cornell, 2001 Nobel Laureate in Physics, also presented a public lecture and a physics colloquium.

A quick summary of the past year in our department is that we, like many others, are struggling because of the weak economy. At the same time, our department remains strong because of its faculty, staff and students. Significant support from research funding agencies and our alumni enable us to realize that the times are not what we would like but we can still do our jobs and do them well.

*K-State Alum Bill Porter, Founder of E*Trade Visits University*

Bill Porter

Bill Porter, the founder and chairman emeritus of E*TRADE, the online stock brokerage, delivered two lectures at Kansas State University. Porter received a master's degree in physics from K-State in 1952.

As part of the College of Business Administration's Distinguished Lecture Series, Porter presented "Change" at 10:30 a.m. Friday, Sept. 20, in McCain Auditorium.

He also was the inaugural speaker in the Department of Physics' new Ernest Fox Nichols Lecturers series, presenting "Applying Physics for the Betterment of Humankind" at 2:30 p.m. Sept. 20 in the K-State Student Union's Little Theatre.

Porter is a physicist, entrepreneur and inventor. With his first startup company, Commercial Electronics Inc., Porter invented the first color low-light-level broadcast television camera. He then went on to develop more than 20 products and services and to hold 14 patents.
He began what evolved into E*TRADE in 1982, an electronic brokerage service bureau for stockbrokers called Trade Plus. The first online trade in the world took place July 11, 1983, through Trade Plus.

Porter then began thinking about how individual investors could save money on brokerage fees and have more control over their investments by making real time stock transactions from their own computers.

In 1992 he launched E*TRADE Securities Inc., one of the original all-electronic brokerages, which began offering online investing services through America Online and CompuServe. In 1996, Porter's E*TRADE Group Inc. then launched www.etrade.com. E*TRADE is now known as E*TRADE Financial and provides a variety of online financial services.

Although Porter stepped down as chairman of E*TRADE in 1996, he did not slow down his entrepreneurial efforts. In 2000 he helped launch a new venture, the International Securities Exchange, the nation's first entirely electronic options market.

K-State's department of physics' Ernest Fox Nichols Distinguished Lecturers Series was named in honor of Nichols, who graduated in 1888 with a degree in physics from K-State. He went on to become a highly regarded physicist at the turn of the 20th century and to serve as president of both Dartmouth College and Massachusetts Institute of Technology. Speakers in the series will be distinguished alumni of the department, such as Porter.

K-State Researchers Receive $1.4 Million Grant to Develop Semiconductor Ultraviolet Light Sources to Aid in Bio-Agent Detection


Hongxing Jiang

Jingyu Lin

If the thought of having an anthrax detector small enough to fit in your home smoke detector is exciting, you might want to know what Kansas State University researchers are working on to try to make that possible.

Led by professors Hongxing Jiang and Jingyu Lin, a K-State research team is part of a new consortium founded by the Defense Advanced Research Projects Agency. One of several universities to be a part of this consortium, K-State has been awarded $1.4 million over four years to develop semiconductor ultraviolet light sources, including LEDs and laser diodes for detection of bioagents such as anthrax. Several universities, including Brown University, Cornell University, the University of California at Santa Barbara, the University of Texas at Austin, and several companies are also members.

It takes ultraviolet light to "excite" a bioagent such as anthrax, causing it to give off a light of its own. If you can excite a biological system by ultraviolet light, then the biological agent will emit another type of photon of different wavelength with specific characteristics, making it possible to detect, according to Jiang and Lin.

"We are making better materials and finding the optimal structure to make this ultraviolet source. The other team members are trying to find out how to identify the fluorescence of threatening biological systems," Lin said. "We hope to work together to potentially identify biological threats by using ultraviolet light."

"We know, for example, that anthrax, other bioagents and a lot of materials fluoresce when you shine a small enough light on them," Jiang said. "You need a light with a shorter wavelength to excite these smaller particles."

According to Jiang and Lin, while there are larger ultraviolet lights that can detect these agents, there are currently no miniature ultraviolet LEDs that can enable smaller items -- such as portable devices -- to detect bioagents. The key here, according to the researchers, is making chip-scale and remote detecting devices.

"There's no point to bring a gigantic laser to do tests on a battlefield, for example, so what they want to do eventually is to make chip-scale detection devices for these biological threats," Lin said.

But more than just potential anthrax detectors, ultraviolet lights' short wave length can be very useful for medical purposes as well, since many biological cells and DNAs can be excited by UV light, according to Jiang and Lin.

"UV LEDs are important -- not just for detecting anthrax, but also for the medical field and medical research. In the future, invasive methods can be replaced with light detection. A person with diabetes, for example, would not have to draw blood every day," Jiang said.

Assisting the researchers with their current and new projects are grants from the Department of Defense and the Department of Energy to purchase a $1.2 million commercial Metal Organic Chemical Vapor Deposition reactor.

"We feel very lucky. It's not easy to get this kind of equipment at a university," Jiang said. "As far as we know, it's the second largest machine in the university setting. This machine will open a lot of opportunities for us in the future."

The research team began installing the new machine in January 2002 and have been using the machine since the end of May. The new machine can simultaneously produce six pieces of 2-inch III-nitride wafers.

"It takes us three to four hours typically to make one-half of a 2-inch wafer on the old machine," Jiang said. "With the new machine, we can make six to seven wafers in the same amount of time. And, we get the uniformity that we didn't get with our home-built machine."
"Our small machine is still very critical to us. It's where we define the best structure of the wafer," Lin said. "Once we determine the structure of the LEDs using the small machine, we'll put that recipe in the big machine to produce and supply to the people who need it -- collaborators, team members in the consortium, etc."

"We will be able to contribute not only for our research, but for the cause as well," Jiang said. "As part of a team with all kinds of experts, we will be able to supply them with different materials and structures."

Jiang and Lin's research is funded by the grants from National Science Foundation, Department of Energy, Army Research Office, Ballistic Missile Defense Organization, the Office of Naval Research and the Defense Advanced Research Project Agency.

The Defense Advanced Research Projects Agency is the central research and development organization for the Department of Defense. It manages and directs selected basic and applied research and development projects for the Department of Defense, and pursues research and technology where risk and payoff are both very high and where success may provide dramatic advances for traditional military roles and missions.

Jiang and Lin's current research team includes visiting professor Sixuan Jin; postdoctoral research associates Tom N. Oder and Zhaoyang Fan; research assistant Wei-ping Zhao; physics graduate students Jing Li, Kyoung Kim, Jagat Shakya, Ki-Bum Nam, Mim Nakarmi, and Chakra Maharjan.

K-State Faculty Member Honored by KU for Research Excellence


Talat Rahman

A Kansas State University physicist is one of four recipients of a research award from the University of Kansas. Talat Rahman, a K-State university distinguished professor of physics, will receive the Olin Petefish Award for research achievement in the basic sciences. The $10,000 Higuchi award recognizes research excellence by faculty members at Kansas Regents institutions. The award was presented Oct. 2 in the Bruckmiller Room of KU's Adams Alumni Center. Recipients may use their awards for research materials, summer salaries, fellowship matching funds, research assistance or other support. Rahman is a condensed matter theorist who investigates the physics of nano-materials, solid surfaces and interfaces. This work is important for solving technological issues such as thin film growth, new materials development, tailoring of properties of nanomaterials, controlling chararcteristics of catalysis and corrosion. It also is important for the fundamental questions it raises about the nature of the bonding between atoms at surfaces and interfaces and in other regions of low coordination like those on nanocrystals. Rahman is a pioneer in delineating the impact of atomic vibrations on the characteristics of materials. She is recognized world-wide for her contributions in the area of surface dynamics. One area of recent focus is establishing the theoretical framework for multiscale modeling of materials which allow an understanding of the macroscopic properties of materials from information obtained at the microscopic level. Her efforts to model and visualize complex phenomena prompted her to seek funding from the National Science Foundation to expand the scientific and technical computing capability at K-State. The NSF grant and matching funds from the university established K-State's Center for Scientific Supercomputing, a facility for faculty across campus.

Rahman's research programs have been continuously funded by national funding sources throughout her tenure at K-State, beginning in 1983.

Rahman has been an invited scientist at many of the world's most important research labs. Her awards include the UNDP Fellowship and the CNR-Italy Research Fellowship and Alexander Von Humboldt Fellowship. Rahman is a Fellow of the American Physical Society. In 1998 she received K-State's University Distinguished Graduate Faculty Member Award.

She has published hundreds of research articles, many of which have been accepted by Physical Review Letters, one of the most prestigious of the peer-reviewed publications in the physical sciences. Rahman received K-State's William L. Stamey Teaching Award in 1992. A faculty senator for several years, she is a former president of Faculty Senate. She was instrumental in establishing the K-State Developing Scholars' Program, which aims to enhance the retention and graduation rates of students from historically under-privileged groups. For the past several years Rahman has been funded by the National Science Foundation to organize scientific activities at the international summer college in Nathiagali, Pakistan, on "Frontiers in Physics and Contemporary Needs of Developing Countries." Currently Rahman is serving a three-year term on the executive committee of the Division of Materials Physics, American Physical Society.

Rahman earned her first degrees in physics from Karachi and Islamabad universities in Pakistan and a doctorate in physics from University of Rochester. She served as a postdoctoral research physicist and assistant research physicist at University of California at Irvine before joining the K-State faculty.

The awards were established in 1981 by Takeru Higuchi, KU distinguished professor of chemistry and pharmacy and chair of pharmaceutical chemistry, and his wife, Aya. Higuchi created the award with the stipulation that faculty members at all Kansas regents institutions be eligible. The annual awards are named for people who have worked through the KU Endowment Association to further KU's overall research program.

Alumni News

Mark Troike, M.S. in Physics 1996 under Brett DePaola, is currently working as a software engineer and Oracle database administrator for a software company in Dayton Ohio. He is responsible for design and implementation of new software features as well as being responsible for database design, implementation and support. He says that while a Physics degree has no direct relevance to our software (ATM management), the problem solving techniques taught in the discipline are of use on a daily basis.

Tracy N. Tipping is currently the Deputy Radiation Safety Officer at the University of Texas at Austin.

Mahtab Ullah is a lecturer in physics in B. Z. University, Multan, Pakistan. He is working with a research group on " Ab-initio Calculations , atomistic modeling of materials"

Steven L. Silva graduated from Kansas State University in 1997 with a B.S. in Physics. He continued his education at the University of Missouri - Kansas City. He started a research partnership with Dr. Fred Leibsle studying Scanning Tunneling Microscopy. He completed his studies in 1999 by earning a Master's in Physics from the University of Missouri. Immediately following his Master's degree he began working as a Process Engineer at Honeywell specializing in physical vapor deposition (PVD). He recently changed careers and is now working as a Process Engineer with Aixtron, a leading metal organic chemical vapor deposition (MOCVD) company, specializing in compound semiconductors.

Mark Hjelmfelt graduated with a B.S. in 1969. He was Treasurer and President of S.P.S. He did graduate work at Purdue, served in the Air Force, recieved his M.S. in Meteorology from South Dakota School of Mines and Technology in 1975,and his PhD from Dept. of the

Geophysical Sciences, University of Chicago in 1980. He worked at the National Center for Atmospheric Research from 1980-1982 and 1983-1988, with a year at Brookhaven National Laboratory. Since 1988 he has been part of the faculty in the Department of Atmospheric Sciences at South Dakota School of Mines and Technology, serving as Department Chair 1997-1999.

His research interests are cloud processes, severe storms, influences of topography on clouds and precipitation, and the coupling of clouds and hydrology on the local scale. He has been involved in a number of field programs utilizing instrumented aircraft, research radars and other platforms, and has used complex numerical models to examine physical processes. He has taught a variety of upper-division and M.S. level courses. He has found many exciting physics problems in atmospheric science.

Howard A. Barnes graduated in 1962, with a B.S. For most of his career, he was involved in computer simulation of spacecraft or aircraft systems, trajectories, and flight dynamics. This required an understanding of mechanics and thermodynamics, and an ability to analyze various systems. "I always felt that my Physics education was the perfect foundation for a career in simulation." With some cutbacks in military projects, his career shifted somewhat in the 1990's. He is currently a full time graduate student in Computer Science, at the University of Tulsa. In June, 2001, he read a story, on the Internet, about a fellowship program, sponsored by the government. This program, known as Cyber Corps, is intended to produce computer security specialists, to defend against Internet hackers and terrorists. I will be serving an internship this summer, at NASA headquarters in Washington, D.C.; and, when he graduates next year, he will have a two year commitment to government service.

Roger Facklam graduated from KSU in 1976. He is currently working for the Office of the Secretary of Defense, Pentagon Annex, Washington, DC. He is working on the Airborne Laser program (Check BOEING Website under fighter aircraft) for the Ballistic Missile Defense Office (BMDO). They are installing a million-watt class laser on a 747 to kill ballistic missiles hundreds of miles away from the aircraft. After KSU he worked on the Voyager spacecraft team. He then went into the Air Force and completed an MS in Engineering Physics (Air Force Institute of Technology) and was a PhD Candidate in Laser optics (University of New Mexico). He is the sole inventor on three US Patents. He invented the laser clock accurate to 1 second in 10,000 years! He also invented a laser line narrowing system and an optical dispersion controller. His bio was included in 2000-2001 WHO'S WHO Science and Engineering and will also be included in the next edition. He is married and has two boys 3 and 11 years old.

K-State Professors Elected Fellows in American Physical Society

Three Physics faculty members have been selected as fellows in the American Physical Society. Itzik-Ben-Itzhak, Brett DePaola and Bharat Ratra were among the less than one-half of 1 percent of the international society's members to be recognized with fellowships this year. The fellowship program was created to recognize members who have made advances in knowledge through original research, made significant contributions in the application of physics to science and technology or made contributions to the teaching of physics or to the society.

Ben-Itzhak, who joined K-State in 1988, is a member of the J. R. Macdonald Laboratory, an atomic physics group operation under a Department of Energy grant researching ion-molecule collisions.


Itzik Ben-Itzhak


Brett DePaola

DePaola was one of the first physicists to travel to Japan as part of a cooperative research program between K-State and a Japanese physics laboratory, RIKEN. His experiements involved linear acceleration attempts to characterize electrons. He came to K-State in 1986.

Ratra is in the middle of a five-year, $300,000 National Science Foundation grant to study experimental data generated by deep-space experiments to help determine the shape of the universe. He recently co-authored an article in The Reviews of Modern Physics on his research. Ratra joined K-State in 1996.


Bharat Ratra

Physics Undergraduate Invited to Give Talk at 2002 APS Meeting


Max Sayler

It is not common that one of our undergraduate students is invited to give a talk in the APS meeting, in this case the DAMOP meeting of 2002.

Max Sayler, one of our undergraduate students is conducting research in the James R. Macdonald Laboratory on "Ionization and fragmentation of water by fast ions" under the supervision of Professor I. Ben-Itzhak. His research on isotopic effects in bond rearrangement and bond breaking have been discovered and have resulted in a few publications and an invitation to present his research in the "undergaraduate student research session" of the Annual Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting of American Physical Society that was held in Williamsburg, Virginia during May 2002.

Only four to five students are selected each year to present such talks. The title of his talk was "Ionization and fragmentation of water molecules caused by fast proton impact; an isotopic effect in bond rearrangement. " In addition to his talk, he presented a poster focusing on "Bond rearrangement during molecular dissociation; a sudden or slow process?" along with J.W. Maseberg, D. Hathiramani, K.D. Carnes, B.D. Esry, and I. Ben-Itzhak.

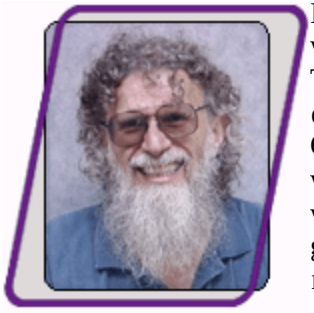
Physics Education
Kim Coy

The Physics Education Group continues to focus on the NSF-funded research project "Technology & Model Based Conceptual Assessment and Research: Students' Applications of Models in Physics and Mathematics." The goals of this research are to measure and trace changes in students' states of understanding through instruction, provide real-time feedback on students' states to students and instructors and develop tools that instructors can use in their classes to learn more about students' states. Some of the activities currently being undertaken to meet these goals include interviews on students' use and understanding of Newton's Second Law across contexts in mechanics and electricity and magnetism, student interviews and surveys on student mental models of sound, teaching experiments on student mental models of energy, and surveys and interviews on the effect of question order on student responses.


Sanjay Rebello

Sanjay Rebello has been working on his NSF-funded CAREER grant that is studying "Students' Mental Models, Learning and Transfer as a Guide to Application-Based Curriculum Development and Instruction." The goals of this project are to investigate students' mental models about the physical principles underlying everyday devices, measuring the change of these models with instruction, measuring transfer of learning from the classroom to everyday contexts or from one everyday context to another and developing curriculum based on this research by addressing physics used in everyday devices. Interviews are being conducted on students' mental models working to explain the bicycle and some electrical appliances and simple circuits. This research will expand to include other devices that students use everyday and their understanding of physics as portrayed in popular media. Work will then begin on developing instructional units focused on a particular application and addressing multiple concepts.

In addition, Sanjay is conducting research with Andrew Bennett of the Math Department on an NSF-funded project, "Assessing Student Transfer and Retention of Learning in Math, Physics and Engineering Courses. " This project is designing assessment tools that address the materials students learn and their retention in core engineering science courses in math and physics, the level of understanding of the students (facts and procedures versus the broader picture) and to what extent the students can transfer what they have learned in these math and physics courses to their engineering courses. This research is utilizing online homework, student interviews and surveys to investigate students' conceptual understanding in math courses and investigating student transfer and retention of learning from Engineering Physics to Statics and Dynamics and Electromagnetic Theory.


Dean Zollman

Dr. Zollman has recently received funding on an exciting new project which is funded by a Digital Libraries grant at NSF. The Physics Teaching Web Advisory (Pathway) is creating a proof-of-concept demonstration of a new type of digital library for physics teaching. Combining Carnegie Mellon University's digital video library technology with pedagogical advances developed at Kansas State University and with materials contributed by master teachers, the Pathway concept goes beyond simply creating a collection of teaching and learning materials. It provides continuously improving assistance and expertise

for teachers and students of all levels. Pathway builds on a unique collaboration between several longstanding research projects in digital video libraries, advanced distance learning technologies, collaboration technologies and nationally known experts in physics pedagogy and high quality content. Synthetic Interviews provide the teacher with an interface that is very similar to conversing with an expert. The video and other information are stored in a database that is presented when a teacher asks a question. Synthetic Interviews have been created for medical advice as well as "conversing with entertainment, sports and historical figures." Pathway will build on these experiences.

In personnel happenings, Paula Vetter Engelhardt joined the group as a research associate in August. Paula was previously a graduate student at North Carolina State University where she did her dissertation research on developing a multiple-choice diagnostic instrument called DIRECT which covers concepts related to simple direct current resistive circuits. She has spent the past four years with her family in Japan. In connection with the CAREER grant, she's currently working on investigating how students apply their physics understanding to everyday things such as bicycles. She is also using DIRECT to examine if the order in which questions are presented affects the overall performance on the test.

Dave Van Domelen is the new Director of Instructional Support. Dave comes to KSU from Michigan State University where he was an instructor/postdoc in the Lyman Briggs School. Dave received his Ph.D. Physics in 2000 from The Ohio State University. He did his thesis on "Development of the Problem Decomposition Diagnostic." The department gave him time to become acclimated during the fall but this spring he will begin teaching classes as well.

Graduate students Wally Axmann, Alice Churukian and Seunghee Lee finished their PhDs and Zdeslav Hrepic finished his Masters during 2002. Wally is currently an instructor at Wichita State University. Alice is a Juliana Wilson Thompson Visiting Assistant Professor at Wooster College. Seunghee Lee is taking a break from classes and work while her husband Jae-Hie Cho is working as a postdoc for Bruce Law here in the department. Zdeslav Hrepic has begun working on his Ph.D. research in Science Education under Dr. Zollman's supervision. Alicia Allbaugh is beginning to fine-tune her research and is writing her thesis in anticipation of a May graduation.

We are preparing to move a new group of graduate students in during the fall of 2003 as they move on to the research portions of their studies instead of spending all of those hours grading and teaching in the classrooms! We have the following students joining our group --- Edgar Corpuz (MS from De Le Salle University in The Philippines), Lili Cui (MA from Heifei Univ. of Technology in China), Corey Gerving (BS from the U.S. Military Academy,) Arifa Habib (MS from Lahore College for Women in Pakistan), Oppress Makhafula (M.Sc. from the Midlands State University in Zimbabwe) and Darryl Ozimek (BS from Clarion University).

Additional information about the group is available at http://www.phys.ksu.edu/perg/.

News from the Semiconductor Group

Jingyu Lin

Hongxing Jiang

The year 2002 was another busy and productive period for our semiconductor group (Hongxing Jiang and Jingyu Lin). The U.S. Patent Office has issued a patent for our invention of the semiconductor microdisplay. Several companies have already expressed interest in pursuing the technology to bring it to commercialization. In the last issue of Physics Newsletter, we reported that our group was initiating a new research project in the area of III-nitride ultraviolet (UV) photonics for bio-threat detections. Our group's involvement in this nationwide effort, which is currently funded by DARPA, was reported by some of the major media outlets including The New York Times, USA Today, CNN.com, and ABCnews.com during November 2002. The project is progressing well, but is technically very challenging. We have been seeking innovative new approaches to overcome some of the greatest difficulties. We have developed III-nitride UV micro-size lens arrays with individual lens sizes as small as 10 microns in diameter and focal length varying from 7-30 microns for coupling light in and out, as well as for enhancing the optical sensitivities of the III-nitride UV micro-size detectors and emitters. We have also successfully achieved, for the first time, nano-fabrication of III-nitride photonic crystals operating in the blue and UV spectral regions with air holes as small as 100 nanometers; furthermore, an unprecedented enhancement factor in quantum efficiency has been realized.

In collaboration with KU and funded by NSF (Information Technology Initiative program), we are also developing innovative integrated photonic devices based on III-nitride semiconductors for optical communications. The success of this project could provide revolutionary advances in optical communications.

With continuous strong support from several federal funding agencies, we are further expanding the laboratory infrastructure for advanced semiconductor research. The third commercial MOCVD system capable of producing simultaneously 6 pieces of 2-inch III-nitride wafers (successfully installed in May 2002) is running well and producing high quality III-nitride crystals. Other new facilities added to our lab include a deep UV photolithography system for micro-size device patterning with a 0.25-micron resolution, an X-ray diffraction (XRD) spectroscopy system for material structural characterization, and a deep UV near-field scanning optical microscope for nano-scale optical studies. Our unique capabilities for semiconductor material growth, micro- and nano-device fabrication, and fundamental property measurements have placed K-State in a unique position for advancing III-nitride wide bandgap semiconductor research.

Our group's research has evolved successfully from basic physics studies to a comprehensive program that encompasses fundamental physics, state-of-the-art epitaxial material growth, as well as advanced micro- and nano-photonic and electronic device fabrication. More specifically, our current research covers the development of semiconductor UV light sources for biological threat detection and for solid state lighting, integrated photonic devices for optical communications, high power electronics for wireless communications, and microdisplays for image processing. In this way, we are preparing our students with cutting-edge technological skills for the ever-changing scientific world.

News from the J.R. Macdonald Laboratory

Pat Richard, Lab Director

Pat Richard

Faculty, staff and students working in the JRM Laboratory were prominent in the news this year. Following are some bits of information, which may or may not be in the rest of the newsletter.

Faculty in the News

University Distinguished Professor Lew Cocke, Associate Lab Director for JRML, was elected to the position of Secretary/Treasurer of the Division of Atomic, Molecular, and Optical Physics. If you are getting the DAMOP newsletters, they are coming from Lew. Two members of the group, Professors Brett DePaola, and Itzik Ben-Itzhak, were awarded fellowship status in the APS. Brett's citation reads "For developing and applying technologically advanced experimental methods for studying basic atomic collision processes." Itzik's citation reads "For his creative experimental studies of molecular dissociation dynamics via fragment coincidence and 3D imaging techniques; and for his studies of the creation and decay of long-lived metastable molecular ions." Uwe Thumm was promoted to Professor of Physics in Fall 2002, and Brett Esry recently has been awarded tenure and promoted to the position of Associate Professor of Physics at KSU. Congratulations to all.

Lew Cocke

Brett DePaola

Itzik Ben-Itzhak

Uwe Thumm

Brett Esry

Staff in the News


Al Rankin

Al Rankin, assistant scientist, who has been a staff member in JRML since 1985, was recently recognized for his efforts in founding the A-3 Skywarrior aircraft website. The website allows former pilots and crewmembers to communicate. In an effort to expand his efforts, he organized a group that created a board of directors for the A-3 "Skywarrior" association. The association purchased and now maintains a commercial website, www.A3skywarrior.com. Al says there have been many rewards for his efforts. The association has received e-mails from kids of Vietnam veterans whose fathers were killed in the war. Finding people who knew their dads -i.e. squadron mates of their fathers, has helped them. The association celebrated the fiftieth anniversary of the first flight of the A-3, in Van Nuys, California in October 2002. Approximately 500 were in attendance, including Al and his wife, Mary.

Students in the News


Hai Nguyen

We have just learned that Hai Nguyen, physics GRA working on his Ph.D. with Brett DePaola has been awarded the "Upward Bound Achiever of the Year" award. At this writing the official announcement has not been made. To be nationally recognized by this organization is quite an honor. Upward Bound provides fundamental support to participants in their preparation for college entrance. The program provides opportunities for participants to succeed in pre-college performance and ultimately in higher education pursuits. Upward Bound serves high school students from low-income families, high school students from families in which neither parent holds a bachelors degree, and low-income, first-generation military veterans who are preparing to enter postsecondary education. The goal of Upward Bound is to increase the rates at which participants enroll in and graduate from institutions of postsecondary education.


Max Sayler

Max Sayler, one of our undergraduate research assistants, working with Itzik Ben-Itzhak, was selected to present a talk at the DAMOP 2002 meeting in Williamsburg, Va in the "undergraduate student research session." It is an honor to be selected to make such a presentation. His work was on "Ionization and fragmentation of water by fast ion beams". Max is presently a graduate student in our AMO physics program. Jesus Hernandez, an undergraduate working with Brett Esry, has been selected this year to present a talk at the DAMOP-2003 meeting in Boulder, CO in the "undergraduate student research session." His work is on "a new theoretical description of atoms in intense laser fields."

New Faces in the Lab

We have hired two new research associates in the Macdonald Lab.

Dr. Ali Alnaser has joined Lew Cocke's group. Ali received his Ph. D. in physics from Western Michigan University working with Professor John Tanis. Ali is working on "electron rescattering phenomena," which is important in describing intense laser - atom/molecule interactions. Dr. Jiangfan Xia has joined Itzik Ben-Itzhak's group. Jiangfan was a research associate working with Professor Donna Strickland at the University of Waterloo, Canada. Jiangfan is working on an experiment to study the interaction of intense laser beams with molecular ion beams. Dr. Bernold Feuerstein joined the group of Professor Uwe Thumm. Bernold is on a fellowship from the Max Planck Institute in Heidelberg, Germany. He is working on theoretical models for molecular fragmentation in a strong laser field.

Ali Al-Naser

Jiangfan Xia

Bernold Feuerstein

Research in the Lab

Please check our website www.phys.ksu.edu/area/jrm to see the latest in our research efforts. One of the main thrusts in the lab is to use the ultra-short pulse, ultra-intense laser beams, which have been developed during the last one and one- half years by Professor Zenghu Chang's group.

Activities

We are in the process of interviewing for a new faculty member in AMO Physics. Five candidates have been selected for interview.

Funding in the Lab

Last year (FY02) the AMO group received six grants totaling $2.95 Million. We have just received our renewal grant ($2,350,000) for the third year (FY03) of our latest 3-year grant from DOE. We will be submitting a proposal to DOE this summer for the next 3-year period.

Ali Mohammad to Attend M.I.T.


Ali Mohammad

Congratulations to Ali Mohammad on his acceptance to Massachusetts Institute of Technology.

In addition to being a Physics undergraduate student, Ali is also majoring in Mathematics, Computer Engineering and Computer Science at Kansas State University.

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If you wish to make a donation to one of the physics department scholarship funds, please make your check payable to the scholarship of your choice.

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