MOMENTUM

THE UNIVERSITY OF KANSAS DEPARTMENT OF PHYSICS AND ASTRONOMY

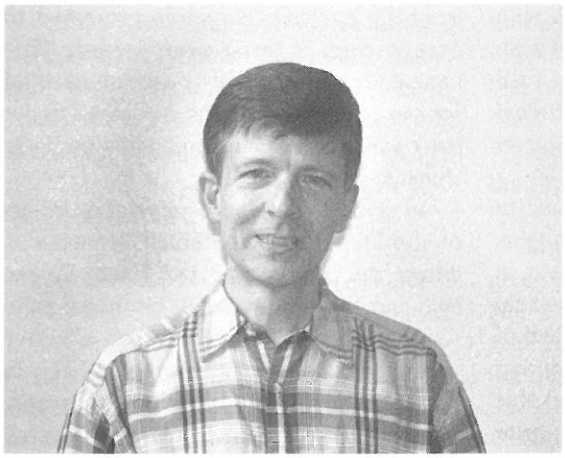
Sanders to become New Chairman

In the entire ninety-three year history of the Department of Physics and Astronomy, there have been only five chairmen. These are Frederick E. Kester (1909-1941), James D. Stranathan (1941-1964), David B. Beard (1964-1976), J. P. Davidson (1977-1989), and Ray Ammar (1989-2003). This spring we went through the process of choosing a new leader, and the College has named Professor Stephen Sanders to be the next Chairman.

Steve is a nuclear experimentalist who came to KU in 1989. His doctorate from Yale (1977) was followed by postdoc positions at Argonne National Lab. Until recently, he had been primarily interested in questions related to low-energy heavy-ion reactions. For the past few years, however, his interests have moved to relativistic heavy-ion collisions.

Preparation for his new position includes a number of tough jobs. These include chairing the departmental space/shop committee, the faculty evaluation committee, and the instructional laboratories committee—all while serving as our local Webmaster! He is known among his colleagues for his organization, his detailed approach to problems, and his ability to get things done while working collegially with everyone.

We asked Steve to write for *Momentum* readers how he sees the future under his chairmanship.



Steve Sanders

When the Editor of *Momentum* asked me to write a piece on my "goals" as the future Department chair, I saw this as an opportunity to relate some themes likely to influence the Department's development over the next few years. Many of these ideas were highlighted by our recent Planning Committee, Chaired by Professor Barbara Anthony-Twarog.

Our Department has seen many changes since I arrived, about 13 years ago. External research support has more than tripled, reflecting the national and international reputations of the faculty. Much of the funding growth can be attributed to our success in hiring exceptional new talent, both on the faculty and as staff personnel. Credit also has to be given to the current Chair, Professor Ray Ammar, for his strong support of the research programs and for his support in building up the research infrastructure of the Department. Although teaching was already a priority of the Department before my arrival, I see even greater emphasis on developing effective teaching today than when I arrived. It should come as no surprise that many of our best instructors are also our most productive researchers. What has not changed since my arrival is the size of the department. Our successes have been accomplished in spite of flat staffing.

Although these are difficult times at both the State and National levels, there is reason for optimism within our local community. For the first time since my arrival at KU, it looks like we may be able achieve an incremental increase in the size of the Department as a result of the University being allowed to have greater control of its tuition funds. There is considerable support within the Department and within the College to develop a biophysics program. Although it will be a challenge to recruit in this highly competitive field, the University and the local Lawrence community have much to offer prospective candidates. Within the Department the biophysics initiative is being spearheaded by what may seem like an odd combination of condensed matter experimentalists and high-energy theorists. This combination reflects the potential richness of the field for new discovery.

The biophysics initiative is being developed with tuition enhancement funds and should run parallel to our "regular" requests for new faculty hires based on retirements and exceptional opportunities. Over the past decade most of our new faculty have been experimentalists. It should come as no surprise, then, that the Department has stated its top priorities for new hires are for a theoretical physicist, with an emphasis on particle astrophysics, and for a condensed matter theorist. We are hopeful that we will be able to recruit in both of these areas within the next few years.

Before I take office it now seems certain that the Atmospheric Science program will be leaving the Department to return to its old home in the Geography Department. While strong arguments can be made for this move based on common research interests of the Atmospheric Science faculty and members of the Geography Department faculty, it is still sad to see Colleagues move away—even if it only involves their moving further up Mount Oread! It will be important that the Department not lose the perspective

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A Letter from the Chairman

This is the last time that I will be communicating with you in this manner via our newsletter. In mid-August I will be stepping down as chair of the Department after 14 years of service in that capacity. I will be succeeded by Steve Sanders who will assume his duties with the start of Fall Semester 2003. We all wish him every success in his new job and I am confident that he will be providing excellent leadership for the Department in the years ahead.

At a time like this it is not unusual to look back and review some of the highlights of one's past activities. I became chair in 1989 and welcomed the opportunity to help influence the character and development of the Department. In the subsequent 14-year period our Department has made remarkable progress. In 1989, and for several years prior to that, annual external research funding averaged around $600K—today the amount is over 3 million dollars, and reflects the increased vitality of the Department. A great deal of the credit is due to the very fine faculty which we have hired: more than half of our continuing faculty were hired during this period. The condensed matter physics program, which had all but disappeared by 1989, is now a flourishing program. The cosmology group has been greatly strengthened as has been the elementary particle and nuclear physics groups. As a result, we not only have a very fine faculty, but a wide spectrum of contemporary research specialties to appeal to the interests of most graduate students.

Turning to more immediate matters, the State has continued to experience serious financial problems similar to those occurring throughout the nation, and one consequence of this has been a reduction in State funding for the University. This has resulted in a number of austere measures, including a sharp reduction (essentially a freeze) on the hiring of new or replacement faculty. On the other hand, the past year has also seen the implementation of the first of three years of planned tuition increases, which has partially offset the shortfall in funds budgeted by the State. The tuition increase is funding a wide variety of improvements: upgraded classrooms, increased graduate assistant stipends, an increase in tuition grants, expanded access to technology, etc. Particularly noteworthy is the 10% annual increase in graduate teaching assistant stipends projected to persist over a three-year period. This increase in stipends will be a welcome relief for our graduate students and make us far more competitive in recruiting new graduate students of high quality.

In news of our faculty, several members of the Department received promotions during the past year. Alice Bean, Siyuan Han and Judy Wu were all promoted from Associate Professor to Professor, effective with the start of the Fall Semester 2003. In addition we were joined by two new Assistant Professors: Michael J. Murray (experimental nuclear physics), and Mikhail V. Medvedev (theoretical plasma astrophysics). Dr. Murray received his Ph.D. from the University of Pittsburgh in 1989, and Dr. Medvedev obtained his Ph.D. in 1996 from the University of California, San Diego. On the other hand two highly regarded faculty members retired: Tom Armstrong (space physics) and Nowhan Kwak (experimental high energy physics). They will be missed.

The Atmospheric Science (ATMO) program will return to the Geography Department effective with the start of the Fall Semester 2003. The ATMO program came to our Department from Geography in 1984, partly due to conflicts, which no longer exist. Over the years it has become clear that the program would benefit greatly from a return to Geography, where there are faculty working in areas dealing with climate and remote sensing, which tie in well with the interests of the current ATMO faculty. In addition, there is a far better opportunity for the nurturing of a graduate ATMO program in the Geography Department rather than in ours. Graduate students in Geography are well-matched to the ATMO program while there is no such natural constituency in our Department. Both the Geography Department and the current ATMO faculty are enthusiastic about the return of the ATMO program to Geography and we wish them every success in their new surroundings. We are confident that the friendships and social contacts that have been made here will endure the test of time.

Members of our Department have received important honors and awards during the past year. Adrian Melott received the 2003 Outstanding Educator Award from the KU chapter of Pi Delta Kappa, the national education fraternity. Phil Baringer received the Steeples Award for Service to Kansans in recognition of his work with outreach and public education. This past year, two undergraduates (Sarah Feldt and Josh Meyers) won prestigious Goldwater Scholarships. In addition, Alan Dibos won the Prosser Award and Adam Kraus won the Stranathan Award, for outstanding academic achievement in their respective categories. Additional student honors were presented at our annual awards banquet, as discussed elsewhere in the Newsletter.

On September 20, 2003, the University will hold its third annual open house. We always welcome visits by alumni and this annual University-wide event could be a good opportunity for such a visit. It is important for the Department and its alumni to stay in touch and this newsletter provides one method of doing so; we welcome news about your careers and personal lives for inclusion in the newsletter's section on alumni news. You may also learn of Department activities via our Web site, whose new address is www.physics.ku.edu. Like many other institutions, we depend on alumni contributions to allow us to support activities not normally covered in our budgeted program. We thank you all for your support and your continued interest in KU. As indicated above, this will be my final report to you as chair—I have enjoyed serving the Department these past 14 years, and look forward to my new role on the faculty.

Ray Ammar
Chairman

STUDENT NEWS

Student Awards

AuH_2O Again

Our excellent students continue to succeed in the national competition for Goldwater Scholarships. Our newest members of this elite group are **Sarah Feldt** and **Josh Meyers**. Sarah works with Professor Jeff Olafsen, while Josh works with Professor Dave Besson.

William Cross' undergraduate research award with Jeff Olafsen is to begin work to find Brownian motion of a macroscopic, free particle moving along a periodic fluctuating lattice as a model for understanding surface dynamics in non-equilibrium processes.

Sara Feldt received an undergraduate research award to continue her work from last summer with Jeff Olafsen. Her work is to understand chaos of a macroscopic particle near a hyperbolic surface as well as probe the velocity dependence of the coefficient of restitution in a two-disk collision. She is a Wealthy Babcock scholarship awardee this coming academic year in the math department.

Stephen Floor, an undergraduate, presented a poster paper at the winter meeting of the American Astronomical Society. His paper, in collaboration with a number of others, was on "Ellipticity Evolution in Simulated Galaxy Clusters." He was awarded an undergraduate research award of $1300 for summer research. He will present this work this summer in a number of European venues, including Denmark, Estonia, and on Mykonos (Greece). Melott is his advisor.

Kevin Kohlstedt will be participating in the Summer 2003 Student Research Participation Program at Argonne National Laboratory this summer. Working with Jeff Olafsen's collaborator, Igor Aronson, he will use Argonne facilities for his stick-slip experiment and will help to extract velocity measurements in a liquid-filled electrostatic cell to study the motion of granular particles with long-ranged attraction and viscous drag.

Adam Kraus presented a poster paper at the winter meeting of the American Astronomical Society. His work, a collaborative effort that resulted from his summer position at the National Solar Observatory (part of the National Optical Astronomy Observatories) was titled "A Prototype Data Reduction Pipeline for the GNAT System." He will be going to graduate school in astronomy at CalTech in the fall.

Ian Lewis will be a Black-Babcock scholar in the Department of Mathematics.

Keith Preston, who is working on a project on the use of phase information in cosmological configurations, won 2nd prize in the annual KU mathematics competition.

Nurur Rahman, a student of Professor Shandarin, presented a paper at the IGM-Galaxy meeting at the University of Colorado last August.

Ina Robertson, a graduate student of Tom Cravens, attended the COSPAR/World Space Congress meeting in Houston, TX. She presented a talk entitled "X-Ray Emission for the Terrestrial Magnetosheath".

Hannah Swift, majoring in astronomy, math, and physics, was awarded an undergraduate research award of $1300 for summer research. We congratulate her because it is extremely rare for a freshman to receive one of these research awards. Within the Math department, she received the Wealthy Babcock New Student Scholar and the May Landis Scholarship.

Ian Tice, who is graduating with degrees in physics and mathematics, won an NSF Graduate Fellowship worth $38,000 per year for three years. He will study at Columbia University.

Yang Yu graduated in August 2002. He accepted a postdoctoral position from MIT's quantum computing group led by Professor Terry Orlando. At a recent meeting Professor Orlando told KU Professor Han that Yang has become an invaluable team member of his QC project. Yang and his wife recently gave birth to a boy.

A number of students participated in KU's 6th annual Undergraduate Research Symposium. **Jesse Atwell**'s work was on

Josh Meyers and Sarah Feldt: 2003 Goldwater Recipients

STUDENT NEWS

anisotropy in a granular gas of non-spherical grains. **Sarah Feldt** spoke of her work on identifying periodic, unstable, and chaotic orbits for a free particle moving near a hyperbolic potential. **Kevin Kohlstedt** talked about his research into describing stick-slip events in a 1D granular array of particles. All three students worked with Professor Jeff Olafsen. In addition, **Stephen Floor** talked about his work with Professor Adrian Melott. **Joni Jorgensen** and **Jake King** each gave talks on "Hybrid Testing for D0 RunIIb Detector," and **James Snow** talked about "A Novel Detection Technique for Cosmic Rays."

Many of our students are majors or minors in mathematics as well as physics and/or astronomy, so it shouldn't be surprising that some familiar names cropped up at the math departmental awards banquet. Awardees not mentioned elsewhere include **Matt Matheny, Josh Meyers, and Andrew Womack**. Among the students expected to graduate with honors in mathematics are some familiar names, including **Ian Tice, Jeremy Wade** and **Ryan Kinser**.

Department Awards

E.E. Slossen Award for Outstanding Graduate Teaching Assistant
Shahid Hussain
Leah Bowen
Richard Alexander

Prosser Scholarship Award
Alan Dibos (Rt.)
*Jesse Noffsinger
*Joni Jorgensen
(*Honorable Mention)

Astronomy
Storer Award
Judy Yu

Atmospheric Science
Outstanding TA
Tanya Brown
Outstanding Senior
Eric Levy

Engineering Physics
Outstanding Senior
Kevin Kohlstedt

Physics
Outstanding Senior
Adam Kraus
Graduation with Honors
Adam Kraus
Judy Yu
First Year Graduate Scholarship
Zhuoya He

Outside Department

Goldwater Award
Sarah Feldt
Josh Meyers
University Scholar (Top 20 Sophomores in the University)
Alan Dibos
REU Summer Research Awards
Alan Dibos (NSF, UI-Urbana)
Josh Meyers (NSF, Cornell)
Jesse Noffsinger (NSF, Ohio State)
Jason Shea (NSF, Cornell)
Kevin Kohlstedt (DOE, Argonne Lab)

Graduate Degrees

Ph.D. in Physics
Roberto S. Aga
Christina Hebert
Hironori Ito
Doug Patterson
Soebur Razzaque
Yang Yu
M.S. in Physics
Kristin Commer Simunac
Yu Zhang

Bachelor's Degrees

Astronomy
Stephen M. Hill
Adam L. Kraus
Patrick David Leiker
Shau-yu (Judy) Yu
Atmospheric Science
Charles Edward Dorssom
Amanda Lee Fisch
Wesley Alan Hovorka
Matthew Clark McClasky
Raymond John Miller
Jennifer Ann Noblitt
Scott Daniel Patterson
Timothy Wayne Reith
Physics
Adam L. Kraus
James Culbert West
Shau-yu (Judy) Yu

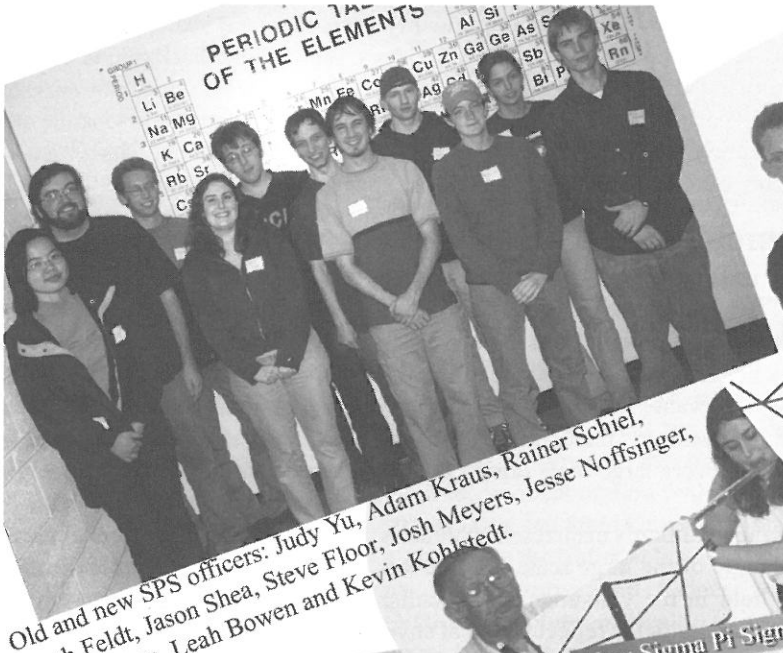
Roberto Aga: Ph.D. with Honors

SPS/Sigma Pi Sigma

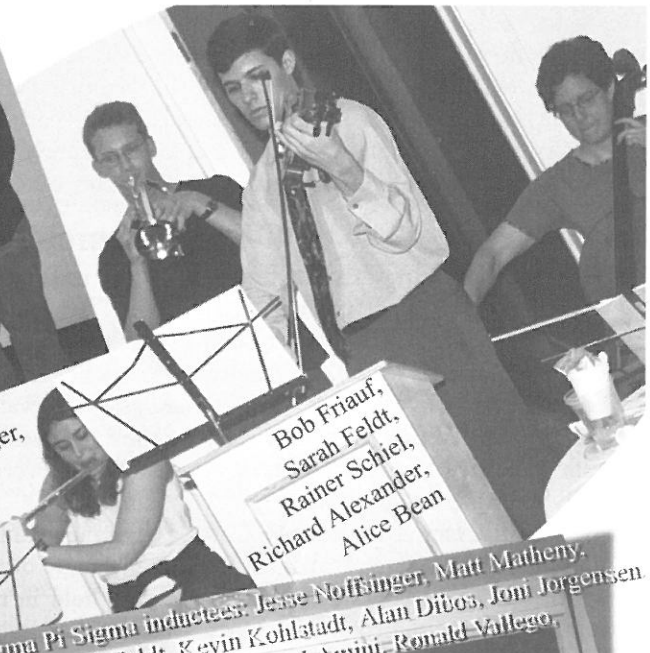
The Society of Physics Students continues to meet every Friday afternoon for discussion of science and for camaraderie. These gatherings provide a great time for students and some faculty to interact outside the classroom and to get to know each other better.

Some ideas for a new direction for KU SPS include extending beyond the current undergraduate student base and actively recruiting graduate student participation, more Departmental social activities, and faculty guided physics discussion about "hot topics" in science and physics brain teasers. Remaining unchanged in SPS for next year will be the continuous, healthy supply of sugar in the form of cookies and soda every Friday afternoon.

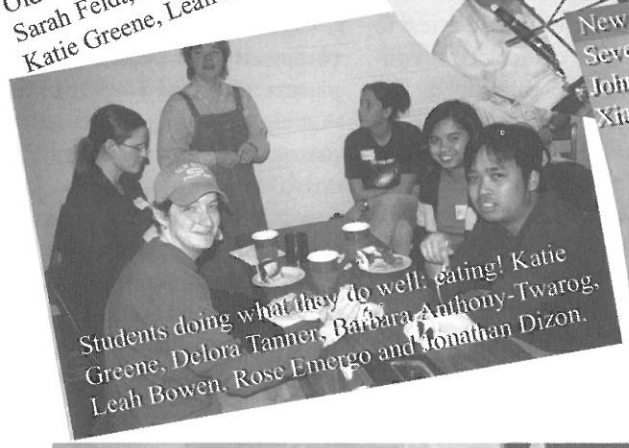
STUDENT NEWS



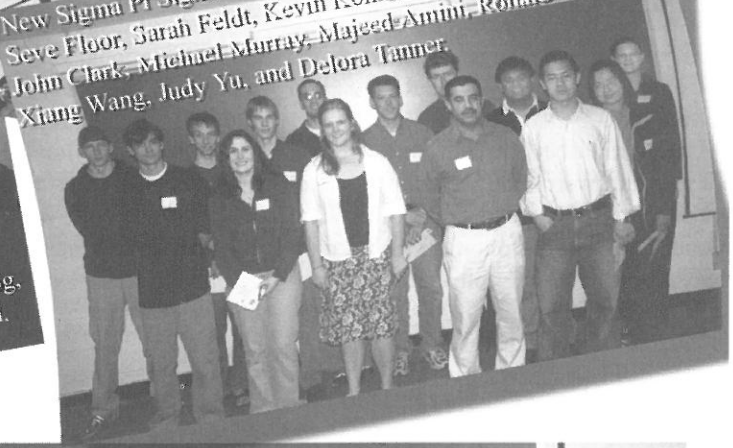
Old and new SPS officers: Judy Yu, Adam Kraus, Rainer Schiel, Sarah Feldt, Jason Shea, Steve Floor, Josh Meyers, Jesse Noffsinger, Katie Greene, Leah Bowen and Kevin Kohlstedt.



Bob Friauf, Sarah Feldt, Rainer Schiel, Richard Alexander, Alice Bean



Students doing what they do well: eating! Katie Greene, Delora Tanner, Barbara Anthony-Twarog, Leah Bowen, Rose Emergo and Jonathan Dizon.



New Sigma Pi Sigma inductees: Jesse Noffsinger, Matt Matheny, Steve Floor, Sarah Feldt, Kevin Kohlstadt, Alan Dibos, Joni Jorgensen, John Clark, Michael Murray, Majeed Amini, Ronald Vallego, Xiang Wang, Judy Yu, and Delora Tanner.

All present Sigma Pi Sigma members: Jack Shi, Ed Sion, Phil Baringer, John Ralston, Adam Kraus (hidden), Josh Meyers, Bob Curry, Tom Cravens, Matt Matheny, Judy Wu, Jesse Noffinger (hidden), Steve Floor, Sarah Feldt, Alice Bean, Steve Sanders, Keven Kohlstedt, Joni Jorgensen, Barbara Anthony-Twarog, Alan Dibos, Majeed Amini, Judy Yu, John Clark (hidden), Xiang Wang, Michael Murray, Todd McAlpine, Delora Tanner, Frank Prosser, Ronald Vallejo.

RESEARCH

Extraterrestrial Physics

The topics of research and teaching within the Department of Physics and Astronomy have, in recent years, included separate programs in astronomy, cosmology, and space physics. This organization comes from history, politics, and background of faculty rather than from what makes sense scientifically. The faculty in these fields have decided that it makes sense for there to be a pseudo-merger under one heading—extraterrestrial physics. However, each aspect of our extraterrestrial physics program has a separate and interesting history, and a group of loyal alumni that identify strongly with the program with which they were involved. Thus, we will continue to have separate columns in *Momentum*, while placing each under our new umbrella.

Astronomy

The astronomy part of Extraterrestrial Physics at KU is populated by tenured faculty, adjunct faculty, and students. The tenured, ever-older faculty, are Barbara Anthony-Twarog, Stephen Shawl, and Bruce Twarog. Adjunct faculty are Keith Ashman (Assistant Professor at University of Missouri at Kansas City), Scott Baird (Professor at Benedictine College in Atchison), and Karen Camarda (Assistant Professor at Washburn University in Topeka). Graduate students are Misty Cracraft and Delora Tanner. We continue to attract excellent undergraduate students, some of whom you'll read about below and elsewhere in *Momentum*.

Astronomy at KU is on the edge of a bold move forward that, we believe, could have a significant effect both locally and beyond. The three astronomers have a joint proposal with several colleagues in aerospace engineering at KU, and astronomy collaborators at NASA Goddard, Dartmouth University and San Diego State University, and an engineering firm based in Tucson, Composite Mirror Applications. If our proposed project is funded, KU will be part of a team, testing in every way imaginable, new technology mirrors, with an eventual outcome of a share in a telescope at Mount Laguna Observatory. The telescope technology proposed is that of light

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Cosmology

Research in the KU cosmology group focuses on the large-scale structure of the universe, that is, on scales from a few million light years on up to the largest observable scales. In fact they are probably quantum fluctuations that expanded to a very large scale during the era of inflation.

Hume Feldman's main research thrust is in the study of the large scale peculiar velocity field in the Universe. The peculiar (local) velocity fields reflect the local environment of distant galaxies and so attest to the gravitational effects of density irregularities in the galaxy's neighborhood. For the study of the large scale structure of the Universe, these fields provide an excellent dynamical tracer. In collaboration with Melott and Ph.D. student and Self fellow **Brian Thomas**, he has been working

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Extraterrestrial Physics Group: Tom Armstrong, Sergei Shandarin, Barbara Anthony-Twarog, Bruce Twarog, Misha Medvedev, Steve Shawl. Not shown: Adrian Melott, Tom Cravens, Hume Feldman.

Space/Plasma Astrophysics

Space Physics at KU is taking on a new look, as Professor **Tom Armstrong** retired from the University in May after 35 years. He has been in the University's phased retirement program for several years, teaching halftime and devoting the rest of his time to Fundamental Technologies, a company begun and owned by him and several others. New to the Space Physics group this year is Professor **Misha Medvedev**, a plasma astrophysicist, who will also be working with the Cosmology group.

Tom Cravens and his students have continued their research on solar system plasma physics. Work has continued on models of Titan's upper atmosphere and plasma environment in anticipation of the arrival of the Cassini spacecraft at Saturn in July 2004. Cravens is a member of the Ion and Neutral Mass Spectrometer (INMS) team for that mission. He spent the Spring 2003 semester on sabbatical at the Space Physics Laboratory at the University of Michigan. While he found the winter much more onerous than in Lawrence, he enjoyed working with Michigan colleagues on a number of projects. One of these activities was planning for the many measurements to be made by the INMS instrument onboard the Cassini spacecraft. He also worked on

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RESEARCH

Condensed Matter

Condensed matter research at KU has three thrusts: the quantum device and circuitry group led by Siyuan Han, the semiconductor physics group led by Linda Olafsen, and the thin film group headed by Judy Wu.

Professor **Siyuan Han**'s Quantum Device and Circuitry group focused on realizing one- and two-bit quantum gates using flux qubits (quantum bits) based on superconducting quantum interference devices (SQUIDs). Dr. **Shaoxiong Li** and senior graduate research assistant **Wei Qiu** have achieved several important milestones including the demonstration of single-shot ultrahigh fidelity readout of qubit states using detectors that are very weakly coupled to the qubits and quantum effects caused by microwave-qubit interaction. Graduate student **Majeed Amini** is working hard on developing and characterizing cryogenic microwave filters that will be used at T<0.01 K for the flux qubit experiment. **Richard Alexander** (GRA) is going to investigate the effects of low frequency noise on decoherence in flux qubits. **Matt Matheny**, who is an undergraduate student doing research with Dr. Han's group, has developed software for experiment control and data acquisition, and he is also going to measure the quality of Josephson junctions, which are the key elements of flux qubits, to look for correlations between junction quality and decoherence in flux qubits.

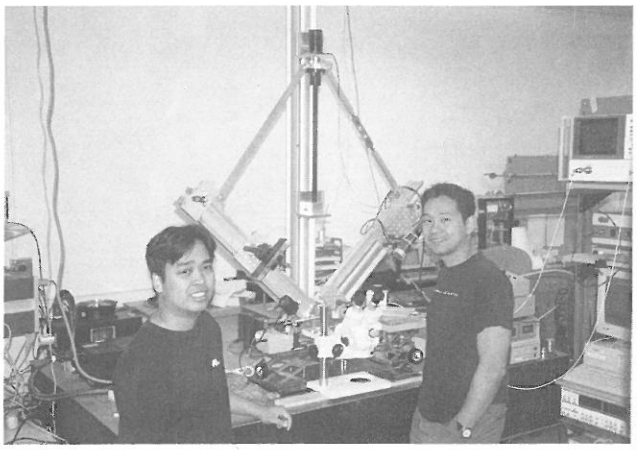
In the last 12 months, the group has published eight refereed papers in prestigious journals such as *Science*, *Physical Review Letters*, *Physical Review A*, *Physical Review B*, and *Physics Letter A*. In addition, *Science*, *Physics Today*, and *Scientific American* reported the group's work on Rabi oscillations in Josephson junctions.

The semiconductor physics group, led by Assistant Professor **Linda Olafsen**, continues its efforts to develop more efficient semiconductor lasers that operate in the infrared region of the optical spectrum. Graduate student members of the group include **Todd McAlpine**, **Katie Greene**, and **Michael Santilli**. Recent work has focused on "optical pumping injection cavity" lasers, or OPICs, which use distributed Bragg reflector mirrors to couple a pump beam into the active region of the material in order to greatly enhance the efficiency. With an optical parametric oscillator (a tunable near-infrared source), the group can tune the pump wavelength to the resonance in the OPIC. The KU group is the first to do this, as other researchers have used fixed wavelengths to excite their OPIC lasers. These lasers hold the promise of high temperature operation and high output powers.

A new research focus has developed in the field of glucose monitoring. Linda Olafsen, in collaboration with the University of Iowa and Ohio University, obtained a grant from the National Institute of Diabetes and Digestive and Kidney Diseases (National Institutes of Health) to develop a novel blood glucose sensor for the management of diabetes. The KU semiconductor group is fabricating light emitting diodes and detectors for an optical spectrometer. The success of this new device will allow more frequent or even continuous blood glucose sensing, enabling better feedback and control of glucose levels in diabetic patients.

This summer, the semiconductor group begins a project with Ioffe Institute in St. Petersburg, Russia. This will involve electrical and optical measurements for the development of more efficient light emitting diodes (LEDs) for chemical sensing.

The KU thin film group led by Professor **Judy Wu** currently has one postdoctoral fellow (**Roberto Aga**), nine graduate students (**Zhongwen Xing**, **Ronald Vallejo**, **Xiang Wang**, **Rose Lynn Emergo**, **Hua Zhao**, **Jonathan Dizon**, **Javier Baca**, **Zhuoya He**, and **Leah Bowen**), three undergraduates (**Alan Dibos**, **Jesse Noffsinger**, and **Jason Brookman**), and one visiting scientist, Dr. **Sangho Yun**, from the Royal Institute of Sweden. The group continues working on the high-T_c superconducting (HTS) thin films, funded by NSF, AFOSR, and DOE, through extensive collaboration with national labs and other universities. One focus has been on resolving issues in epitaxy of HTS on metal tapes. These so-called coated conductors find numerous applications in the power industry ranging from power transmission cables to high-field magnets. A new thrust in this group is in the fabrication of nanowires of semiconductors, such as silicon and boron, and superconductors. In collaboration with the Ames Lab, Professor Judy Wu's group is one of a few to make nanowires of MgB_2, which was recently discovered to superconduct at ~ 40 K. In addition, exciting results have also been obtained in her group in fusing nanowires together, an important step towards fabrication of nanoscale devices. Roberto Aga graduated in December with honors; his Ph.D. thesis was on the development of a novel dual probe for scanning microwave and scanning optical microscopy (US patent pending). Since graduation, he has been leading a group of students for the optimization of this probe for investigation of various samples including metals, superconductors, and dielectric materials, as well as exploring other concepts for dual channel scanning probe microscopy.



Condensed Matter Lab: John Dizon and Dr. Roberto Aga

RESEARCH

Particle Physics-Experiment

The high energy physics experiment group had some changes this year. **Christina Hebert** defended her Ph.D. thesis this spring. Hers was the first thesis from the group to use D0 data. She looked for new particles (excited quarks and new vector bosons) decaying into two jets. While unable to find any, she was able to set the world's most restrictive limits on the production of these particles. Postdoc **Xin Zhao** left the group for a job in the software industry and new postdoc **Carsten Hensel** joined the group. He will be working with Professor Graham Wilson on tracking triggers for the D0 experiment. Also, Alice Bean was promoted to Full Professor this year (congratulations, Alice!). All told, the high energy particle physics group currently comprises Professors Ray Ammar, Phil Baringer, Alice Bean, Robin Davis, Nowhan Kwak, Graham Wilson, postdoctoral researchers Drs. Don Coppage, Carsten Hensel, and Len Cristofek, grad students Peter Bryant, John Gardner, Scott Graham, Tina Herbert, and Shabnam Jabeen. Many undergraduates also contribute to this effort, including Jaeson Myers, Joni Jorgenson, Jake King, and David Hover.

The D0 experiment at the Fermilab proton-antiproton collider continues to be the main research area for the particle physics group. Data are continuing to flow in and data analysis is becoming a major focus of the group. Other activities include understanding the performance of the fiber tracker and preshower detector and the above mentioned tracking triggers. Graduate students **Shabnam Jabeen** and **John Gardner** are leading several of these efforts. Postdoc **Len Christofek** is working with Professor Bean to upgrade the D0 silicon tracker. Over the next few years the performance of the current detector is expected to degrade from radiation damage and replacement will be needed to help D0 meet its ambitious physics goals.

Phil Baringer and **Alice Bean** are members of the CMS collaboration, which will operate a detector located at the Large Hadron Collider (LHC) near Geneva, Switzerland that will start taking data around 2008. With postdoctoral support from **Leonard Christofek**, the group has helped with the effort to construct the tracker outer barrel silicon detector. When it is built, this will be the largest silicon detector in the world, consisting of 6000 modules and almost a square mile of silicon wafers. Because of the precision with which the silicon can measure a particle track, it will be extremely useful in trying to observe the Higgs boson. If the efforts to detect the Higgs boson fail at the Fermilab D0 detector, the group has hedged their bets in order to make sure that they are a part of important future discoveries at the LHC.

Experimental high energy physics group gathers for a meeting. Students and postdocs resident at Fermilab attend via video conference. From left to right: Alice Bean, Graham Wilson, Dave Besson, David Hover, Peter Bryant, Shawn Henderson, Eric Benavidez, Phil Baringer. On screen: Don Coppage, Carsten Hensel

At the same time, **Graham Wilson** is leading the local R&D effort anticipating construction of the "Next Linear Collider," which should be the largest domestic accelerator construction project to date. He has been involved in developing the physics case and the detector concept for a linear collider since 1995 and has made major contributions to several areas.

On the detector concept, he has studied the requirements for hermeticity and suggested the possibility of using radiative-return mu-mu-gamma events to measure the beam energy using the polar angle of the muons and the known mass of the Z particle. The latter requires a precision polar angle measurement, particularly at forward polar angles, for high center-of-mass energies. Both of these requirements are now adopted in, for example, the TESLA detector design where, particularly at forward angles, the mask design has been improved dramatically.

On the accelerator side, already in 1995, he noted the importance of achieving a high luminosity at relatively low center-of-mass energies and the possibilities opened up by polarized positrons. The accelerator designers of both TESLA and NLC now have designs that can have high luminosity as low as at the Z-peak (Giga-Z).

On the physics side, he has contributed with studies of the measurement of the W-mass from the energy corresponding to the threshold for the W-pair production and with a study of the sensitivity to direct graviton production - a signature of extra-dimensions.

Alice Bean, along with KU freshman

RESEARCH

James Snow and KU theorist **John Ralston**, has also been approved by the Fermilab directorate for a test beam measurement of the so-called "Askaryan effect", which forms the basis of the KU-based "RICE" experiment. Bean and Ralston have been leaders of this experimental effort since its inception in 1995. The beam tests that are scheduled to occur imminently will be the first-ever measurement of the so-called "hadronic" shower contribution to the electromagnetic pulse. Many theorists worldwide have speculated on the possible size of this component; Bean's experiment will be the first to experimentally determine its magnitude. Using a clever geometry (utilizing a large, instrumented "tank"), the group (Bean, Ralston, Snow) will make measurements that will provide basic confirmation of the Askaryan effect, as well as give parameterizations of basic electro-dynamical quantities.

Particle Physics-Theory

The proton has a lot more going on inside it than previously thought, according to **John Ralston** and several other physicists around the globe. John's theoretical work with former postdoc **Pankaj Jain** and former Ph.D. student **Roman Buniy** show that there should be plenty of orbital angular momentum, and consequent shape distortion, in the quark and gluon makeup of the proton. Experiments at Jefferson Lab in Virginia support this picture. This has generated enough excitement to get *USA Today* and the *New York Times* calling John for his view of these developments (See *USA Today*, September 22, 2002 and the *NYT Science Times*, May 6, 2003). The work of John and his fellow researchers may clear up the long standing puzzle of the mismatch between theory and experiment in understanding proton polarization data.

On another front, John, Pankaj and former Ph.D. student **Soeb Razzaque** have noticed that there is a piece of physics missing in the standard analysis of air showers induced by ultrahigh energy cosmic rays. The consequence is that the experiments studying these cosmic rays that come from the most energetic sources in the Universe may be miscalibrated! The hope for understanding particle physics and astrophysics of black holes rests on these experiments, so the stakes are high. Soeb, a postdoc in the Astronomy and Astrophysics Department at Penn State, is continuing his work on ultrahigh energy sources and their detection.

John and **Doug McKay** continue their participation in KU's RICE neutrino telescope project, led by **Dave Besson**. RICE had a paper published in the journal *Astroparticle Physics* this year, and another setting a limit on the possible flux of ultrahigh energy cosmic ray neutrinos is in press. Analysis of all of the 2000 and 2001 data is now complete and will be reported at the International Conference on Cosmic Rays. RICE results are competitive with the best that several, much larger, international projects have reported, and the new analysis should put the group up front in the chase for the first signal of neutrinos from cosmically remote, powerful sources like the black holes believed to live at the heart of most galaxies.

Searching for probes of possible new particle forces, including those arising from "extra" dimensions, Doug and John have published a couple of papers in the past year that look for changes in neutrino fluxes propagating through Earth. The ratio of up-going to down-going high energy cosmic neutrinos is especially sensitive to new forces experienced by neutrinos. Graduate student **Shahid Hussain** is developing this work further, and Doug and colleagues at the Abdus Salam Centre for Theoretical Physics in Trieste and at Wisconsin are also checking laboratory neutrino data for signs of deviations from the stubbornly successful "Standard Model" of particle physics.

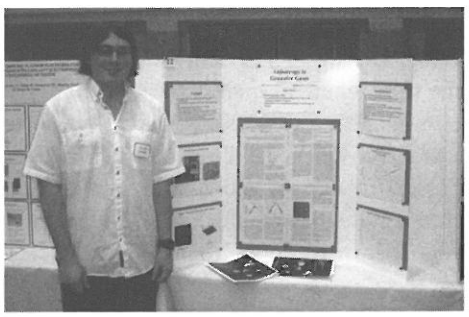
As usual, it's been a year full of surprises and excitement in physics, and we and our current and former students are participating to the fullest.

Nonlinear Dynamics

The Nonlinear Experimental Group, often referred as ISLE (Imaging Systems Laboratory Experiments), had twelve undergraduate students involved in research this year. Mentoring all these students kept Professor Jeffrey Olafsen busy! Students performing research in the group included Jesse Atwell, Ben Bammes, Alan Dibos, Cory Doolittle, Sarah Feldt, Ryan Kinser, Kevin Kohlstedt, Jesse Noffsinger, Simon Roh, and David Tenny.

The ISLE group is a prime example of how research and teaching are interconnected. ISLE continued its close association with the PHSX 601 (Design of Physical Systems) class this spring. **Kevin Kohlstedt** and **Kenny Johnston** both worked on their design projects within the laboratory. Kevin designed a Labview program and built a test cell to study low-dimensional chaos in the motion of a single macroscopic dimer on a vibrating plate. Kenny is working a program and sensor package to measure and control the shaking amplitude of an experiment that will investigate sound propagation in a settling sand pile.

External collaborations grew in the past year with the start of two new research efforts. The American Chemical Society gave funding in the summer of 2002 to support the visit of a colleague, Bill Baxter from Penn State, Erie. He came to work on a project that was an outgrowth of Jesse Atwell's work and the precursor to William



Jesse Atwell, of the Nonlinear/ISLE research group, presenting his poster at the spring UGRA Honors Symposium on Anisotropy in Granular Gases.

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Cross's experiment. Baxter and Olafsen worked together to develop a new method of thermalizing a driven granular gas. In the process, they discovered an experimental confirmation of molecular chaos (a lack of particle velocity correlation) in a driven granular gas system. They have submitted a paper to *Nature* on their results and Baxter will be returning to ISLE lab at KU as part of his sabbatical in the spring of 2004.

A second collaborative effort was initiated with Christopher Sorensen at KSU. His lab examines the structure of nanoscaled systems such as colloids. Similar ordering has been observed in macroscopic granular systems on a scale 10^5 times larger. The two labs hope to make a comparison of the visually similar structures and their underlying order during this summer.

Nuclear Physics

The Experimental Nuclear Physics Group consists of Professors Michael Murray and Steve Sanders and graduate student Brett Neumann. Other participants in the research program during the past year were graduate student James Morris and undergraduate students Brent Harris and James Horner. The group is doing research in the area of relativistic heavy-ion physics and collaborates on the BRAHMS experiment at the Relativistic Heavy-Ion Collider (RHIC) at Brookhaven National Laboratory.

The RHIC facility, where two heavy ions are brought together at ultra-relativistic velocities, is believed to create conditions similar to those that existed in the early Universe a few microseconds after the Big Bang. During this Epoch, which is prior to the time when all quarks become confined within the known hadrons, the matter in the universe will still have consisted of a "soup" of deconfined quarks and gluons. One of the goals of the RHIC facility is to establish in RHIC collisions the existence of this "quark-gluon plasma" state. The BRAHMS experiment has a focus on the overall dynamics of the reaction products. It explores an extended region of the reaction phase space, a region much larger than that studied by the other experiments at RHIC, using two spectrometer arms mounted on movable rails. The forward spectrometer can identify reaction products as close as 2.3 degrees from the beam direction. At these angles the reaction yields are expected to be baryon rich and dominated by fragments of the original interacting nuclei (consisting entirely of baryons). A second, mid-rapidity spectrometer moves between 35° and 95° with respect to the beam. Near 90°, this spectrometer covers the region where most of the reaction products are believed to be formed by the hadronization of quarks produced from the underlying vacuum. As such, we expect a comparable number of baryons and anti-baryons, leading to what is referred to as a baryon-poor region. Early results from the BRAHMS experiment confirm this transition from a baryon-poor, mid-rapidity region to a baryon-rich fragmentation region at forward angles.

The Kansas group has chief responsibility for the BRAHMS multiplicity array. This device, consisting of both Si strip detectors and plastic scintillators, is used to determine the "centrality" of the collisions by developing a measure of the total number of charged particles emitted in each collision. More central collisions will lead to greater particle multiplicities. The multiplicity array has also been used to develop an overall distribution of charged particle production with angle. This correlation puts severe constraints on model calculations of the relativistic heavy-ion reactions. We are currently analyzing data from a just completed run involving deuteron on gold collisions at a center-of-mass energy of 200 GeV per nucleon pair. These data, when compared to our earlier measurement of gold on gold collisions at a similar energy per nucleon pair, should help to highlight the novel conditions achieved with central gold on gold collisions.

Steve Sanders as reflected in the threshold Cherenkov detector.

As a new initiative during the past year, the Kansas group, in collaboration with researchers at Brookhaven National Laboratory, has designed and constructed a threshold Cherenkov detector to augment the capabilities of the mid-rapidity spectrometer. This detector will nearly double

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the range in momentum where pions can be identified in the mid-rapidity spectrometer. At the higher momenta covered by this detector, the pions are believed to originate from "hard" scattering processes, involving the interactions of individual quarks and gluons. By locating the mid-rapidity spectrometer at its most forward angle of 35 degrees, it will be possible to develop a fuller picture of these hard scattering processes by exploring the transition from the mid-rapidity region to the forward fragmentation regions. The new Cherenkov detector has been commissioned and we are currently analyzing results from the deuteron on gold collisions. KU graduate student **James Norris** (who has recently decided to move to the Philosophy Department) has been instrumental to developing some of the simulations used in the detector design.

Construction of the new Cherenkov detector required building a large, hermetically-sealed aluminum box in the Department's machine shop. Our Research Technologist, **Allen Hase**, aided by our Instrument Maker **Zach Kessler**, had to overcome a number of challenges posed in putting together a box that is larger than can be easily handled by our local equipment. Allen and Zach also had to learn techniques of aluminum welding to develop a leak-tight box.

With his move to KU, **Michael Murray** brings to Kansas responsibility for the BRAHMS Zero-Degree Calorimeters. The calorimeters are located at the point where the two RHIC beam lines merge on entering the interaction region. Their location between the two merging lines allows them to measure the emission of neutrons at zero degrees. For gold on gold collisions, these detectors provide the minimum bias trigger for the experiment. Although they are less efficient for deuteron on gold collisions (at least on the deuteron side), they still provide valuable information on the reaction dynamics. Michael is now developing a proposal for similar detectors to be used in the CMS experiment at the Large Hadron Collider currently under construction at CERN.

Physics Machine Shop

There's no such thing as an ordinary day — or an ordinary task — for research technologist Allen Hase.

In his six years at KU, Hase has constructed everything from monkey-proof casings for activity monitors to research equipment for particle accelerators.

"You never know where these projects will take you," Hase says. "It's always something different. It's challenging; I like it."

Hase and Zach Kessler, an instrument maker, make up the two-person staff of the physics and astronomy machine shop, nestled in the basement of Malott Hall. It's here that professors bring their ideas to be made into mechanical realities. Hase works with faculty members to create mechanical apparatuses for experiments. Sometimes, this involves simply following a set of plans the professor has created. Other times, it means creating something from just an idea.

Often, Hase says, "they have the idea, they're just not familiar with the machining capabilities."

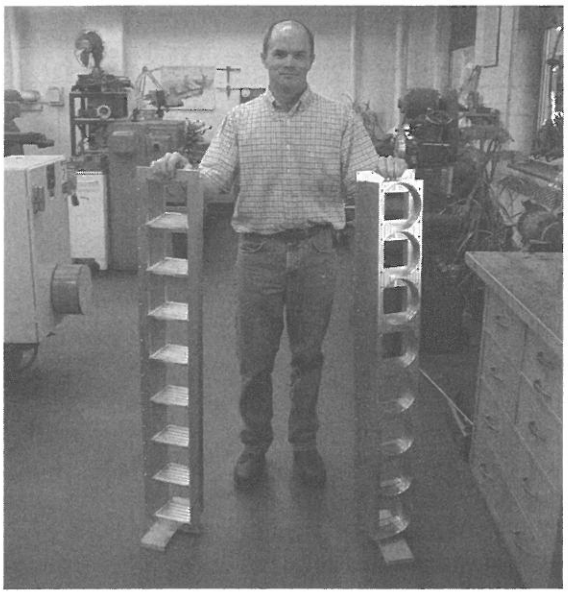
Troy Zarcone, assistant research professor and coordinator of the Biobehavioral Measurement Core at the Life Span Institute at KU, says Hase brings not only knowledge but also creativity to his work.

"He comes up with solutions for most of the problems I create or come up with," Zarcone says.

Designing objects is a technical process. Hase can produce computer drawings in the shop that sketch out a design and show the precise way the object will be created by the shop's computer-controlled machines.

In building a piece, he also often must study the conditions it must endure.

For example, last year, Zarcone approached Hase with a problem in an experiment involving monkeys. The monkeys, who wore $1,500 activity monitors on their collars, would pull off the sensors and destroy them. Hase created a casing for the sensors made from a light, durable plastic, and the casing proved monkey-proof. KU later signed a release with Mini Mitter Co. Inc., which produces monitoring equipment, to manufacture the casings.



Allen Hase, Research Technologist

Without the machine shop, KU researchers would have to pay up to 10 times more to develop their ideas at commercial machine shops, which may not have experience working through scientific problems, Zarcone says.

Hase's work has not gone unnoticed. Sarah Campbell of Human Resources recently audited Hase's position, and she left feeling that "what he was responsible for was pretty impressive."

"He is the only person in physics and astronomy who does the work he does," she says.

The varied assignments, major responsibilities and even the monkey run-ins do not trouble Hase, though.

"Every job is completely different from the last," he says.

(From *The Oread* with permission. By Jennifer Kepka.)

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*(**Astronomy**: Continued from Page 6)*
weight, superstrong carbon composite fibers. For example, we propose that a 1-meter telescope mirror and support system could be built that weighs less than 100 pounds! Furthermore, identical mirrors could be produced rapidly and very inexpensively. We're very excited and hopeful about this collaborative effort, so watch for news about its outcome.

Astronomy student alumnus **Nathan De Lee** (B.S. 2002, now at Michigan State University), working with Bruce Twarog and Barbara Anthony-Twarog, inadvertently hit upon a newsworthy result last summer as the team analyzed and calibrated (and recalibrated) photometric data in a supposedly metal-rich open cluster, NGC 6253. The estimated heavy element content of this solar-system aged cluster may be as high as three to five times the solar metal content, a disturbingly high result. KU astronomers will be watching with interest to see if the 2003 galactic center observing season might bring a spectroscopic confirmation of this result.

Meanwhile, the Twarogs are pursuing photometric investigations in open clusters with the assistance of masters' candidates **Delora Tanner** and **Misty Cracraft**. Delora is analyzing data obtained at the WIYN 0.9 meter telescope in January of 2003 for the classic open cluster, NGC 2420; our hope is to shed new light on the metal content for this important intermediate-age cluster. Misty will be testing photometric software on an understudied cluster, M 48. Both expect to finish this coming academic year; Delora has added the challenge of motherhood to her year's activities! Delora and Matt added nine pounds to the mass of the universe with the arrival of their daughter on May 8, the day after Delora's last class. We note her dedication: she taught an astronomy lab a few nights before in which the class was on the roof the football stadium observing!

Stephen Shawl is following up on a lead from his dissertation work, in which he found two stars, g Her and X Her, whose polarization position angle changed with wavelength and time in unexpected (and as yet unexplained) ways. The thought is that these observations might be explained if the stars had binary companions, even though the literature contains no indication of a companion. Thus, in collaboration with an astronomer at the University of Victoria who is doing the observations, they have been making accurate Doppler shift measurements looking for wavelength shifts indicative of the presence of a companion. While the data are suggestive, they are not yet definitive and observations will continue through the next observing season.

Villanova astronomy professor Ed Sion (BA 1968, MS 1969) and KU Professor Bruce Twarog at the Sigma Pi Sigma induction.

Four students will receive astronomy degrees this year, **Jesse Atwell**, **Stephen Hill**, **Adam Kraus** and **Judy Yu**. Jesse is moving from Kansas to New York, from astronomy to music; Judy will be starting graduate studies in space physics at the University of Michigan, while Adam heads to Pasadena to join KU alum Stuartt Corder (B.S. 2001) in the graduate astronomy program at Cal Tech. Stephen is still weighing his options! They join a broadly educated, and widely dispersed group of astronomy alumni around the country.

Postscript: End of an era 2. In last year's *Momentum*, we lamented the loss of the roof of Lindley Hall as the location of the KU Observatory's telescopes. However, the classroom and office space continued to be used for astronomy discussion sessions and storage of equipment (some of which is very old). Now, however, as of May 30, 2003, except for the 6-inch refractor that is only rarely used, astronomy has been removed entirely from Lindley Hall in the deal that involves removing atmospheric science from our department and returning it to Geography, whose offices are in Lindley. The new space for holding discussion sessions and meeting with astronomy students is superior in many ways. However, it was with some sadness, and with thoughts of the many astronomy alumni who had trudged up the narrow stairs to the Lindley roof and cut their observing teeth with those telescopes, as Bruce Twarog and Steve Shawl made their last trip down the stairs. Alumni will be pleased to know that Wyman Storer's old roll-top desk was removed by us and may continue to be used elsewhere.

*(**Cosmology**: Continued from Page 6)*
on the "Bullseye" effect with funding from the NSF. This effect exploits the way observations of the distant Universe are conducted. For example, since galaxy distances are hard to determine, the way to find them is to observe each galaxy's recessional velocity, which is proportional to its distance (the famous Hubble velocity-distance relation). However, because this method introduces some distortions that depend on the matter density in the Universe, it is possible to determine the average density using this effect.

Feldman, with Ph.D. student **Will Chambers**, has been developing new statistical methods. A major problem with the determination of the large scale behavior of the Universe is the noise (non-linearity) inherent in the observations of objects that are exceedingly far away. He has developed a formalism that analyzes noisy data and which, by filtering out the noise, provides clean (linear) information about the large scale structure in the Universe. With Roman Juszkiewicz (Rose Morgan Visiting Professor, Fall 2001) he has developed a statistic called the Pairwise Velocities statistic that determines some important cosmological parameters in a complimentary and independent way to the CMB determination and has distinct advantage over all other methods in

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that it uses dynamical tracers of the large scale flows.

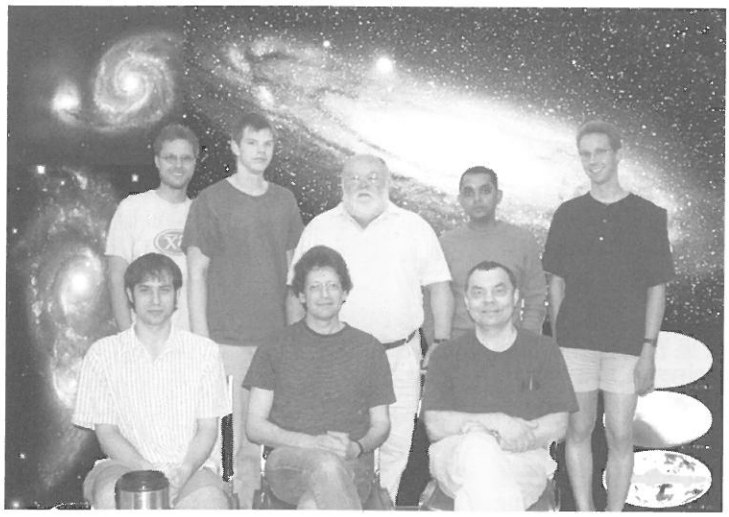
Feldman was on a sabbatical in the spring 2003. He spent the first couple of months of his sabbatical with his daughters in Israel, specifically at the Hebrew University in Jerusalem and at the Technion (Israeli Institute of Technology) in Haifa. Although the work and new collaborations have kept him occupied, frequent forays to the beach, horseback riding and hiking trips occupied at least some of his busy schedule.

Adrian Melott's research was represented by an invited talk at COSMO-02 in Chicago, "Galaxy Cluster Correlations and Large-Scale Structure." He was also a member of a three-person panel at an evening session at Adler Planetarium, entitled "What do we want people to know about cosmology and why?" This meeting was organized by alum **John Beacom** (B.S. Physics 1991), who is now David Schramm Postdoctoral Fellow at Fermi National Accelerator Laboratory. Incidentally, John did his first research as an undergraduate with the cosmology group.

The research, which is supported by the National Science Foundation, includes graduate student and Self Fellow **Brian Thomas**, as well as undergraduate **Stephen Floor**. Stephen has worked on a research project with Adrian on "Ellipticity Evolution in Simulated Galaxy Clusters." They have uncovered a discrepancy between the apparently rapid evolution of real galaxy clusters toward a more spherical shape with a much slower rate in cosmological simulations. The National Center for Supercomputing Applications has recently awarded an additional 10,000 hours of supercomputer time to use in this research.

Sergei Shandarin has been exploring the morphology of both the large-scale objects (superclusters and voids of galaxies) and the entire large-scale structure. With collaborators, he developed a novel technique for measuring the shapes of objects having complex shapes. The method is based on computing the quantities known in differential and integral geometry as Minkowski functionals. Applying this technique to one of the largest numerical simulations made by the VIRGO consortium, they studied the morphology of the mass distribution in cosmological models dominated by dark energy (70% of mass) and dark matter (27% of mass). Such models are highly favored by recent observations of remote supernovae and the cosmic microwave background radiation measured by NASA's Wilkinson Microwave Anisotropy Probe.

Along with graduate student **Nurur Rahman**, Shandarin developed a technique for analysis of galaxy images. They applied the method to the study of the morphology of infrared images obtained by the 2MASS survey.



Back row: Brian Thomas, Will Chambers, Adrian Melott, Nurar Rahman, Rainer Schiel. Front row: Darius Galliger, Hume Feldman, Sergei Shandarin after a cosmology seminar.

Emeritus Professor Robert Friauf and Assistant Professors Linda and Jeffrey Olafsen at dinner in the team hotel at the Final Four in New Orleans. All three basketball fans were lucky enough to obtain tickets to the Marquette and Syracuse games through the KU lottery.

(Space/Plasma Astrophysics:
Continued from Page 6)

analyzing and interpreting x-ray images and spectra of Jupiter's x-ray aurora measured in February of this year by the Chandra X-Ray Observatory.

Cravens and graduate student **John Clark** continue to work on the ionospheres of Mars and Titan. They are developing new models for superthermal electron transport in these ionospheres and presented some of their results at the joint European Geophysical Society/American Geophysical Union meeting in Nice, France, in April. Undergraduate student **Judy Yu** is working on the chemistry that takes place in Titan's ionosphere.

Graduate student **Ina Robertson** is busily writing her dissertation. She has been studying x-ray emission associated with the interaction of the solar wind with neutral atoms in the terrestrial geocorona or with neutral hydrogen and helium from the local interstellar medium.

Misha Medvedev is continuing his research on plasma physics processes and phenomena in both interplanetary space and the distant cosmos. He has started a collaborative project with Cravens and Ina Robertson on x-ray emission from Mars and what it can tell us about the solar wind flow around that planet. Together with Adrian Melott from the cosmology group and two collaborators from other universi-

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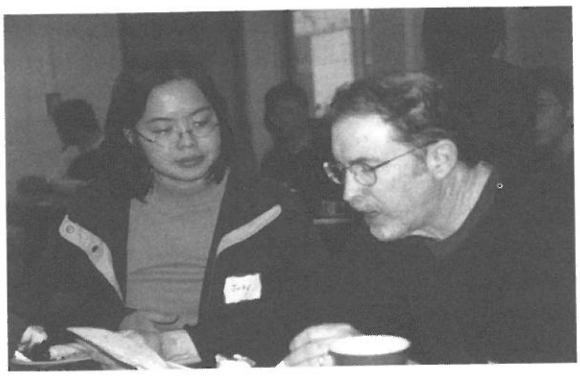
ties, he has analyzed (using newly available data) thermal conductivity in plasmas inside 165 galaxy clusters and fully confirmed a theoretical prediction that conduction is a major source of heat in the cluster cool cores. He also demonstrated that it is very unlikely that the highest energy cosmic rays observed on Earth have been accelerated by an electromagnetic mechanism, thus ruling out most of the astrophysical candidates. With a colleague from CITA in Canada, Medvedev studied a hot accretion flow onto a black hole and identified astrophysical objects that may contain a rapidly spinning black hole.



Judy Yu and Professor Tom Cravens munching and talking at the Sigma Pi Sigma induction..

Biophysics to become New Research Area

Biophysics is an emerging interdisciplinary field spanning two of the most prominent research areas identified for the 21st century, namely nano-sciences and life sciences. Nano-science deals with structures at the nanometer (10^{-9} meter) scale, where many interesting features have been observed and studied (for reference, the diameter of the hydrogen atom is about 0.1 nanometer). Physics has long provided major facilities for use in the life sciences, dating as far back as Roentgen's discovery of X-rays in 1895 and more recently providing tools such as Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) scans. Although many of these discoveries were initially pursued primarily for their physics interest, they have ultimately found their way into the life sciences where they are indispensable. Biophysics provides a major thrust in advancing life science research by developing and applying other sophisticated research tools such as scanning probe microscopes, scanning/transmission electron microscopes, SQUIDs (very sensitive magnetic field detectors), and various biosensors. It has attracted major federal research dollars in recent years from NSF, NIH, DOE, NASA, and DOD due to its critical role in life science.

Our department has requested three faculty positions to establish a Biophysics program at KU that would build on the collaborations the department has already established among different disciplines within the university. This program has been prioritized as the sole new initiative of the department and the focus of this program will be on development of advanced tools for investigation of the functionality of biosystems, development of novel biosensors for *in vivo* monitoring of biosystems, and biological simulation/bioinformatics. The goal is to establish and lead a large-scope, multidisciplinary research program at KU involving Physics, Biology, Chemistry, Pharmaceutical Chemistry, Geology, and Engineering. Strong leadership and expertise are necessary for these emerging collaborative efforts to truly flourish. Therefore, establishing a competitive biophysics program, by adding several new faculty members and investing in infrastructure, is critical to enable KU physics to successfully pursue the most exciting opportunities in biophysics and life science research. This will go a long way towards realizing Chancellor Hemenway's vision of making KU one of the top 25 public research universities, and significantly increase KU's share of federal research funds.

Quantum Weirdness

Professor Carlos Stroud of the University of Rochester Institute of Optics, and Director of the Center for Quantum Information, visited KU in the fall via an award from the Distinguished Traveling Lecturer Series. Professor Linda Olafsen obtained this award from the Division of Laser Science of the American Physical Society to support travel for the speaker. The purpose of the visit was to get faculty, students, and the community excited about optics and physics.

The highlight of the visit was a public lecture titled "Quantum Weirdness: Technology of the Future?" Approximately 300 people attended the lecture, and visitors stood in the aisle and in the back of the lecture hall in Wescoe. In addition to KU faculty and students, many high school students and other members of the community came from as far as Kansas City to hear him.

To accomplish the goals of the visit, the speaker had lunch with thirteen undergraduate majors in Physics, Astronomy, and Engineering Physics. At the lunch, he spoke to students about exciting research in optics, including deformable lenses operated with a series of piezoelectrics that allow scientists to remove the aberration caused by the lens in the human eye in order to image individual cones and rods using a laser.

Professor Stroud also presented a Physics and Astronomy colloquium titled "Rydberg Electron Wavepackets."

Professor Carlos Stroud lecturing on "Quantum Weirdness."

FEATURE ARTICLES

The N. Wyman Storer Award

The N. Wyman Storer Award was established by the Department in 1981 to honor the 35 years of unselfish dedication to astronomy and astronomy students by Professor Storer. The award is given to the student who "has provided services to the astronomy program at the University of Kansas in excess of what can be expected of a good student, or has an outstanding record as a student in astronomy." While other Department awards are presented each year, this one is awarded only when an outstanding candidate is available. The winner's name is placed on a plaque in the Department and a small cash award is also given.

Barbara Anthony-Twarog and Steve Shawl with Storer Award Recipient Judy Yu.

The first time it was awarded, in 1981, it was shared by previous graduates David Tholen (Ph.D. University of Arizona) and Thomas Collison. This was a particularly interesting pairing, since eventually, they became brothers-in-law! Dave is now a professor at the Institute for Astronomy at the University of Hawaii. Sadly, Tom is deceased.

The list of awardees is impressive: Merle Reinhart (1983, at Hubble Space Telescope Science Institute), Joe Shields (1985, Ph.D. Berkeley, now at Ohio University), Tamara Whitacre (1986, Ph.D. University of New Mexico, now at Kirkland Air Force Base), Eric Heim (1987), Mark Everett (1991, Ph.D. Ohio State, Planetary Science Institute in Tucson), Kurt Dominik (1992), Jacquelynne Milingo (1993, Ph.D. Oklahoma, now at Gettysburg College), Karla Kuebler (1994), Jenny Hand (1995, Ph.D. Colorado State, recent Postdoc at NCAR in Boulder but now at the Cooperative Institute for Research in the Atmosphere in Ft. Collins), Daniel Nunes (1997, graduate student at Washington University of St. Louis), and Stuartt Corder (2001, graduate student at CalTech). It must have been in the stars that two of our awardees, Karla Kuebler and Dan Nunes, would meet at Washington U, and get married in 2002!

This year's winner is Judy Yu. Judy, a spring 2003 graduate with majors (in alphabetical order) in astronomy, computer and electrical engineering, math, and physics has shown extraordinary dedication and unselfishness to the astronomy program in particular and the department in general. She led the Astronomy Associates of Lawrence, our local amateur astronomy group; sometimes, she (and only a few others) *was* the AAL! She ran public observing sessions. She got speakers for meetings. She was a lab TA. Ask her, and she acted. We are losing a gem, but Michigan is gaining one. We look forward to her future successes as a scientist and more.

Department Hosts 2002 Regents Academy

The KU Department of Physics and Astronomy had the honor of being selected to host the 2002 Kansas Regents Academy summer school. This school, given to a group of Kansas high school students handpicked by the Kansas Board of Regents, is sited each summer at one of the seven Kansas public Universities. In recognition of the high public visibility that recent advances in cosmology have enjoyed, as well as the numerous contributions of the KU Cosmology group, the Physics and Astronomy Department was chosen to sponsor this summer school in 2002. Among the lectures given to the students, Professor Steve Shawl outlined current searches for extraterrestrial intelligence, while Professors Hume Feldman and Tom Cravens gave presentations on "Standard Big-Bang Cosmology" and "Asteroid Impacts." Feedback from the students was extremely positive; we look forward to being able to play an important role the next time this prestigious Academy comes to KU (2009).

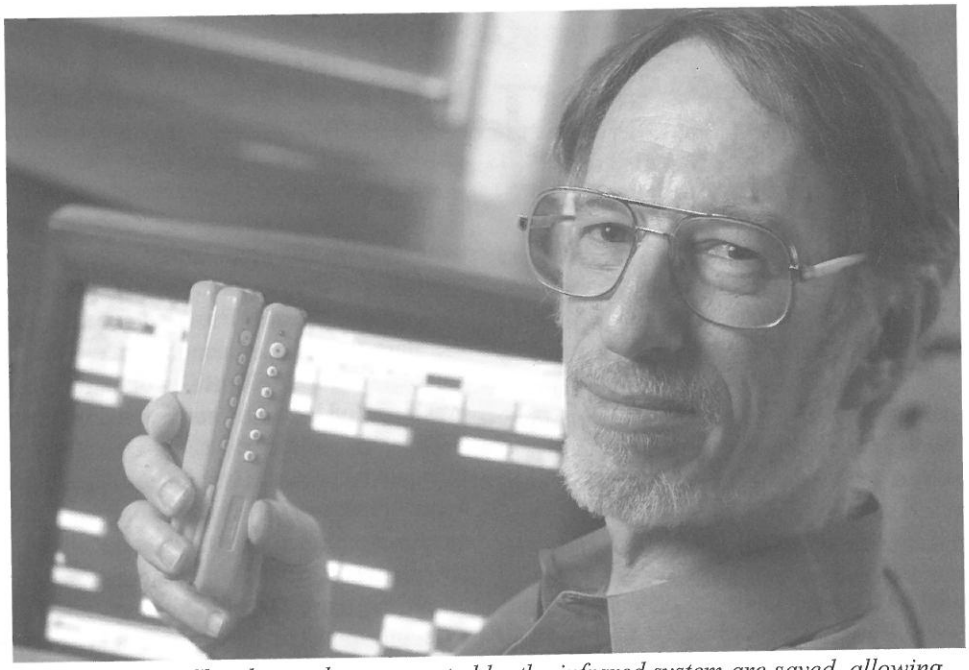
The Kansas QuarkNet Center

The Kansas QuarkNet center, sponsored by members of our Department, will enter into its third year this summer. QuarkNet is a national project, funded by NSF, to involve high school physics teachers in experimental particle physics. The goals of QuarkNet are to help the teachers bring the excitement of modern physics and an understanding of experimental science to their students.

In Summer 2001, two excellent lead teachers were recruited for the center — Alan Gleue of Lawrence High School and Fred Nelson of Manhattan High School. Alan and Fred spent eight weeks that summer working with Professors Baringer, Bean and Besson on their particle physics projects. Then Alan and Fred helped organize the three-week workshop that took place in Summer 2002. Twelve Kansas high school physics teachers participated in that workshop. The final week of the workshop took place at Fermilab. The other participants in addition to Alan and Fred were: Joe Bradshaw (Lawrence High), Ed Harbord (Olathe S.), Donald Meier (Olathe S.), Brian Meyer (Shawnee Mission N.), John Olson (Free State High), Rex Powell (Lawrence High), Rod Smith (Jeff West), Oather Strawderman (Free State High), Mark Wentz (Blue Valley NW), and David Wright (Shawnee Mission S.).

FEATURE ARTICLES

Twenty-First Century Interactive Teaching Reaches KU



Professor Steve Shawl says data generated by the infrared system are saved, allowing him to grade his own classroom performance from semester to semester. "For the first time through it can be time consuming [to prepare lectures], but my feeling was, we asked students to buy these things, so we needed to really use it."

That old business of raising hands? So 20th century. At least it is for Steve Shawl, professor of physics and astronomy, who this spring deployed an infrared classroom system that allows his Contemporary Astronomy students to react instantly to materials discussed in lectures.

With instant and accurate feedback, Shawl knows whether his message is getting through.

"Where I go next ideally depends on how they responded," says Shawl, a member of the KU faculty since 1972. "If the vast majority of students got the question right, I simply go on. If there are what I consider to be significant numbers who got it wrong, then we can discuss it.

"And if the majority of people chose the same wrong answer, I can talk about why that's not right. I can immediately respond to what they're understanding or not understanding."

Each receiver costs about $180, and eight were installed in Shawl's Malott Hall lecture room; students must purchase their own transmitters for $30, which can be later resold for $15. Shawl says he envisions a day when the systems will be in many campus classrooms, so students can buy one transmitter and use it for four years.

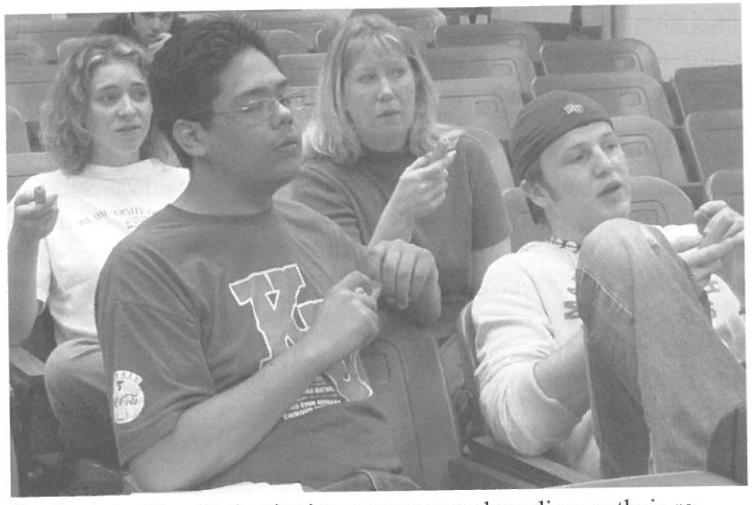
When asked if other faculty members would adopt such a system, he replied, "For faculty who are looking for new ways of engaging students and helping them learn, they will find it extremely interesting. One must be willing to learn new tricks and not be tied to the ways one has always used."

Besides being fun, it's demanding. Shawl has to come up with "really good questions" to rate learning during each class session, as well as "good distractors" that can lead students down a wrong path.

"When that happens, you then have something to talk about" Shawl says. "The idea is to force interaction and thinking, as opposed to the students just sitting back and listening passively to what the instructor is doing. An aspect of that came across in a book I'm reading that has produced my new mantra: "It's not what the instructor does that matters, it's what the students do."

"This system emphasizes that."

(Adopted with permission from a story that originally appeared in *Kansas Alumni Magazine*, published by the Kansas Alumni Association and written by Chris Lazzarino.)



Students in Shawl's beginning astronomy class discuss their response to a question before transmitting their answers. Left to right: Alisha Ashley, Hugo Cabrera, Kathy Wilson, and Travis Barnacle.

FACULTY NEWS

New Faculty

Mikhail (Misha) Medvedev

Misha Medvedev has joined us to work in the area of plasma astrophysics. Born in Moscow, he received his first masters in physics at Moscow Institute for Physics and Technology (1993) and a second one at the University of California at San Diego (1994). He enjoyed the San Diego weather so much that he remained there to earn his Ph.D. in physics in 1996 with a dissertation on "Nonlinear dynamics of coherent Alfven wave packets." He then accepted postdoctoral fellowships from 1998-2000 at the Harvard-Smithsonian Center for Astrophysics, and then from 2000-2002 at the Canadian Institute for Theoretical Astrophysics.

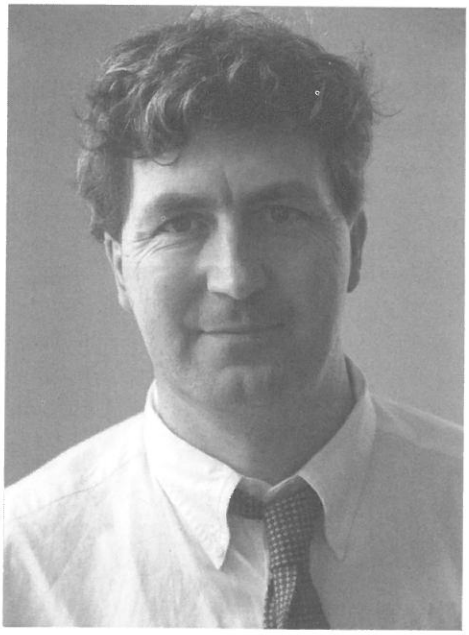
His scientific interests in theoretical astrophysics include: solar and stellar wind physics; theory of gamma ray bursts and afterglows; shocks and radiation physics; theory of accretion flows onto neutron stars and black holes; plasma processes in galaxy clusters; cosmology and dark matter physics; origin of TeV gamma-rays and ultrahigh energy cosmic rays; structure and dynamics of galaxies and other self-gravitating systems; waves, turbulence, and particle heating in the interstellar medium and space plasma. He also has interests in quantum physics, statistical physics, and general plasma physics.

He is married to Olga and has two children, Katerina age 15, and Misha age 6. Besides them, he enjoys walking through forests and relaxing on the beach. But the most exciting thing is solving interesting scientific problems.

Misha Medvedev

Michael Murray

Michael Murray was born and lived in Wales until he went to Manchester University at age 18 to study math and physics. Having tired of the English rain, he went to the University of Pittsburgh for graduate school. Although now working in nuclear physics, his degree is actually in high energy physics, which he completed in 1989. His dissertation work was on the first generation relativistic heavy ion experiment, HELIOS. To further complicate his "pedigree," his next three positions were with nuclear chemists. His first postdoc, from 1989-1992 was at Los Alamos, although he was mainly stationed at CERN working on the second generation experiment, NA44. He continued work on that experiment at Texas A&M from 1992 through 2002. During that time, he also worked on low energy heavy ion physics.



Michael Murray

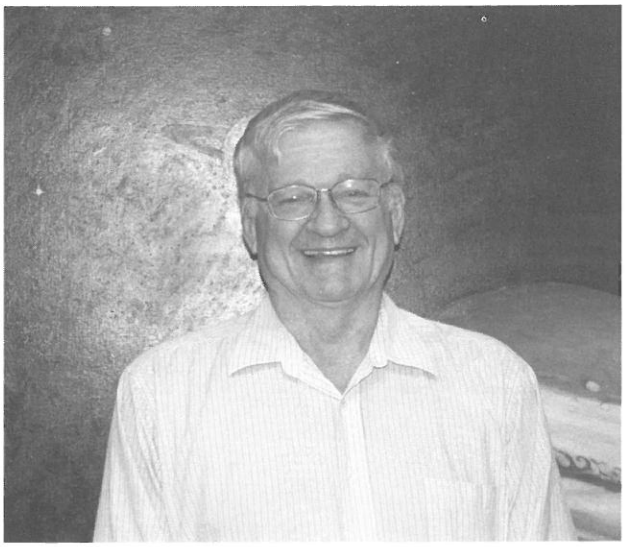
Michael was part of faith and science groups at Texas A&M, and he also has an interest in arms control issues. He was drawn to nuclear physics at least partly because it was nuclear physics that dealt with moral questions before any other fields of physics.

When not doing physics, he and his wife Maureen are bound up in the lives of their children: John (14), Tess (12), Rosie (10), Kolbe (8), Romero Daniel (4,) and Xavier (16 months). Xavier is already working on being an experimental physicist; he has experimented with the effects that an oven has on a can of cream of mushroom soup as the temperature increases to 475F, and learned that the oven door can be blown off and the glass shattered! In less exciting times, they all enjoy reading, eating, and partying! The kids had not heard that Kansas has a reputation for being flat, in that they say that Lawrence is too hilly. The family is amazed at the beauty of the countryside and the rapidity with which the Kansas weather changes.

FACULTY NEWS

Retirement Festivities to Honor Prof. Armstrong

Tom Armstrong will be honored on Sept. 13, 2003, with a scientific symposium to recognize and celebrate his many contributions to space and plasma physics throughout his career. Most of his former Ph.D. and masters students have been contacted and many plan to attend and present papers. Also invited are a number of his colleagues from the Johns Hopkins University Applied Physics Lab, Lucent Technologies, etc. More information can be found at the Departmental Web site.



Tom Armstrong

Reflections on 35 Years of Space Physics at the University of Kansas

The occasion of retirement evokes in one an impulse to reminisce—I shall try to avoid that! Rather, I want to compliment and thank the people—especially students, who have meant so much to me for the past three-plus decades. Professor Beard was chair of the Department when I joined in 1968. I knew David from his visit to Iowa and his work on the shape of the Earth's magnetosphere. My "job interview" was spontaneous and informal. I stopped in Lawrence to visit the Department at my own initiative in August of 1967 when Jeanette and I were on our way to England to a Postdoctoral Appointment at the United Kingdom Atomic Energy Authority Laboratory at Culham. Professors Beard and Goldhammer, and I went to lunch at a steak house on sixth street. At the time none of us had the idea that this was any more than a social visit, and certainly nothing resembling an interview visit as they are done today. As I neared the end of my postdoc year in England, I wrote to Professor Beard (and others) for leads on other positions. As it happened, he had just been informed by Professor Henry Horak, then visiting at Los Alamos National Laboratory, that he would not be returning to his duties at the University for the 1968-1969 academic year. I infer that Professor Beard discussed this matter with Professor David Montgomery of the University of Iowa (my dissertation advisor) and Professor Van Allen, also of Iowa, with whom I had spent a postdoctoral year, and offered me a position with the Department. I remain grateful and deeply indebted to David Beard and other faculty in the Department at that time for offering me a position. I saw the opportunity at Kansas to be welcome and challenging. Beard's theory work was the only space physics and Professor Enoch's the only plasma physics going on in the Department at the time. That meant that I would need to carry out space experimental work in collaboration with space experiments at other institutions. I believed that I could make a success of this and accepted the University's offer.

What made my academic life at Kansas fulfilling has been a progression of excellent graduate students, Ph.D. and Master's. I hope the editor will indulge my listing (alphabetically) all of the doctoral students here: Mohammad Ahmadian, Naser Alinejad, Ed Bell, Moncef Boufaida, Scott Brandon, Pat Briggs, Gloria Chen, Tim Duman, Rob Decker, Joe Giacalone, Juan Gomez, Dennis Haggerty, Dennis Hewett, Mike Holmes, Ramona Kessel, Frank Kutchko, Claude Laird, Jerry Manweiler, Alexei Nikitin, Mark Paonessa, Doug Patterson, Shawn Stone, Gul Tariq, and Bernard Yu.

I have also enjoyed collaborations with other faculty in supervising students. I was fortunate to assist Professor Cravens in the supervision of the Ph.D. studies of Jerry Manweiler and Francis Vitt. Professor Friauf kindly allowed me to assist with Yue Wu and Ali Rezvani. Finally, Professor Enoch and I enjoyed the Ph.D. studies of Rebecca Chaky and Joey Nonnast.

Masters students included Chris Brull, Moncef Boufaida, Michael Brox, John Buckley, Steve Frierdich, Xiaodong Hong, Lee Irons, Michelle Leonard, Colleen McKee, Laura Jiang, Jerry Manweiler, Chris Mosley, Jack Price, Sheela Shodhan-Shah, Marty Venner, Elizabeth Wainwright, and Yi Zhang.

This is an appropriate forum to acknowledge the support, cooperation, and assistance of the Faculty and Staff of the Department of Physics and Astronomy whose effective and unselfish work and sharing of precious resources accounts for much that I have achieved. To all, thanks!

Among physics Ph.D. departments, there are four departments (including the *University of Kansas*) where 20% or more of their tenured/tenure-track faculty are women. In this group, the *University of Kansas* has the largest number of women.

FACULTY NEWS

38 Years of Service to KU

I came to the Lawrence campus of the University of Kansas in August 1965 with a great expectation of establishing a new High Energy Experimental Group at KU with Professor Robert Stump, who retired in the 1980's.

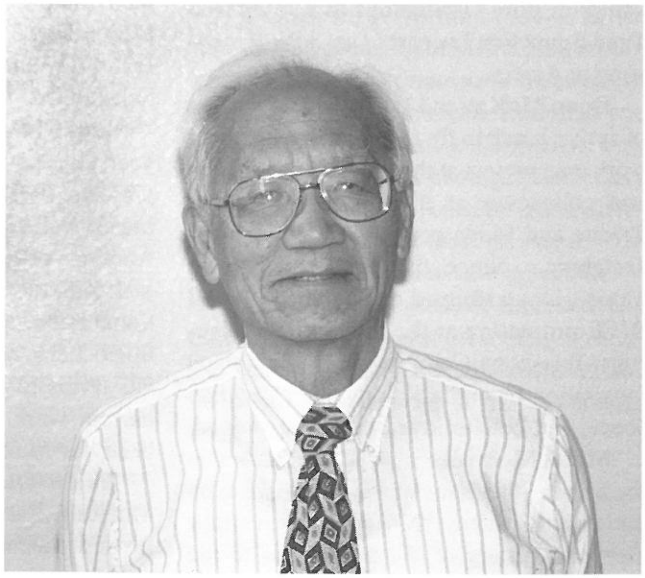
The first experiment that we undertook was the p^+ interactions in the Helium bubble chamber taken at Brookhaven National Lab. It took a tremendous amount of effort for us to scan the films and analyze the events. I remember we had to carry a huge deck of computer program cards and data tapes to the computer center to be run. A group of graduate students participated in the experiment. They are J. H. Head, J. E. Manweiler, G. H. Mall, M.S. Redeker, T.A. Stringer, R.R. Echert, and M.L. Nicholas. Those days, it was a joy to work together with students in the laboratory. We worked through days and nights, sometimes even without a weekend. Other experiments were pbar-p and K^- d interactions.

The group got a big boost when Professors Ray Ammar and Robin Davis joined from Northwestern in 1969, and 1970, respectively. The group has done two bubble chamber experiments namely K^- p and nd interactions. The main goals of study were to search for new particle resonances predicted by SU3 quark model and particle productions by Weak Charged Currents.

On my first sabbatical leave during the academic year of 1973-74, I joined the CHOV experiment at CERN. This was my first experience with counter experiments with a huge detector. Proton beams collided head on with each other. This experiment was carried out with the first proton-proton colliding machine (ISR) in the world. We were interested in deep elastic scattering between proton and proton. I was fortunate to continue the experiment for the following three summers as a visiting scientist.

My family came along with me to Europe, but they lived in Vienna, Austria in order to enroll our children into Vienna Music Academy since they were taking string lessons. Sarah went to a Volkschule, and Larry attended a Gymnasium, which is equivalent to high school in the US. It was hard for them to adjust to life in a foreign country at the beginning, but they eventually did and accomplished their schooling successfully. Still we remember many joyful memories of Vienna. Later my children revisited our old apartment we had lived in and brought back pictures.

One day in 1978 I unexpectedly received a call from Professor C. N. Yang (Nobel Prize winner) to discuss the possibility of visiting our Department and reviewing some of my work done with the CHOV collaboration at CERN. I immediately informed Jack Davidson, chair of the Department then. He was more than happy to invite Professor Yang for a special colloquium. We never had any visit by a Nobel laureate before. This was the beginning of a decade in which the Department was able to invite many Nobel laureates for special colloquia and public lectures. Among the visitors were C. N. Yang, Arno Penzias, Sheldon Glashow, Carlo Rubbia, Nicolaas Bloembegen, C.C. Ting, Jerome I. Friedman, and Martin L. Perl.



Nowhan Kwak

After charmed particles were discovered in mid 1970, new electron-positron colliders were built at DESY in Hamburg, Germany, Cornell in Ithaca, New York, and KEK in Japan in order to search for beauty-particles. Dr. K. Schubert of Heidelberg, my colleague with CHOV asked me to join the ARGUS experiment at DESY. I grabbed a great opportunity for an exciting experiment. I took my second sabbatical leave in 1980-81 leaving my family behind at home. Because the ARGUS experiment had a promising future, I urged Bob, Ray, and Robin to join the ARGUS group. I was very happy to hear that all agreed to join the experiment. More than seventy papers were published in journals during our ARGUS collaboration until 1989.

I remember the time I went directly to DESY and started working in the lab immediately after arriving at the Hamburg airport. Discovering new particles excited me more than anything else. I had to learn how to cook and grocery shop in the open market. The KU group couldn't afford to rent a car, so we had to carry our grocery bags. I gradually adjusted to the local life-style. It was a hard life, but it was worth it for we accomplished much. When my wife visited me several times during summer and Christmas time, I was even more than delighted. We traveled and shared our life together in Germany, Spain, and Norway for our vacation. Also our children, Larry and Sarah, visited on separate occasions. Our reunions are unforgettable memories I still cherish.

Because the CLEO detector had many advantages over the aging ARGUS detector, the HEP experimental group decided to switch collaboration in 1989. I started going to Cornell instead of going to Hamburg, which was much easier and economical. Robin and I, with graduate students, Sangryul Ro and Nader Copty, studied mainly charmed mesons. Ro investigated

FACULTY NEWS

iew decay modes of charm mesons and earched for strange flavored B mesons, vhile Copty studied the P-wave charmed nesons. My association with the CLEO collaboration ended in 1997. Meanwhile, Phil Baringer, Alice Bean, and Dave Besson, who were all former CLEO collaborators, oined the HEP group and they are the ones who carry on high energy physics at KU.

I was elected to serve as the 15th President (1993-94) of AKPA, the Association of Korean Physicists in America. During my tenure, the AKPA founded what has become its most important program, the annual Outstanding Young Researcher Award (OYRA) that recognizes outstanding research and accomplishment of a young physicist of Korean origin within five years of his/her doctoral degree. The first OYRA was awarded in 1994, and its 10th annual award was given in March 2003.

Lastly, I appreciate support received in research and teaching by many colleagues during my thirty-eight years at the University of Kansas. I especially owe much to Jack Culvahouse for making it possible to run the Advanced lab smoothly when I took over the lab from him. I enjoyed Robin Davis's companionship in sharing an apartment while we were in Hamburg, and in Ithaca. Ray Ammar has also been not only a good partner of our research, but also a fair administrator for the Department.

Faculty Awards

Alice Bean, **Siyuan Han**, and **Judy Wu** have all been promoted to full professor, effective August 15, 2003.

Phil Baringer has received the *Steeples Award for Service to Kansans*, in recognition of his work for outreach and public education, including *QuarkNet* and the *Magic Show* presentations. The award, presented at the Master's graduation ceremony, is a $1000 cash award along with a $1000/yr salary supplement.

Adrian Melott has received the *2003 Outstanding Educator Award* from *Pi Delta Kappa*. This is the *KU* chapter of the national education fraternity that provides a forum for educators to discuss research, teaching, and service in their profession.

Ray Ammar is this year's recipient of the Undergraduate Teaching Award.

Faculty Activities

Barbara Anthony-Twarog was chair of the Department Planning Committee, whose job was to evaluate the department's needs for the next five years.

Robert Curry, our director of Labs was interviewed by the Topeka NBC affiliate KSNT, where he discussed accidents involving gasoline and static electricity at the pumps. The topic has become hot because of fires started by sparks. The interview included a demonstration taped in one of our department labs, and a discussion on negating the problem by grounding.

During **Tom Cravens'** sabbatical semester this spring, he traveled extensively, including trips to the University of Leiden to talk about solar system x-ray emission and to Nice, France to attend the European Geophysical Society - American Geophysical Union joint assembly, where he was invited to talk about the planetary ionospheres and the cometary plasma environment.

Siyuan Han gave an invited talk "Observation of Rabi Oscillations in a Josephson Tunnel Junction" as part of an APS symposium at Austin.

Doug McKay and Linda took advantage of spring break to fly to Italy so Doug could work on a project at the invitation of friends and colleagues at the Theory Center in Trieste and Linda could do some inspired sketching. Since they had to fly into Venice, Doug stopped to do some informal RICE promoting at the International Neutrino Telescope Conference, Linda gained inspiration from the art-drenched Venetian scene, and both enjoyed the sun and food.

Misha Medvedev's work was featured in the March 2003 issue of *Physics Today* with an article titled "X-Ray Observations Deepen Mystery of What Happens to the Cores of Galaxy Clusters."

In spring 2003, **Adrian Melott** was an invited speaker at the American Institute of Physics Assembly of Society Officers. This includes the leaders of such organizations as the American Astronomical Society, the American Physical Society, the American Geophysical Union, etc. He spoke on "Motivating Scientists for Effective Political Participation".

A related activity was the publication of an editorial "Intelligent Design is Creationism in a Cheap Tuxedo", in the June 2002 issue of *Physics Today*. The staff reported an unprecedented interest as measured by the influx of letters to the editor, which continued for months thereafter. Talks to public institutions included visits to Bethel College and Piper High School in Kansas to speak on "The Fate of the Universe".

Adrian Melott spearheaded collecting books on physics and related areas for the Kabul University, which reopened last year, and is once again open to women. Among its greatest needs are books to replenish the destroyed library.

Adrian was also awarded the Joseph Burton Forum Award for 2002 by the American Physical Society "For his outstanding efforts in helping to restore evolution and cosmology to their proper place in the K-12 scientific curriculum...he played a key role in helping the people of Kansas reverse their State Board of Education's anti-science action." The award included a $3000 cash prize and was presented at an invited talk at the APS meeting.

Jeff Olafsen traveled quite a bit this year to report results from a variety of projects. These included the fall DFD meeting in Dallas, the APS March Meeting in Austin, a talk at the Annual Granular Flow and Kinetics Workshop at Argonne National Laboratory, a trip to Los Alamos National Labs, and the physics department at UC Irvine to present an invited talk on the current work to better understand antlion behavior in shallow sandbeds.

Linda Olafsen was appointed to the Materials Research Society Bulletin Book Review subcommittee this year. In addition to writing book reviews several times each

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year that appear in the MRS Bulletin, she also finds and assigns reviewers for other materials research related texts.

Sergei Shandarin reported results at the XXXVII Rencontres de Moriond meeting on "The Cosmological Model" in Les Arcs, France, in March 2002, and at the workshop on "Structure Formation in the Era of Large Surveys" at Aspen, CO.

In **Stephen Shawl's** final year on the nominating committee for the Astronomical Society of the Pacific, he was the committee's chair. The committee's work is to come up with a slate of candidates for the Society's Board of Directors. The hard part is asking people to participate when 50% will lose! He also attended a week-long workshop funded by NSF and the Pew Charitable Trust at the University of Buffalo on the use of case studies in college science teaching. An additional workshop at the University of Colorado dealt with professional development for teachers. He was chairman of the College of Liberal Arts and Science Committee on Undergraduate Studies and Advising.

Judy Wu gave an invited talk, "Microstructural evolution and thickness dependence of J_c in YBCO, Tl-2212 and Hg-1212 thick films", with student coauthors Xiang Wang, Rose Emergo and Zhongwen Xing, at the 105th Annual conference of American Ceramic Society (AcerS) in Nashville. She gave another invited talk, "Growth and characterization of boron and magnesium boron oxides nanowire films," last December at the 4th International conference on low-dimensional structures and devices held in Fortaleza, Cerea-Brazil.

In the Front: Gordon Wiseman, Professor Emeritus. Standing left to right, Nowhan Kwak, Professor of Physics; Richard Sapp, Professor emeritus; Peter Richards, KU faculty from '64 to '72 and afterwards at Sandia Laboratories; Ken Wong, Professor Emeritus; Jack Culvahouse, Professor Emeritus; and Wesley Unruh, KU faculty 1971-1983, and afterwards at Los Alamos Laboratories.

Impromptu Malott Hall Conference among KU Physics People of the 1964-1972 Period

A visit by Peter Richards, faculty member at KU from 1964-1972, led to a gathering in Malott Hall on October 24, 2002 to celebrate some memories of events, people, and students from that era. Some of those who participated were caught by the "official photographer", Cory Doolittle, one of our current undergraduates, who took a break from his Physics 516 Heat Flow experiment to take the photo.

Robert Friauf, Professor Emeritus, and Carl McElwee Professor of Geology, Professor Richards' last graduate student missed the photo-op; but were at the celebratory dinner later.

*(**Sanders**: Continued from the cover)*
offered by the Atmospheric Science Program on the application of the techniques of science to questions relevant to our daily lives.

We have a faculty that places a high emphasis on teaching. A common frustration for faculty who have taught one of our introductory physics courses, in either the algebra- or calculus-based sequences, is the apparent lack of learning that is seen with many of the students. This is a problem faced by almost all physics programs and many innovative techniques have been developed with the hope of giving more effective instruction. Over the past several years there has been an informal effort in the Department, led by Professor Dave Besson, to invite researchers in the area of Physics Education to give colloquia. Based on these presentations, and on our own experiences, there is a growing sense that we can and must do better in our approach to teaching introductory physics. Technology may help.

(Continued on Page 23)

ALUMNI NEWS

Alumni News

In Memorium

Wade Lanford Fite (A.B. Physics 1947) died at his home in Fox Chapel, Pennsylvania. He had gone on to do his graduate work at Harvard. Most of his research was in atomic physics, especially collision phenomena. He was Professor Emeritus at the University of Pittsburgh.

Jean Delord, PhD ca 1950 died October 22, 2002 at age 82 from Parkinson's Disease. His professional career was mostly as a professor of physics at Reed College, where he set a standard for physics teaching. During WWII, he was imprisioned in 1941 for publishing anti-Nazi tracts. Escaping in 1943, he joined the French Resistance working on forging documents that allowed people to escape to Spain. While at KU, he married Natalie Nelson of Newton, Kansas.

1960's

James Liebert (BA Astronomy, Physics, Math 1968) and **Edward Sion** (BA Astronomy 1968; MS Astronomy 1969), astronomers who often collaborate with each other on studies of white dwarf stars, visited the department one day apart from each other in April. Each was passing through on their way to visit family in Kansas.

1970's

Humberto Campins (BS Astronomy 1978) accepted a position as a Provost's Research Professor at Central Florida University, where he is starting up a new program of planetary sciences within the physics department. He was originally given two faculty positions to fill immediately and one for next year but that number has already increased! In addition, he was provided with start-up funds in excess of his request.

Brenda Beaumont Johnson, (BA Special Majors, 1979) a colonel in the U.S. Air Force, serves as chief of space force enhancements systems for the secretary of the Air Force. She and her husband, **Lindley Johnson**, (BA Astronomy, 1980), live in Kingstowne, Va. He is a U.S. Air Force deputy chief of space control systems.

1980's

Rick Miller (1983 KU MS Physics, Geophysics Option) is the head of the Exploration Services Section of the *Kansas Geological Survey* at *KU*, which is composed entirely of former students from the KU Geophysics Program. This program has been selected for the 2002 Distinguished Achievement Award of the Society of Exploration Geophysicists.

Eric Ramberg (MS Physics 1981) returned to KU to give a high energy seminar about the CKM experiment at Fermilab, where he is a staff scientist. He fondly recalled his days on the 4th floor of Malott scanning bubble chamber film! Film—what's that??!!

1990's

Capp Yess (Ph.D. Physics, 1997) was awarded tenure as an Associate Professor of Physics at Morehead State University in Kentucky. He travels to Alaska and England this summer, plus teaches summer school (after Tanner graduates from high school).

2000's

Michael Kaufman (MS Physics 2000), who is now a graduate student in the physics department at the University of Wisconsin, has worked on a variety of physics projects, including one using mouse bones! He reports that it's nice to be at a place where, when you get bored with research, you can take the afternoon off and go sailing. Mike, you could have done that at KU, too; we do have Clinton and Perry lakes!

Donor's Hall of Fame

We are honored to acknowledge the generosity of those who have made donations to the Physics and Astronomy Department Development Fund, the Atmospheric Sciences Fund, or the Tombaugh Observatory Fund during this past year.

Frank W. & Judith Boyer Addis
Randal S. Baker
Margaret M. & Robert C. Bearse
James G. Berryman
Patrick R. Briggs
Rebecca C. Chaky
Donald A. & Robbin S. Close
John P. & Mary R. Davidson
Gina Louise Enfranca
Charles Lee Francis Jr.
Ashford A. Galbreath
Ashford Andrew Galbreath Jr.
Neoma & William G. Galinaitis
Walter E. Geiger III
Michael B. Gillispie
Carl E. & Nancy L. Hane
Gary E. & Kay Blauer Hanson
Dennis W. & Elizabeth Kovacic Hewitt
James R. & Kathy Johnson Hover
Brenda S. & Lindley N. Johnson
Karla E. Kuebler
Thomas W. Laming
Yvonne Lazear & Richard G. Leamon
Laurence R. McAneny
Douglas W. & Linda Dae McKay
Ralph M. & Barbara Longfellow Moon
Lewis R. Nash
Jeffrey & Linda J. Olafsen
James D. Patterson
Larry Pfortmiller
James A. Pintar
Grant D. Pitzer
Daryl W. & Jane Dion Preston
Lakshmanan K. Rangan
David R. Renneke
Francis B. Sellers
Wen-Wu Shen
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Stephen K. Stearns
Barbara & Bruce Twarog
Esther Storer Utchen
David A. VanPelt
Fred L. & Jimmie J. Wilson
Jeff A. Winger

Corporate matches have added significantly to donor's gifts, and we are grateful to Aventis Pharmaceuticals, Inc., The Boeing Company, Lucent Technologies and Motorola Foundation, for those matches.

ALUMNI NEWS

*(**Sanders**: Continued from Page 21)*

We have been using an on-line computer homework entry program for the past several years in our introductory calculus-based sequence—with reasonably good results. More recently we equipped one of our larger classrooms with an interactive response system. This system was successfully used this past term by Professor Steve Shawl in an introductory astronomy course, and it seems likely that we will equip additional classrooms to exploit this technology in the near future. Although technology can help, it is only a tool. We will also be exploring other possible changes in our course structure with the goal of improved learning.

The Astronomy and the Engineering Physics programs are important to the overall success of our undergraduate program and are responsible for a number of our best students. While they share many common elements with the physics program, these tracts also have their own special needs and opportunities. The structure of the Astronomy program suggests that in the near future we will want to hire an additional observational astronomer. Engineering Physics requires close cooperation and coordination with the School of Engineering, as has been handled for the past several years by Professor Robin Davis as Engineering Physics Chair. It will be important that we build on the ties developed by Professor Davis as he steps down from this position.

I started this piece suggesting that many of its themes would be based on our recent planning exercise. One of the Department's strengths is the way major decisions tend to be made by the faculty in a collegial manner. As we move forward, it is going to be increasingly important that we also engage our students and our alums in the process of planning our future. I welcome your help!

(Cut Here)

Keep in Touch!!

Let your KU friends know what you're doing...

If you would like to hear from the Department more often, you might enjoy our bimonthly in-house newsletter, which contains more details of what individuals are doing throughout the year. You can obtain it on-line at the Department Web site (www.physics.ku.edu), or we can send you a copy if you write to Ms. Teri Leahy in the Department with the request to the address given below.

Please return to:
Department of Physics and Astronomy
Malott Hall
1251 Wescoe Hall Dr., Room 1082
Lawrence, KS 66045-7582

Or e-mail shawl@ku.edu

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