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# SPECTRUM

FOR ALUMNI & FRIENDS OF THE DEPARTMENT OF PHYSICS & ASTRONOMY

UNIVERSITY OF NEBRASKA–LINCOLN ANTHONY F. STARACE, EDITOR

# Materials Researchers Awarded $5.4 Million NSF Grant

BY DAVE FITZGIBBON/
UNIVERSITY COMMUNICATIONS

***Editor's Note:*** *The growing materials research group at UNL achieved one of its goals this year, the award of a 6 year MRSEC for "Quantum and Spin Phenomena in Nanomagnetic Structures." David J. Sellmyer is the Center Director. Department faculty participating in the Center include Shireen Adenwalla, Bernard Doudin, Peter Dowben, Stephen Ducharme, Sitaram Jaswal, Roger Kirby, Diandra Leslie-Pelecky, Sy-Hwang Liou, Ralph Skomski, and Evgeny Tsymbal. The focus of the center is on fabricating and studying new nanomagnetic structures and materials. In what follows we reprint the UNL news release of the award.*

Lincoln, Neb., Sept. 23, 2002 — Materials researchers at the University of Nebraska-Lincoln have won a prestigious $5.4 million grant from the National Science Foundation. The grant establishes a Materials Research Science and Engineering Center (MRSEC) at UNL, making it one of 27 such elite centers in the nation.

"This is a very exciting accomplishment for UNL. Competition for these centers is intense and only the top research programs in the country win these awards," said UNL Chancellor Harvey Perlman.

The MRSEC is an outgrowth of UNL's Center for Materials Research and Analysis, and involves scientists from the departments of physics and astronomy, chemistry, and mechanical engineering, and the School of Biological Sciences whose research focuses on nanomagnetic structures. Their work in magnetic materials at the nanoscale — as small as one-billionth of a meter— has applications in advanced computing and data storage systems, handheld electronic devices, advanced sensors, and possible future medical technologies.

**MRSEC Group:** Some of the MRSEC faculty at a September 24th, 2002 celebration hosted by Chancellor Harvey Perlman and Vice Chancellor for Research Prem Paul to recognize the NSF award. Clockwise from left: Diandra Leslie-Pelecky, David J. Sellmyer, Bernard Doudin, Roger Kirby, and Evgeny Tsymbal.

"Nanoscience and nanotechnology are amazingly creative new subfields of materials science," said David Sellmyer, UNL physicist and director of the new center. "We are delighted at the opportunities this center will bring to students at UNL."

UNL nanomagnetics researchers are nationally recognized for their theoretical and experimental work, and fabrication of new materials. In just the last two years, their research has included the synthesis of the first magnetic polymer or "plastic magnet" and has generated six patents granted or filed on devices for data storage, portable electronics and optical sensors. The MRSEC grant illustrates the success of Nebraska's investments in UNL research, said Prem Paul, UNL vice chancellor for research and dean of graduate studies.

"Our stature in materials research and nanotechnology is a direct result of Nebraska Research Initiative funding in the past decade. Now we are seeing the return on that investment," Paul said.

The grant funds more than research projects, Sellmyer said. Training of graduate and undergraduate students, and programs for educational outreach and technology transfer to business and industry are included in the center. The six-year grant will fund salaries for two post-doctoral fellows, 14 graduate students and 10 undergraduate students. It also funds a program that brings high school teachers and students to campus for research experiences, recruitment of graduate students from underrepresented groups, and supports a "Women in Science" program for high school students.

The center's research and its collaborations with industry partners such as IBM, Seagate, Hewlett-Packard, and developing relationships with Nebraska companies, hold high potential for inventions and discoveries that can be patented and commercialized. A recent example is a small, powerful neutron detector developed at UNL that could be used to detect hidden nuclear devices.

UNL's MRSEC grant is one of only three new awards made this year. Other institutions with MRSEC grants **include the California Institute of Technology, Massachusetts Institute of Technology, Carnegie Mellon University, Harvard University and Princeton University.** ■

*Editors Note: In case you missed us, please note that there was no issue of Spectrum published during the 2002–2003 academic year. Consequently the present issue is larger than usual. It is intended to bring you up to date on news and events of the two years since our last issue of Spectrum up to Spring 2004.*

## INSIDE

# Long-Range Research/Outreach Planning Pays Off

As I have discussed in earlier letters, the Department of Physics and Astronomy has had a long-range plan since the mid 1980s to focus its research efforts in a few areas where we could have national and international impact. At the time the plan was developed, our effort in condensed matter physics was fairly small, involving only 5 or so faculty members active in research. While there were several successful individual research programs, there was little overall coherence to our effort.

This began to change with the establishment in 1987 of the Center for Materials Research and Analysis (CMRA), with **David J. Sellmyer** as its Director, a position he still holds today. CMRA provided central facility support, and more importantly, partial salaries and startup funds for new faculty hires. This permitted the Department to invest in new areas of condensed matter research in a more coordinated way. We chose to emphasize the magnetic and electronic properties of materials, and most new hires established research programs in these areas.

Fifteen years later, the condensed matter group includes twelve active faculty members, and we now have one of the top few groups in the world studying magnetic materials. In addition, we have very strong groups in the electronic properties of surfaces and in spin transport. As reported in the 2002 issue of the *Spectrum,* the condensed matter group leads the UNL-supported priority initiative in Nanoscale Science and Technology. The "enhancement" funds for this priority initiative program are permitting us to hire four additional faculty members in condensed matter physics (with the first two being **Shireen Adenwalla** and **Christian Binek,** who are profiled in this issue of *Spectrum*).

In the past year, the Department has received external validation of the success of this approach. As reported elsewhere in this issue, the condensed matter group led the successful effort to obtain a Materials Research Science and Engineering Center (MRSEC) award from the National Science Foundation. Competition for MRSEC awards is extremely intense, and our group was fortunate to come out ahead of similar groups at very well known research institutions. This $5.4 million grant will enable research and graduate education in the fabrication and study of nanoscale magnetic and electronic materials, and will go a long way towards improving the national research standing of our Department.

The condensed matter group also was awarded the State of Nebraska's first major grant from the W. M. Keck Foundation to study nanoscale materials and establish the Keck Center for Fast Dynamics. *In toto,* our successes in the nanoscale science arena have been very significant to us, and they have made us highly visible on the national research scene.

Motivated by these successes, the Department hopes to effect a similar revolution in our atomic, molecular and optical (AMO) physics program. The AMO physics program is already very strong, is also designated as a UNL priority initiative, and has also been awarded enhancement funding. The enhancement funds will permit us to hire three new AMO physicists over the next few years, provide funding for **T. P. Jorgensen** postdoctoral fellows, and bring in outstanding short- and long-term AMO physicist visitors from around the world. We are pleased to announce that one of the new hires will be at the senior level as the Dorothy and Leland Olson Chair of Physics. We hope that this senior hire will permit our AMO group to be even more highly recognized among similar groups around the world.

Let's also note that our experimental high energy physics group, which now includes **Greg Snow** and **Dan Claes,** will be expanding to three faculty members by Fall 2004. This group already plays major roles in the D0 experiment at Fermi National Accelerator Laboratory, and has assumed leadership of the luminosity portion of the CMR experiment at the Large Hadron Collider at CERN (in Geneva, Switzerland). Adding another faculty member is essential if the group is to continue building on its significant successes so far.

Finally, the Department is also recognized for its outstanding education and outreach programs, which have some overlaps with the UNL funded priority initiative in *Math and Science Teachers for the 21st Century.* The *Cosmic Ray Observatory Project (CROP),* headed by Dan Claes and Greg Snow, received $1.34 million from NSF to build research/education relationships with Nebraska high-school teachers and students, and it has received national and international attention. Similarly, Project Fulcrum, headed by **Diandra Leslie Pelecky,** received $1.44 million from NSF to create partnerships with elementary and middle schools to improve science education at the "grass roots" level. It appears that Project Fulcrum will be renewed for another five years at an even higher funding level. Thus, the Department is building great strength in education/outreach as well.

I hope that this letter gives you a sense that the Department of Physics and Astronomy is on a very positive slope in developing its research and education/outreach programs. I have not dwelt on our progress in instruction — I'll leave that for another time. In the meantime, I would appreciate hearing from you. I enjoy greatly my interactions with our alumni. I hear many fascinating stories and take pride in your collective successes.

Sincerely,

Roger D. Kirby

Roger D. Kirby
Professor and Chair

Roger Kirby, Chair

> "Fifteen years later, the condensed matter group includes twelve active faculty members, and we now have one of the top few groups in the world studying magnetic materials."

# Dowben Named Charles H. Bessey Professor

BY ROGER D. KIRBY

On December 20, 2001 Chancellor Harvey Perlman announced his selection of Professor **Peter A. Dowben** to become a Charles H. Bessey Professor of Physics. Dowben joins three other chaired professors in the Department. (John R. Hardy, David J. Sellmyer, and Anthony F. Starace are all George Holmes University Professors of Physics.)

Dowben was one of 10 leading UNL scholars chosen to become the University's first Charles Bessey and Willa Cather professors, which "were created…to recognize distinguished scholarship and creative activity," said Perlman. Perlman made the final selection after a field of 38 candidates were reviewed by the University Professorships committee. Perlman stated that "The establishment of the Bessey and Cather professorships is an important element in the university's efforts to retain its top faculty…whose research and creativity carry on in the tradition of Charles Bessey and Willa Cather, two of the outstanding individuals in the history of the University of Nebraska."

Professor Dowben earned the Ph.D. degree at Cambridge University, spent two years at the Fritz Haber Institute in Berlin, after which he joined the faculty of Syracuse University as an Assistant Professor. He rose to the rank of Associate Professor (with tenure) but left Syracuse to join our faculty in 1993. He was promoted to the rank of Professor in 1996, and he has since proved to be a catalyst for condensed matter/materials physics research at UNL.

**Peter Dowben:** "Peter Dowben has served as a 'spark plug' for condensed matter/materials science research on campus."

Dowben is regarded as an exceedingly productive experimentalist who specializes in the investigation of surface electronic structure in a wide variety of interesting materials. He is a recognized innovator in developing instrumentation for photoemission and inverse-photoemission studies of solids and surfaces. He has two patents on such instrumentation (among a total of 10 patents), and he has led the development of two beam lines on the recently commissioned synchrotron source at the Center for Advanced Microdevices in Baton Rouge, Louisiana. His work has established UNL as a world-wide leader in this area.

Dowben has published more than 300 papers in peer-refereed journals, which is a very large number for a physicist of his age. Among these papers are many significant contributions to our discipline's understanding of surface phase transitions, surface magnetism, and electronic structure of materials ranging from metals, to oxides, to polymers. In the year 2000 alone, he published seven papers in two of the most high profile journals in physics: *Physical Review Letters* and *Applied Physics Letters*, which indicates that his work is not only highly regarded but also merits accelerated publication. Among his very recent successes is the development of the Boron Carbide neutron detector (see the Research Highlight in this issue of *Spectrum*).

Peter Dowben has served as a "spark plug" for condensed matter/materials science research on our campus. He is broadly knowledgeable about condensed matter physics, has many ideas, and has a talent for bringing together teams of researchers to work on interesting projects. Evidence for this latter point are his eleven *currently active* collaborative grants, totaling over $10 million. Professor Dowben was appointed a Research Professor of Chemistry at UNL because of his strong collaborations and joint funding with Chemistry faculty. He has long-standing collaborations and joint funding with faculty in our Mechanical and Electrical Engineering Departments. It is clear that Professor Dowben is an intellectual leader on our campus and that the honor of being named a Charles H. Bessey Professor is well deserved. ■

# Programs Benefit as University Funds Priority Initiatives

In academic year 2000–2001 the University developed and approved more than 80 priority programs as a means toward focusing university resources in areas that already are, or are potentially able to become, nationally competitive. A key goal was to develop a number of priority programs in multidisciplinary areas that involve faculty from across the campuses. Ideas for programs originated from the various colleges and departments; upper administrators then encouraged and facilitated some larger multidisciplinary combinations, when appropriate.

During academic year 2001–2002 the selected programs were invited to submit proposals indicating how they might use additional funds to build upon their existing strengths. Of the many programs that applied for enhancement monies, only 15 were funded, including three that involve Department faculty: (1) Atomic, Molecular, and Optical Physics (AMOP), (2) Nanoscale Science and Technology (NST), and (3) Math and Science Teachers for the 21st Century. (The Department's high energy physics program is also a UNL priority; but it was not awarded enhancement funding in this first round of competition.)

The goal of the AMOP program is to use enhancement funding of approximately $600,000 over the five aca-

**PRIORITY**
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demic year period 2002–2008 to become one of the top-ranked programs in this area.

As a means toward this goal, the enhancement funds will help the Department to increase the number of tenured or tenure-track faculty in this area by 50%, from the current six to nine. Grant funding for the current six faculty is already in excess of $900,000 annually and it is expect to increase more than proportionally as the size of the group grows. Enhancement funding will also allow the group to invite many more leading AMO physicists to campus, including for longer visits (from several days to a few months).

> “During academic year 2001–2002 the selected programs were invited to submit proposals indicating how they might use additional funds to build upon their existing strengths.”

It will also fund two Jorgensen Postdoctoral Fellows per year, who will collaborate with group faculty but who also have freedom to pursue their own research interests. The first two Jorgensen Fellows are **Jin Wang** (Ph.D. 2001, University of Queensland, Australia), who is collaborating with the groups of **Herman Batelaan** and **Anthony Starace** in the area of quantum information, and **Igor Mariyenko** (Ph. D. 2000, Institute of Physics, Kiev, Ukraine ), who is working in the area of intense laser physics with the group of **Cornelis Uiterwaal.**

The main aim of the Nanoscale Science and Technology (NST) priority initiative is to use enhancement funding of approximately $1,140,000 over the 5 academic year period 2002–2008 to create leading national programs in selected areas of NST through growth in faculty, facilities, research, and education. The UNL departments involved in this priority initiative include Physics, Chemistry, Chemical Engineering, Electrical Engineering, and Mechanical Engineering.

NST has been predicted to lead to the next industrial revolution, with breakthroughs likely in computation and data storage; magnetic, optical and structural materials and devices; medicine and health care; environment and energy; and national security. The NST program will be used from 2003-2008 to hire and set up 11 new faculty, including 4 in Physics to bring the Condensed Matter and Nanoscale Physics group to 12 faculty. Two hires have already been made in Physics: **Shireen Adenwalla** and **Christian Binek** (see page 7 of this issue of *Spectrum*).

The NST priority initiative is being administered by the Center for Materials Research and Analysis, which is directed by **David J. Sellmyer.** The 5-year total funding for the NST priority initiative is $4.89 million, including $1.14 M, $1.77 M, and $1.98 M respectively from the NST’s enhancement funding; CMRA, Department and College matches; and the Vice Chancellor for Research. Included in these funds is $700,000 to renovate portions of Behlen Laboratory and Ferguson Laboratory to house experimental laboratories for the nanoscale physics effort.

> “Of the many programs that applied for enhancement monies, only 15 were funded, including three that involve Department faculty: (1) Atomic, Molecular, and Optical Physics (AMOP), (2) Nanoscale Science and Technology (NST), and (3) Math and Science Teachers for the 21st Century.”

These renovation efforts are already underway, and include a major renovation of the current underground “accelerator laboratory” in the sub-basement of Behlen.

NST enhancement funds also are being used to hire administrative and accounting staff to administer large grants, including the NSF Materials Research Science and Engineering Center on *Quantum and Spin Phenomena in Nanomagnetic Structures*, and the W.M. Keck Center for *Mesospin and Quantum Information Systems*. In addition, enhancement funds support the CMRA *Materials and Nanoscience* Seminar Series.

The goal of the Math and Science Teachers priority is to make UNL a national model for a research university where mathematicians and scientists work together with education faculty and local K-12 systems to develop superior math and science teachers – teachers who are able to significantly strengthen the math and science education of the K-12 students they teach. This partnership includes faculty from the University of Nebraska-Kearney and the Lincoln Public Schools, and over time a number of faculty from the Department will contribute.

A number of Department faculty are already engaged in projects involving K-12 science teachers. **Kevin Lee** and **C. Edward Schmidt** have organized astronomy workshops for area teachers during the academic year, and week-long astronomy camps for high-school students during the summer. **Diandra Leslie-Pelecky** is the Principal Investigator for the NSF-funded *Project Fulcrum*, which forms partnerships between UNL science graduate students (Fulcrum Fellows) and middle and elementary schools in Lincoln. The Fellows are resources for the public school teachers to draw upon.

The goals of this program are to improve science and math education in public schools and to develop Ph.D. scientists who are knowledgeable about the challenges of science and math education.

**Greg Snow** and **Dan Claes** have developed the *CROP* program, which trains high-school teachers and their students in cosmic ray physics and instrumentation, and places cosmic ray detectors at the high-school sites. So far teachers and students from more than 20 schools have participated in the month-long summer workshops and these schools now have cosmic ray detectors at their sites. It is anticipated that collective studies of highly energetic cosmic rays shows will begin later this year, with students from many high schools collaborating and sharing their data. ■


Keck Center faculty. Left to right: Roger Kirby, Andrzej Rajca (Chemistry), Peter Dowben, Ralph Skomski, David Sellmyer, and Anthony Starace. (Other Keck Center faculty not shown: Bernard Doudin, Sy-Hwang Liou, and Evgeny Tsymbal.)

# Behlen Lab Houses New Research Center Funded by Keck Foundation

A new center for the study of mesospin structures was dedicated on May 1, 2003. The W.M. Keck Center for Mesospin and Quantum Information Systems and the W.M. Keck Fast Dynamics Laboratory are sited in Behlen Laboratory. The Center is funded by a $750,000 grant from the W.M. Keck Foundation. This is the first time the Los Angeles-based Keck Foundation has made a grant in Nebraska.

Researchers in the Center, administered by **David Sellmyer,** George Holmes University Professor of Physics, will conduct frontier research on mesospin structures. The Center will involve nine faculty, one postdoctoral research associate and eight graduate students from the Departments of Physics and Astronomy, and Chemistry.

The proposed research is basic, new, and high risk. The Keck funding will initiate the laboratory, enabling equipment purchase and lab preparation.

Prem S. Paul, Vice Chancellor for Research at UNL, said the Keck grant is an example of the increasing partnerships between private foundations and the University.

"The Keck Foundation is among the premier groups funding leading edge science and research projects," Paul said. "This grant is further evidence of the exemplary work done by materials scientists at UNL."

Mesospin research occurs at the intersection of condensed matter physics, chemistry and materials science, and deals with topics not even perceived until recently. Mesospin structures are those intermediate in size – ranging from single atomic spins to high-spin molecules to nanoscale magnetic dots and clusters. Mesospin structures have great potential for future technological applications in information processing and storage.

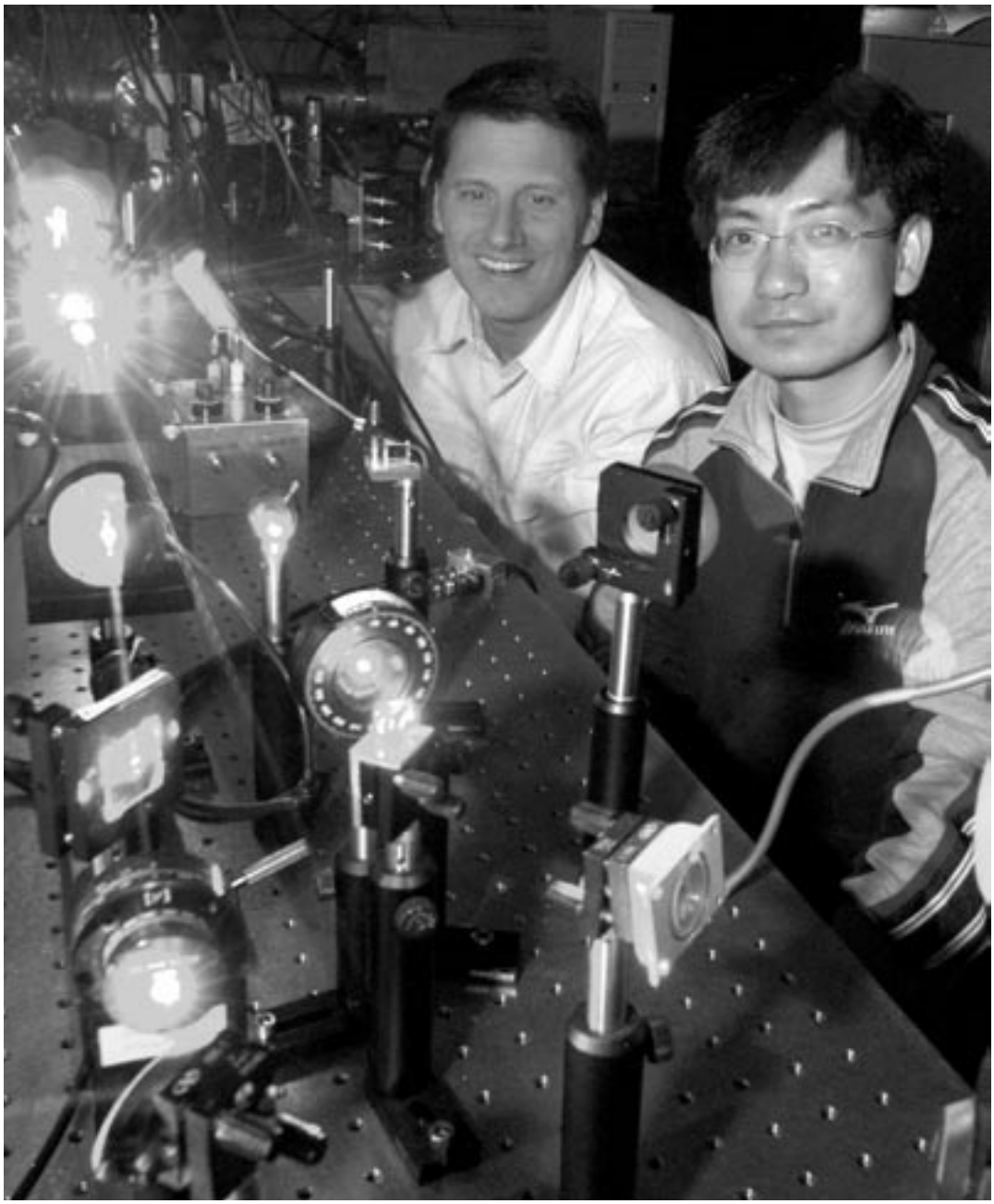
A crucial aspect of the study of mesospin structures is developing precise fabrication techniques through lithographic or self-assembly methods. The fabrication techniques require extreme precision and their development is as important as the theoretical portions of the science, especially as scientists move toward building complex mesospin structures with tailored properties.

The project goal is to initiate a comprehensive and integrated approach to develop novel mesospin structures with great potential for future data storage, logic operations, and quantum information systems.

UNL has developed a particular area of strength in nanotechnology research. In 2002, UNL received $5.4 million from the National Science Foundation to establish a Materials Research Science and Engineering Center [see page 1 of this issue of *Spectrum*]. Many of the scientists involved in that project are also involved in the Keck Center studies.

The W.M. Keck Foundation is one of the nation's largest philanthropic organizations with assets totaling more than $1.5 billion. Established in 1954 by the late **William Myron Keck,** founder of The Superior Oil Co., the foundation's grant-making is focused primarily on the areas of medical research, science, and engineering.

The primary interest of the W. M. Keck Foundation is support for exemplary scientific, engineering, and medical research programs at accredited universities and colleges throughout the United States. The W. M. Keck Foundation seeks to enrich research and teaching through support for equipment, facilities, fellowships, and basic research projects at the frontiers of science and engineering. ■



Herman Batelaan and Gao Hong capture polarized light in a cell containing a vapor of atoms of the metal rubidium.

RESEARCH HIGHLIGHT

# Batelaan Group Stops Polarized Light, Creates Bit of Quantum Memory

BY TOM SIMONS/
UNIVERSITY COMMUNICATIONS

Much as a journey of a thousand miles begins with a single step, the journey to a quantum computer begins with a single qubit — a single bit of quantum memory.

A first baby step in that journey was taken during an experiment in a UNL laboratory earlier this year when a team led by physicist Herman Batelaan captured polarized light in a cell containing a vapor of atoms of the metal rubidium.

In the experiment, designed by Gao Hong, a post-doctoral student in Batelaan's lab, 20-microsecond pulses of polarized light were beamed into a tubular, 4-centimeter-long cell containing rubidium vapor, where the pulses were captured before being released intact. Light normally moves through space at about 186,000 miles per second and a microsecond is one-millionth of a second, so a 20-microsecond light pulse normally would be about 3.72 miles long. But in Gao's experiment, that 3.72-mile-long light pulse was captured and stored in a tube about 1 1/2-inches in length.

That was a notable and interesting achievement, Batelaan said, but it only confirmed results published in 2001 by teams of scientists at Harvard University and the Harvard-Smithsonian Center for Astrophysics, both in Cambridge, Mass.

"We're happy that we at least are up to par with the people at Harvard, but Gao did something more," Batelaan said. "He changed the parameters and found out he could do something with it that actually might mean something."

Gao demonstrated that polarized light could be harnessed to create quantum memory.The ability to store quantum information is a critical element in the quest to create quantum computers, devices that would

vastly outstrip in power and speed any computer now in existence. In present-day computers, memory is stored as millions of zeros and ones on silicon chips. But the point of a quantum computer is to take advantage of how the laws of physics change at the atomic, or quantum, level, where it's possible to exist in more than one state simultaneously.

Something other than static ones and zeros on silicon chips, then, will be necessary for memory storage.

> "The ability to store quantum information is a critical element in the quest to create quantum computers, devices that would vastly outstrip in power and speed any computer now in existence."

"If you have light going a certain way, you have an electric field that oscillates," Batelaan said. "It can oscillate horizontally or it can oscillate vertically. Those are the zeroes and ones of your qubit in this case.

"But the problem is, suppose I want to make a quantum computer out of light. I need to do something with the light, but the light goes by so quickly that I can't do anything with it. So it would be nice to take that light and dump it into something so that we can actually do something with it."

Batelaan, Gao and their research team (which included research assistant professor Mark Rosenberry and undergraduate student Ben Williams of Yankton, S.D.) "dumped" the light into the rubidium tube, and they found they were indeed able to do something with it. They created a quantum memory.

"The scientists at Harvard looked at one polarization only, and what Gao is capable of doing is not only two polarizations, but all combinations," Batelaan said.

"The fidelity for all polarizations is better than 95 percent, so it's darn good. It shows that the polarization state is well-maintained during storage in the rubidium cell. He clinched this issue that you can use polarized light as a qubit, as a one-qubit quantum memory."

A standard, run-of-the-mill desktop computer typically has more than 100 million bits of memory, however, and Batelaan readily acknowledges that there is a long way to go in the quest for a functional quantum computer.

"How many bits do you have in a typical computer memory? A boatload. How many do we have on our table? One," he said. "But the difference between zero and one is often enormous and the obvious thing that we're discussing is how do we make more.

"It's anybody's guess what the future components of quantum computers are going to be. But if you ask my guess, light is definitely going to play a role, and some medium that can store the information, some material like rubidium that can talk to the light, is going to play a role. The process of how light talks to matter, that's what we're studying."

Gao, Rosenberry and Batelaan published their research in the May 2003 issue of Physical Review A, the journal of atomic, molecular and optical physics. Their research was supported by a Nebraska Research Initiative grant. ■

# Adenwalla, Binek Join Department

As part of UNL's plan to increase its faculty strength in nanoscale materials research, supported in part a grant from the Office of Naval Research, in Spring 2003 the Department successfully completed searches for two new faculty. **Shireen Adenwalla** was appointed an Associate Professor in the Department. Her research expertise is in the areas of exchange coupling in magnetic multilayer systems, structural changes in ferroelectric polymers, and the development and fabrication of high-performance boron-carbide neutron detectors. **Christian Binek** was appointed an Assistant Professor in the Department. His research expertise is in the areas of spin structures and exchange bias in magnetic metal/insulator heterostructures as well as in studies of ferromagnetic nanoparticles in antiferromagnetic environments.

Adenwalla

Binek

Shireen Adenwalla received her B.Sc. degree in physics from St. Xavier's College of Bombay University (India) and her Ph.D. degree from Northwestern University. Her doctoral dissertation concerned ultrasonic measurements of two highly correlated Fermionic systems: superfluid helium and a superconducting uranium compound. Following a postdoctoral appointment at Northwestern University, she worked as an Assistant Scientist at Argonne National Laboratory's Intense Pulsed Neutron Source laboratory. When her husband, Associate Professor **Dan Claes,** joined our faculty in 1996, Shireen took a Visiting Assistant Professor position in the Department. Since 1998 she has held a Research Assistant Professorship. Adenwalla has over 50 scientific publications and is involved as a Principal or Co-Principal Investigator on several individual and collaborative research projects. (See the Research Highlight on one of these projects in this issue of *Spectrum*.)

Christian Binek was born and raised in Duisburg, Germany, where he received both his Diploma and his Ph.D. degree at Gerhard-Mercator-University. His doctoral thesis work involved various experimental studies of model antiferromagnetic and ferromagnetic systems. In 2002 he was awarded the Certificate of Habilitation for his work on Ising-type antiferromagnetic systems. Since then he has been a postdoctoral researcher at Gerhard-Mercator-University. During the 1990s, Binek's research has taken him to the Laue-Langevin Institute in Grenoble, France (to perform neutron scattering measurements), to the RIKEN Wako Institute in Saitama, Japan (to carry out calorimetric and magnetometry studies), and to the Hahn-Meitner-Institute in Berlin, Germany (to carry out neutron scattering studies). Binek has over 40 scientific publications and is the author of a monograph entitled *Ising-Type Antiferromagnets: Model Systems in Statistical Physics and in the Magnetism of Exchange Bias* (Springer, Berlin, 2003). ■

Research team members, all affiliated with UNL's Center for Materials Research and Analysis: (Clockwise from lower right) Associate Professor of Physics Shireen Adenwalla, Associate Professor of Chemical Engineering Jennifer Brand, Associate Professor of Mechanical Engineering Brian W. Robertson, Professor of Physics Peter Dowben, and engineering graduate student Andrew Harken.

**RESEARCH HIGHLIGHT**

# CMRA Researchers Develop Tiny Neutron Detector

BY MONICA NORBY/
UNL RESEARCH COMMUNICATIONS

***Editor's Note:*** *Two Department faculty, Shireen Adenwalla and Peter Dowben, are part of a team of UNL researchers associated with the Center for Materials Research and Analysis (CMRA) who have patented a novel small-scale neutron detection device based on boron carbide semiconductor technology. This is the university's press release on their achievement.*

A highly sensitive, hand-held neutron detection device developed by UNL researchers could be used for locating hidden nuclear materials, monitoring nuclear weapons storage and other national security applications.

The detector, built around a boron-carbide semiconductor diode smaller than a dime, can detect neutrons emitted by the materials that fuel nuclear weapons.

"This is a leapfrog technology in neutron detection," said **Peter Dowben,** UNL physicist who was the first to fabricate a boron carbide semiconductor. Using Dowben's boron carbide semiconductors, the research team built a detector about the size of a Lego block that is much more efficient, lighter and tougher than existing detectors.

"This device is very small, it can be powered with small batteries or even solar cells, and it can withstand corrosion and extremely high temperatures," said mechanical engineer Brian Robertson.

Five patents are held by UNL or are pending on the device itself and on the processes for producing the semi-conductors. The team is continuing to refine the device, focusing on improving its efficiency and reliability, and is exploring commercialization with a Lincoln-based engineering company.

"The materials used to make the device are fairly inexpensive and there are manufacturers here in Nebraska with the technology to produce these detectors right now," Dowben said.

Development of the detector was funded largely through the Nebraska Research Initiative, a state-funded competitive grants program.

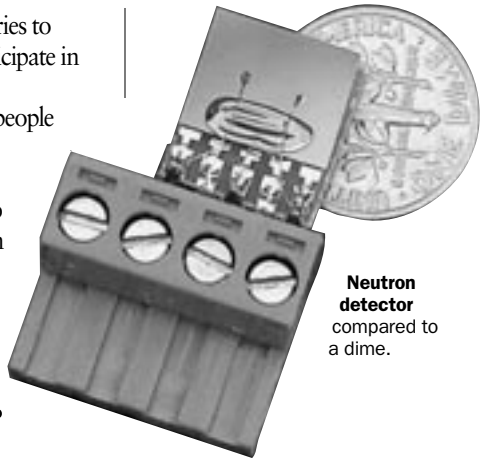
"This is a story of how the state's investment in research can lead to technology that benefits Nebraskans and the nation," said Prem Paul, UNL Vice Chancellor for Research.

The detector has applications beyond national security, said physicist **Shireen Adenwalla.** NASA wants a low-mass, thin device like this for their comet landers, which measure the hydrogen content of comets. It also has uses in experimental medical radiation treatments for cancer and for "scattering" experiments performed in basic neutron research.

The research team, all affiliated with UNL's Center for Materials Research Analysis, includes Robertson, Adenwalla, Dowben and chemical engineer Jennifer Brand.

Robertson presented a scientific paper on the device at a meeting in July of the International Society for Optical Engineering, generating intense interest and invitations from U.S. national laboratories and European laboratories to present results and participate in research programs.

"This is something people have been trying to do for more than 38 years and haven't been able to accomplish," Robertson said. "We have invented this device and it works very, very well." ■



**Neutron detector** compared to a dime.

# Nobel Laureate Wieman Kicks Off UNL's Project Fulcrum's Second Year

Nobel Prize-winning physicist Carl Wieman spoke to UNL students and Lincoln Public Schools teachers on Aug. 21, 2002 at the University of Nebraska–Lincoln in an address that kicked off the second year of UNL's Project Fulcrum.

**Carl Wieman**

Project Fulcrum is a collaboration between teachers, scientists and teacher educators. Graduate and undergraduate science students from the University of Nebraska partner with teachers in LPS elementary and middle schools to improve science and math education. The National Science Foundation-funded program is coordinated at UNL by **Diandra Leslie-Pelecky,** Associate Professor of Physics and Astronomy, and Gayle Buck, Assistant Professor of Curriculum and Instruction.

Wieman, who is a Distinguished Professor of Physics at the University of Colorado–Boulder, shared the 2001 Nobel Prize in physics with Eric Cornell, also of the University of Colorado, and Wolfgang Ketterle of MIT for the first observations of Bose-Einstein condensation (BEC) in a dilute atomic gas. BEC, predicted by Albert Einstein in 1924, is the dramatic transformation of a gas at a sufficiently low temperature. To observe Bose-Einstein condensation, Wieman and his team in 1995 cooled a gas sample to the unprecedented temperature of less than 100 billionths of a degree Celsius above absolute zero.

"The BEC state is a novel form of matter in which a large number of atoms lose their individual identities and behave as a single quantum entity, the 'superatom,'" Wieman said. "This entity is the atom analogue to laser light, and although large enough to be easily seen and manipulated, exhibits the nonintuitive quantum behavior normally important only at much tinier size scales."

In addition to providing an outstanding introduction to BEC for teachers and students, Wieman showed "applets" — web-based programs that provide visual explanations and demonstrations of physics concepts — that he uses to help non-science students understand BEC and the physics surrounding it. Last year, Professor Wieman was one of six scientists in the country to be awarded the first National Science Foundation Director's Award for Distinguished Teaching Scholars. This is the highest honor bestowed by the National Science Foundation for excellence in undergraduate education and research.

Although the Project Fulcrum teachers and graduate students found the explanation of BEC fascinating, they were also impressed by the contagious enthusiasm Wieman has for scientific research.

Wieman discussed more recent experiments that show that the condensate can be "poked," collapse in on itself, and then explode — acting on a microscopic scale in much the same way a supernova does on a large scale. His group dubbed this the "Bose-nova." Shocking the condensate can make it vacillate between acting like an atom and acting like a molecule, or several atoms linked together.

"We're seeing things right now that nobody understands," he told the group. "That's how science progresses... studying strange, unexplained behavior. If you're a physicist, this should sound very strange and disturbing — all of which makes it precisely the kind of material that intrigues scientists."

Wieman showed a number of pictures of the ceremony surrounding his receipt of the Nobel Prize. Since 2001 was the centennial of the Nobel Prize, all of the living Nobel Prize winners were invited to the ceremony. Wieman emphasized the importance of Project Fulcrum's focus on upper elementary and middle school students by noting that most Nobel Prize-winners decided on their careers in their middle school years.

The presentation was followed by a reception, during which Wieman spoke with graduate students and teachers. ■

Carl Wieman, winner of the Nobel Prize in Physics in 2001, speaks with UNL and LPS students and teachers.

# Jack Loos Retires After More Than Thirty Years of Service

BY ROGER D. KIRBY/
DEPARTMENT CHAIRMAN

Jack Loos, an invaluable member of the Instrument Shop staff, retired in December 2002 after more than 30 years with the Department.

Jack joined the Physics and Astronomy Instrument Shop in November, 1970 as an Instrument Maker/Machinist. Over the years, Jack was promoted to the rank of Instrument Maker III.

Following Don Fuehring's death in 1992, Jack was promoted to the position of Shop Manager. He was exceedingly effective in this position. He earned the respect of the other Instrument Shop staff, and he worked very well with faculty and graduate students. Faculty found him to be extremely helpful during the design phase of the instrument fabrication process, where his extensive knowledge and experience led to improved designs and simplified construction techniques.

Jack Loos

Jack was Shop Manager during the period when the Physics and Astronomy Instrument Shop and the Chemistry Instrument Shop were merged into a combined unit. This was a difficult period for the Instrument Shop staff because of concerns about how well a combined shop would serve the very different needs of two Departments. Jack managed the merger very well, and it moved forward with few glitches. We now have an excellent Instrument Shop which continues to make very significant contributions to the research and education efforts of both the Department of Physics and Astronomy and the Department of Chemistry.

Jack and his wife Sharon are enjoying the new level of freedom brought about by Jack's retirement, and we wish them both well in this new phase of their lives. ■

# Nobel Laureate Cronin Receives Honorary Degree

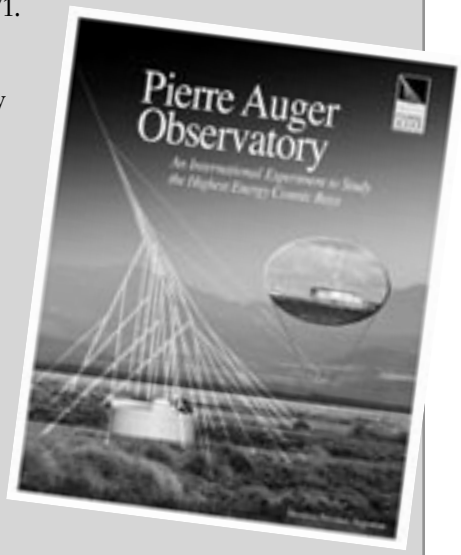
James W. Cronin

James W. Cronin, who shared the 1980 Nobel Prize in physics, was awarded an honorary doctor of science degree at the UNL commencement exercises held May 10, 2003. He also gave the commencement address to the approximately 2,100 graduates in the Bob Devaney Sports Center. UNL Chancellor Harvey Perlman presided.

Cronin is a world leader in ultrahigh-energy cosmic-ray astrophysics. He recently returned from western Argentina, where he and over 200 scientists from 15 countries are building the $50 million Pierre Auger Observatory, the world's largest cosmic ray experiment, to discover the sources of ultra-high energy cosmic rays.

Cosmic rays are particles that bombard the Earth from all directions, and the origin of the highest-energy cosmic rays is one of the most puzzling questions in astrophysics today. Closer to home, Cronin also donated the particle detectors from his previous cosmic ray experiment, the Chicago Air Shower Array, for use in UNL's Cosmic Ray Observatory Project (CROP), which is managed by **Dan Claes** and **Greg Snow.** In this unique education and outreach effort, teams of high-school teachers and students across Nebraska are presently using Cronin's equipment to detect cosmic rays that reach their schools. In the Pierre Auger Observatory in Argentina, Snow serves as the task leader for education, outreach, and public relations activities in the experiment.

Now an emeritus faculty member at the University of Chicago, Cronin shared the Nobel Prize in 1980 with physicist Val Fitch for work the two did at Brookhaven National Laboratory while the two were on the faculty at Princeton University. The pair described CP Violation in the K-meson system, a phenomenon that may explain why the universe is mostly matter rather than equal parts matter and antimatter. (Fitch, a native Nebraskan, was awarded an honorary doctorate by UNL in 1994.) Cronin left Princeton for the University of Chicago in 1971.




Snow was Cronin's host during his visit to UNL. During the afternoon of May 9th, 2003, the day before the graduation ceremonies, Snow organized an informal reception for Cronin in the Department. Brace 211 was filled nearly to capacity with faculty, students, and visitors. Cronin gave a brief slide show on the Pierre Auger Observatory, following which Cronin and the members of the audience engaged in a lively question and answer session that extended for over an hour.

Cronin earned his B.S. degree from Southern Methodist University (1951), and his M.S. (1953) and Ph.D. (1955) degrees from the University of Chicago. He is a Fellow of the American Association for the Advancement of Science and the American Physical Society and a member of the National Academy of Sciences. ■

# Claes, Leslie-Pelecky, Batelaan, Doudin Promoted

During the past two academic years four Department faculty have been promoted with tenure. Effective during the 2002-2003 academic year, Assistant Professors **Daniel Claes** and **Diandra Leslie-Pelecky** were promoted to the rank of Associate Professor with tenure. Effective during the 2003-2004 academic year, Assistant Professors **Herman Batelaan** and **Bernard Doudin** were promoted to the rank of Associate Professor with tenure. In what follows we profile each of these newly promoted faculty.

**Claes** is an experimental high energy physicist engaged in the D0 (pronounced "D-zero") experiment at Fermi National Accelerator Laboratory. He has been designated the Coordinator for the Level-3 software trigger upgrade at D0. This is a position of significant responsibility and importance to the overall project, and involves the supervision of about 30 scientists and technicians. Claes has published 133 peer-reviewed articles in leading physics journals, with 73 of these articles being published after he joined our faculty. Claes' research is funded by the National Science Foundation and has emphasized the search for new particles expected in supersymmetry (SUSY), which is an extension of the so-called Standard Model of particle physics. Claes is also the co-leader of the NSF-funded *Cosmic Ray Observatory Project* (CROP). The aim of CROP is to develop an expanding set of high-school teams who construct, implement, and operate their school-based detectors in coordination with UNL's HEP group. During its first four summers of operation, CROP has provided summer workshops for nearly 100 students and teachers from more than 20 Nebraska high schools; detectors and associated electronics are now in various stages of operation at these schools. Ultimately, at least 30 high schools will be involved in CROP (and possibly many more, depending on the availability of funding beyond the fifth year). Claes has also proven to be an effective teacher, both at the introductory and graduate levels.

**Leslie-Pelecky** is an experimental condensed matter physicist working with nanostructured magnetic materials fabricated by mechanical milling and inert gas condensation. She is author or co-author of more than 30 peer-reviewed journal articles. She has received substantial research funding from the National Science Foundation (including a prestigious CAREER award), the Office of Naval Research, and the Petroleum Research Fund of the American Chemical Society, and has in addition several collaborative grants from other federal agencies. Her recent emphasis has been on the development of magnetic nanoparticles for biomedical applications such as drug delivery and hyperthermia treatment of cancer. Leslie-Pelecky also co-directs *Project Fulcrum*, an NSF-funded outreach program that seeks to improve science and mathematics education in Lincoln Public Schools. *Project Fulcrum* employs 10 Graduate Fellows annually to serve as resource scientists at elementary and middle schools. Fulcrum Fellows form partnerships with teachers to develop math and science activities for the classroom, help with Science Fairs and after school Science Clubs, and help students learn about scientists and what they do. Fellows learn about the challenges of science and math instruction in public schools, with the hope that Fellows continue to be active in this area throughout their careers. Leslie-Pelecky is also responsible for the development of a physics course targeted at future teachers.

Daniel Claes

Diandra Leslie-Pelecky

Herman Batelaan

Bernard Doudin

**Batelaan** is an experimental atomic physicist with interests in matter waves, electron physics, and quantum information technologies. He is author of more than 20 articles in leading physics journals. In a very short time, Batelaan has established himself as a leader in his field through two major accomplishments: The observation of the Kapitza-Dirac effect for free electrons in a laser standing wave, and the elucidation of the Stern-Gerlach effect for free electrons in a longitudinal B-field gradient. His paper on the Kapitza-Dirac effect, published in *Nature*, received international attention, with subsequent articles about it appearing in major newspapers and popular science magazines. His work on the Stern-Gerlach effect dispelled an old idea that observing the Stern-Gerlach effect on electron spins was impossible. Batelaan has received research funding from the National Science Foundation, the Army Research Office, the Research Corporation, and the Nebraska Research Initiative. He is an excellent teacher at all levels, and he has been especially effective in promoting the mentoring of undergraduates in research. Batelaan has also played a significant role in the Department's efforts to improve instruction at the introductory level through the introduction of modern technologies in the large lecture classroom.

**Doudin** is an experimental condensed matter physicist interested in nanoscale wires and junctions. His research is focused on the general area of spin transport, an emerging field which has much room to develop and grow, and he has published in excess of 60 peer-reviewed journal articles. He was a pioneer in producing and investigating the physical properties of nanometer scale wires produced by electrodeposition. Nanowires, junctions between nanowires, and nanocontacts show a number of interesting transport and memory phenomena that are expected to play major roles in the continued development of nanotechnology. Doudin's research has been extremely well supported by several individual investigator and collaborative grants from the National Science Foundation (including a prestigious CAREER award), the Office of Naval Research, and the Nebraska Research Initiative. He is also a leading participant in the Department's recently funded centers, the NSF MRSEC and the Keck Center for Mesospin and Quantum Information Systems. Doudin has contributed significantly to the Department's instructional programs through a complete revision of our undergraduate electronics laboratory. He has introduced modern computer-based measurements to this laboratory and has worked to see that it provides the proper background for subsequent laboratory courses. ■

Tim Gay gives the football a toss in the outdoor physics classroom of UNL's Memorial Stadium.

**IN THE SPOTLIGHT**

# Gay's Football Physics Lessons to Be Viewed Internationally

BY KELLY BARTLING/
UNIVERSITY COMMUNICATIONS

***Editor's Note:*** *Since Fall 1999, Professor Tim Gay has taught the largest physics class in the world — the 74,000 fans that attend Nebraska home football games in Memorial Stadium. During a pause in the action, Gay's lessons are shown on the giant television screens at either end of the field. They range in length from forty-five seconds to two minutes, and cover such topics as Newton's Laws of Motion (blocking and tackling), projectile motion (kicking and punting), kinematics (open-field running), and the ideal gas law (why not fill the football with helium to get better hang time?).*

*Laboratory demonstrations have featured Professor Gay being tackled by a 370 pound lineman, pummeled with a sledgehammer as he lies on a bed of nails, and learning the finer points of passing from Heisman trophy winner Eric Crouch. Gay's work has been featured on ABC World News Tonight with Peter Jennings, a front page story in the Wall Street Journal (11-19-02), People Magazine, ESPN Magazine, the Boston Globe, the Washington Post, and a variety of other television and radio outlets. Gay is currently writing a book — The Physics of Football — that is scheduled to be released in Fall 2004. Its target audience is high school students and football fans of all ages. (His lessons can be viewed on the Web:* ***http://physics.unl.edu/outreach/football.html****)*

*In 2001 Gay was retained by the National Football League to create a series of segments for international distribution. The following story is reprinted from the August 29, 2002 UNL news release on this development.*

The bow tie, broad grin and enthusiasm of physics professor **Tim Gay** will soon be seen a bit more widely than just the 74,000 football fans at Memorial Stadium.

Gay's "Physics of Football" lessons will be seen by millions of foreign NFL fans internationally on a National Football League promotional program called "Blast!"

Gay, the professor made famous by HuskerVision for explaining football physics on the big screen during home games, traveled in early July 2002 to Philadelphia to co-write and appear in 21 football physics segments filmed at NFL Films studios.

"It was a lot of fun, and very educational for me, to see how they do it in the 'big leagues,'" Gay said. "They had about 50 people working on this shoot, and we spent several frantic days of writing and filming."

"Blast!" is a promotional program by the NFL shown outside the United States to market American football to new audiences. It appears in 190 countries and features interviews, profiles and informational pieces for international audiences. Gay said the Physics of Football segments would be three to four minutes long and include interviews with NFL stars. They are fashioned and written in the entertaining and informative style of the HuskerVision pieces, and in fact, Gay recycled most of the HuskerVision topics for use by the Blast! program.

Gay was co-writer, technical consultant and standup talent for the lead-ins and for voice-overs.

"We cover all the football physics topics: blocking, tackling, kicking, fumbling, timing … you name it," Gay said. "They pretty much wrote the scripts and then I made sure the physics was right. I was very impressed at how much better they could make it sound than what I was able to do. The writing was a very dynamic process; we holed up in a windowless room and screamed at each other for two days.

Tim Gay, center, with Brad Minerd (left) and Matt Miller, producers at NFL Films.

"I introduce each piece on the set, standing in front of a blackboard in a classroom at a local Philadelphia college. They had done interviews with players and found footage and I do a voice-over and then end each piece. They did all the player interviews back in June after I gave them questions to ask."

Gay said he was disappointed that he didn't actually get to interview the players in the segments, like Ahman Green, Tiki Barber, Hugh Douglas, Jeff Garcia and Donovan McNabb.

He was excited, though, to get a bunch of free suits. And bow ties.

"The best thing was that they went out and spent, like, $10,000 on suits for me. They returned the rest, and I got to keep the ones I wore. That was cool. And I got four bow ties out of the deal."

> "I'm extremely excited for Tim and for the University of Nebraska that of all the thousands of physics professors out there, they chose Dr. Gay. We might have had a small part in finding and creating the thing, but it's Tim and his personality and his knowledge of physics that have been the key reason for the popularity of the feature."
>
> — JEFF SCHMAHL, HUSKERVISION DIRECTOR

**Roger Kirby**, Chair of the Physics and Astronomy Department, said the program helps bring the good news of the University to an international audience.

"More of the world will have heard of the University of Nebraska in another year or so," he said. "Football Physics has already led to significant media coverage, including articles in *Scientific American for Kids*, *The Chronicle of Higher Education*, *The Christian Science Monitor*, and the *Philadelphia Inquirer*, as well as interviews with the BBC, the Canadian Discovery Channel and numerous other radio and television stations. Several other universities, including the Universities of Tennessee, Virginia, and Michigan have started their own Football Physics series."

Gay said it's possible that the Football Physics segments could be shown in the United States in the future, because many "Blast!" segments are shown on ESPN and HBO after their original use. Gay also negotiated free use of the segments in university classrooms and in Memorial Stadium.

Jeff Schmahl, HuskerVision director, said NFL Films is the most respected production group in sports, and that it was an honor to have them pick up on his idea.

"I'm extremely excited for Tim and for the University of Nebraska that of all the thousands of physics professors out there, they chose Dr. Gay. We might have had a small part in finding and creating the thing, but it's Tim and his personality and his knowledge of physics that have been the key reason for the popularity of the feature. He's just got the personality to make these things click. That's really terrific for a University of Nebraska professor to be involved with them, and to have their pieces go before millions." ■

Hanging out near the beam line at Fermilab during the 2002 SPS Chicago Road Trip are (front row left to right): Nancy Lanning, tour guide, Ray Lemoine (2002 SPS President), Brad Peterson, Katie Everett (2003 SPS President and niece of Nancy Lanning), Tim Gay; (back row left to right): Chad Petersen (2001 SPS President), Elizabeth Klimek, Gary Pike, and Luke Pawlowski.

## Annual Road Trip Becomes SPS Tradition

Among the annual activities of the Department's Chapter of the Society of Physics Students (SPS), one is becoming a tradition: the Spring Break Road Trip. For the past 7 years, typically over the weekend preceding the week-long Spring Break, the SPS, accompanied their advisor, Professor **Tim Gay,** have traveled to visit various physics laboratories located within a day's drive from Lincoln. These labs have included the superconducting LINAC at the J.R. MacDonald Laboratory at Kansas State University, the Joint Institute for Laboratory Astrophysics (JILA) at the University of Colorado in Boulder, the National Institute of Standards and Technology (NIST), also in Boulder, and Fermilab, just west of Chicago. They have also toured the Museum of Science and Industry and the Adler Planetarium in Chicago.

The SPS group's size has varied between five and fifteen. Typically, they leave Lincoln by van after classes on Friday, arriving at their destination late that night. Saturday and Sunday mornings are spent touring, and everybody heads back to Nebraska Sunday afternoon. Highlights of the various trips have been numerous and varied. They included a 1999 "insiders tour" of the D0 experiment at Fermilab, led by the then SPS President, **Jennifer Webster,** who had worked the previous summer on that experiment with UNL Professor **Greg Snow.** At JILA in 2001, they got the complete tour (including brownies) from Carl Weiman, five months before he won the Nobel Prize for his observation, along with Eric Cornell, of Bose-Einstein condensation in an atomic vapor. On that same visit, Dave Wineland gave them the cook's tour of the time and frequency laser labs at NIST, and **Chris Greene** (B.S. 1976), a Professor at CU, welcomed them as only a Nebraska alum can. Other notable events have included a high speed blow-out on I-80 returning last year from Boulder, and an attempt by Prof. Gay to park a 2.5 m tall van in a 2.4 m tall parking garage on Chicago's North Michigan Avenue. ■

# Guess Who? Speaks at 2002 Recognition Luncheon

Breaking tradition, the Department did not announce beforehand the Department alumnus scheduled to speak at its May 9th, 2002 Recognition Luncheon in honor of the Department's graduating students. The program simply showed the speaker's portrait photograph, reproduced here. Can you guess who this is?

**Who is this alum?**

The suspense ended when Roger Kirby, Department Chair, ushered our beloved Professor Emeritus **Theodore Prey Jorgensen** (B.A. 1928, M.A. 1930) into the room. (The photograph is from the 1930s.) Everyone knows, of course, that Ted Jorgensen, after doing his undergraduate and master's level work at UNL, received his Ph.D. from Harvard, and worked on the Manhattan Project in Los Alamos.

They know that while there, besides doing physics, he cooked Chinese meals for some of the most famous physicists of the 20th Century. After the war he joined the faculty at the University of Nebraska, built a Cockcroft-Walton accelerator with his students, and, together with the other atomic physics faculty he helped recruit, established a world-class atomic collisions program here.

Many alumni recall with fondness the courses he taught and the insights he gave them, not only about physics but also about life and how to live it. More recently, Ted has become famous as the author of the all-time best selling book published by the American Institute of Physics, *The Physics of Golf*.

In speaking to our 2002 graduates, however, Ted related more personal experiences, not all well known, about how he was educated and began to forge a career, driven always by curiosity about how Nature works. He was raised in rural South Dakota. His mother had received master's degrees in English and Mathematics at UNL in the 1890s. In his early years, she taught Ted at home and, in particular, introduced him to mathematics. When he was ready for college, he and a friend drove by motorcycle to Lincoln to register at UNL. He related how the roads they traveled on were unfit for motorcycles, but they managed to arrive by the last day to register. However, he was turned away by the registrar because Sorum High School (in Sorum, S.D.) was not on the university's list of accredited schools. Luckily he was able to take a competency exam (the Army's Alpha Test) and was then allowed to register.

Ted's friend registered in the Engineering College, but Ted could not afford the required

**GUESS WHO?**
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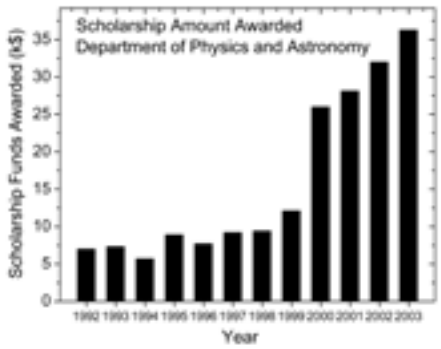
# Department Scholarship Funds Increase Fivefold

The Department recognizes that the cost of attending college is increasing at a significant rate, and we have been concerned that many capable students are finding it more difficult to afford UNL. Thus, we have made a concerted effort to increase the number and amounts of the scholarships that we offer. Thanks especially to the generosity of our alumni and faculty, the amount of scholarship funds available to our best students has increased by about a factor of five in the past eight years, as shown in the adjacent figure.

During the early- to mid-nineties, the Department awarded approximately $7,000 in scholarships annually to about eight students. During each of the past two years, the Department has awarded more than $30,000 to about 20 students. The Physics and Astronomy Alumni Scholarship Fund was set up as an endowment fund in the mid-1980s (by then Chair Anthony Starace) so that the value of gifts from alumni and friends would increase with time. It now generates enough income annually to provide a substantial scholarship. Other "named" scholarships specifically for physics and astronomy students have been established through substantial donations from individuals. They are:

**— John E. Almy Scholarship:** Given by Amy C. Almy, the wife of John E. Almy (M.S. 1897), in 1944 to commemorate her husband's life and achievements as professor of physics at UNL for the period 1900 to 1942. The scholarship "shall be awarded to a student pursuing work in the Department of Physics providing said student has satisfactorily completed one academic year of college work and further providing that said student displays marked ability and promise of success."




**— Henry H. Marvin Memorial Scholarship:** Established in 1954 by Mrs. Henry H. Marvin, whose husband was from 1919 to 1952 a professor of physics in the Department. "Recipients of the scholarships shall be regularly enrolled undergraduate students at UNL who have proven their ability to do satisfactory college work and who are worthy of financial assistance, but in the selection of the recipients preference should be given to those majoring in physics."

**— Elbridge and Mary Stowell Scholarship Fund:** Established in 1999 by the estate of Elbridge (M.S. 1923) and Mary Stowell, to assist deserving UNL physics students.

**— Banti and Mela Ram Jaswal Scholarship:** Established in 2000 by Professor Sitaram Jaswal and his wife Alice in honor of his parents Banti and Mela Ram Jaswal, to assist deserving UNL physics students.

**— Kurt Meyer Physics Scholarship:** Established in 2002 by alumnus Kurt Meyer (B.S. 1988), to assist deserving UNL physics students.

**— The Cheunjit Katkanant Memorial Scholarship Fund:** Established in 2002 by alumnus Vanvilai Katkanant (M.S. 1979, Ph.D. 1983) in honor of her mother Cheunjit Katkanant, to assist deserving UNL physics students. Dr. Katkanant has the distinction of being the first woman to be awarded a Ph.D. from our Department. She is currently Chair of the Physics Department at California State University–Fresno

**— The Elizabeth Anne, Stephan M. and Robert M. Eddy Scholarship Fund:** Established in 2003 by alumnus Stephan M. Eddy (B.S. 1978) in honor of his wife Elizabeth and his father Robert, to assist deserving UNL physics students. ■

**GUESS WHO?**
continued from page 14

slide rule, so he registered in the Arts and Sciences College, "where a slide rule was not required, and registered in courses that had no laboratory fees." He was still forced to take courses in beginning algebra and trigonometry, even though he had already learned these subjects from his mother. By doing well in these subjects, however, he was able to establish himself in the Mathematics Department. Ted related how Professor Gaba of the Mathematics Department had a conversation while at lunch one day with Professor Scott of the English Department about the incoming freshman class.

> "[His] message to our graduates was summed up in a phrase his mother often used: 'You can thank your lucky stars that....' He admitted that when he entered the university, 'I had no idea what I was getting into.' But he implied to our graduates that things would work out for them as they had for him."

Scott was of the opinion that some were of low quality and even "impossible"; Gaba rebutted that some were truly excellent. After a while, Gaba and Scott realized they had in mind the same student, Ted.

Ted's message to our graduates was summed up in a phrase his mother often used: "You can thank your lucky stars that...." It expressed the thought that it often seems that one's life depends on so many chance influences and yet things seem to work out for the best. He admitted that when he entered the university, "I had no idea what I was getting into." But he implied to our graduates that things would work out for them as they had for him. ■

*[Editor's note: Ted Jorgensen's speech at our 2002 Recognition Luncheon was based on his informal autobiography, "An Autobiography: The Adventures of a Physicist (July 2002; unpublished).]*

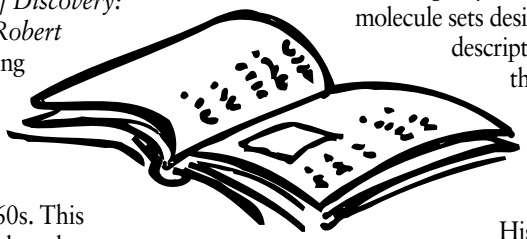
# Brief Notes

- Associate Professor **Herman Batelaan** has won the 2003 Outstanding Young Scientist Award of the UNL Chapter of Sigma Xi, the Scientific Research Society. Batelaan's group achieved international recognition in 2001, when it became the first to observe the Kapitza-Dirac effect (electron diffraction from a standing wave of light). This observation was widely reported and discussed (e.g., see the January 2002 issue of *Physics Today*). The group recently demonstrated the ability to stop polarized light (see page 6 of this issue of *Spectrum*). In addition to doing cutting edge experiments, Herman is also a ranked badminton player who competes regularly in local and Midwest tournaments.

- The work of Professor **Sy-Hwang Liou,** George Holmes University Professor **David J. Sellmyer,** and Research Associate Professor **Ralph Skomski** has been highlighted in the January 2002 issue of *Photonics Spectra*, a leading trade journal. Liou, Sellmyer, and Skomski reported in the October 2001 issue of *Applied Physics Letters* a unique nanofabrication technique that has considerable potential for enhancing information storage densities in magnetic media. They showed that patterned magnetic media, in which each bit comprises several magnetic grains, are more stable against thermal fluctuations than individual magnetic grains. This result makes possible reliable magnetic storage of bits (of information) on a denser scale. *Photonics Spectra* selected this advance as a significant research achievement in the section "Technology World."

- The work of Assistant Professor **Cornelis (Kees) Uiterwaal** and coworkers was selected for discussion in the section "Editor's Choice" of the 18 January 2002 issue of *Science*. Uiterwaal and coworkers reported in *Physical Review Letters* **88**, 023001(2002) that short laser pulses having a broad frequency spectrum that pass through a gas of toluene molecules can shatter the molecules. More intense laser pulses having a narrower frequency spread left the molecules intact. The authors conclude that broad frequency pulses are able to stimulate the carbon-carbon bonds in the molecule so that the backbone framework of the molecule shatters. One of Uiterwaal's coworkers, Bernd Witzel, of the University of Freiburg, Germany, has been a frequent visitor to UNL since Kees joined our faculty. In 2004 Witzel will move to Canada, where he will be an associate professor in the physics department at Université Laval in Québec. This move may facilitate continued collaborations.

- Professor **Robert Fuller's** book, *A Love of Discovery: Science Education, The Second Career of Robert Karplus*, was published by Plenum Publishing Corporation in January 2002. Robert Karplus, a professor of physics at the University of California, Berkeley, USA, became a leader in the movement to reform elementary school science in the 1960s. This book selects the enduring aspects of his work and presents them for the scientists and science educators of today. It tries to capture the essence of his life and work and presents selections of his published articles in a helpful context. It includes also essays on the impact of his work by former colleagues and students.



Bob Fuller is another of the leaders in the effort to transform the teaching of physics by employing active learning methods. Fuller is a Fellow of the American Physical Society, has served in 1980 as President of the American Association of Physics Teachers (AAPT), and has received numerous accolades and awards throughout his career. In particular, he won the AAPT's Robert A. Millikan Medal for outstanding contributions to the teaching of physics in 1992, won the University of Nebraska's Outstanding Teaching and Instructional Creativity Award in 1993, and was named to UNL's Academy of Distinguished Teachers in 1995.

- Professor **Timothy Gay** served as content consultant for the NETCHE-produced CD-ROM *Physics of Light*. NETCHE is the Nebraska Educational Television Council for Higher Education, a consortium of postsecondary institutions devoted to the improvement of teaching and learning. The CD-ROM introduces the properties of light to those with little or no background in science or math. Its lessons include interactive demos and video clips addressing reflection, refraction, and color of light.

- Research carried out jointly by Professor and Department Vice Chairman **Stephen Ducharme** and Russian Academy of Sciences member and UNL Adjunct Professor **Vladimir M. Fridkin** was featured at a noteworthy physics event in Moscow in November 2001. The occasion was the 1,700$^{th}$ and final session of Vitaly L. Ginzburg's celebrated "All-Moscow Seminar on Theoretical Physics" in the I.E. Tamm Theory Department of the Lebedev Physical Institute of the Russian Academy of Sciences. Academician Ginzburg, 85, has made seminal contributions to solid state physics, astrophysics, and nuclear physics, for which he was awarded the 2001 Nobel Prize in physics. At this event Fridkin presented a report of the "First Experimental Observation of Intrinsic Landau-Ginzburg Switching," which is among the many results of Fridkin and Ducharme's 11 year long collaboration. (Landau-Ginzburg switching concerns the time for reversing the polarization direction in a ferroelectric material due to intrinsic interactions, without the influences of defects or domain wall motion.)

- Emeritus Professor **Gordon A. Gallup's** book, *Valence Bond Methods: Theory and Applications*, was published in July 2002 by Cambridge University Press. The book presents ab initio valence bond theory, which is one of two commonly used methods in molecular quantum mechanics. (The other is molecular orbital theory.) The book is split into two parts. Part I gives simple examples of two-electron calculations and the necessary theory to extend these to larger systems. Part II gives a set of case studies of related molecule sets designed to show the nature of the valence bond description of molecular structure. It also highlights the stability of this description to varying basis sets. Since retiring from the Chemistry Department, Gallup has taken up residence within the Physics Department's AMO group in the sub-basement of Behlen Lab. His research concerns elastic and inelastic electron scattering from molecules, dissociative attachment of polyatomic molecules, and scattering of polarized electrons from chiral molecules. He has collaborated with Professors **Paul Burrow** and **Ilya Fabrikant** on a number of research publications in these areas.


Department graduate students Christina Othon (left) and Anthony Caruso (middle) together with University of Nebraska Medical Center graduate student Cerise Elliot. Othon and Elliot were co-winners of Sigma Xi's graduate student paper competition; Caruso received an Honorable Mention. Photo is taken in Caruso's lab.

- Graduate student **Christina Othon** was a co-winner in the UNL Chapter of Sigma Xi's Graduate Student Poster Competition in April 2002; graduate student **Anthony Caruso** received an Honorable Mention. Othon is working with Professor **Stephen Ducharme** on ferroelectric polymer Langmuir-Blodgett films; Caruso is working with Professor **Peter Dowben** on nonmetal to metal transitions at surfaces. Prior to becoming Department Vice Chairman, Steve Ducharme organized the annual Sigma Xi graduate student poster competitions. In the September-October 2002 issue, page 486, of Sigma Xi's magazine, *American Scientist*, Ducharme is quoted extensively regarding how the UNL chapter supports graduate student research.

- Graduate students in Professor **Peter Dowben's** group have received much national recognition recently. **Bo Xu** (Ph.D. 2002), whose thesis was on "Interfaces with Polymers," was a 2002 semifinalist for the American Vacuum Society's (AVS's) Morton Traum Surface Science Division Student Award. **Rui-Hua Cheng** (Ph.D. 2002), whose thesis was on "Surface and Interface Properties of $CrO_2$ Thin Films," in 2002 won an AVS Dorothy and Earl S. Hoffman travel grant and was a semifinalist for the AVS's Falicov Award. **Hae-Kyung Jeong** won the 2001 Outstanding Student Presentation Award at the 36th Annual Midwest Regional Meeting of the American chemical Society, won the AVS's 2002 Graduate Research Award, and won a 2002 AVS Dorothy and Earl S. Hoffman travel grant. Jeong's awards were based on her research on unoccupied surface states of molybdenum [specifically MO (112)].

- Graduate student **Tikhon Bykov** (Ph. D. 2003) was selected by the College of Arts and Sciences Faculty Instructional Development Committee as one of three recipients for a 2003 Arts and Sciences Graduate Research Assistant Award. Bykov received his award at the annual Arts and Sciences Alumni Awards Banquet in April 2003. Dean Richard Hoffmann wrote to Bykov, "It is people like you who make it possible for the University to shine..." Bykov carried out his doctoral research on computational and theoretical studies of liquids in the group of **Xiao Cheng Zeng,** Willa Cather Professor of Chemistry and Adjunct Professor of Physics.

- Research Assistant Professor **Kevin M. Lee** and Professor **Edward G. Schmidt,** Associate Dean of Arts and Sciences, organized the third annual UNL High School Astronomy Camp, held 13-19 July 2003. **Marilyn McDowell** provided administrative support. The camp, designed for high school students, focused on astrobiology, addressing questions such as whether other stars have planets, what are the conditions necessary for life, where should one look for evidence of life, etc. Campers attended classes during the day and participated in hands-on observation projects at night. Students used various facilities, including the UNL student observatory (with its 16 inch telescope and CCD detector), Behlen Observatory in Mead, NE (with its 30 inch telescope and CCD detector as well as four 8 inch telescopes), the Minnich solar telescope in Ferguson Hall (with its filter allowing safe viewing of the Sun), and the Ralph Mueller planetarium in Morrill Hall.

Ring nebula photo taken by 2003 Astronomy Camp students.

The campers took many images of various astronomical objects (e.g., see the photo of the ring nebula shown here); for other images, see the Camp's web site: ***http://astro.unl.edu.*** The Astronomy Camp is co-sponsored by the UNL Center for Science, Mathematics, and Computer Education, the Johnson Space Center, and the NASA Nebraska Space Grant.

- Amateur astronomer **Bob Linderholm** of Cambridge, NE has named asteroid 19294 after Emeritus Professor **John Weymouth.** The asteroid was discovered on 6 August 1996 by Linderholm at Lime Creek Observatory. The orbital parameters of the asteroid and a visualization of its orbit can be seen on NASA's Near Earth Object web site (***http://neo.jpl.nasa.gov/cgi-bin/db_shm?sstr=Weymouth***). John Weymouth retired from the Department in 1989, but has continued to carry out geophysical surveys of archeological sites around the world. In 1997 he received the Fryxell Award of the Society for American Archaeology "for making geophysical techniques an indispensable part" of archaeological research. Among the techniques he employed at archaeological sites and for which he was cited are proton magnetometry, electrical resistivity, ground penetrating radar, and chemical surveying. ■


Group photograph of the reunion attendees. Professor Jorgensen is seated third from the left in the first row.

**IN THE SPOTLIGHT**

# Graduate Student Alumni from '50s, '60s Have Reunion

Old alumni never die; they just have reunions! So, why not physics alumni, too? **Bruce Anspaugh** (Ph.D. 1965) and **Chester Sautter** (Ph.D. 1964) decided that it would be fun to get the alums together who did research on Ted Jorgensen's Cockroft-Walton ion accelerator back in the 1950s and 60s. Since **Eugene Rudd** (Ph.D. 1962) was still at the University, they contacted him to help arrange it. It was decided to include other former grad students from that era. So on May 19, 2003 twenty alums and fourteen wives gathered in Brace Lab. Three came from as far away as California and others from New Mexico, Arizona, Washington, North Carolina and Maryland, just to mention the most distant places.

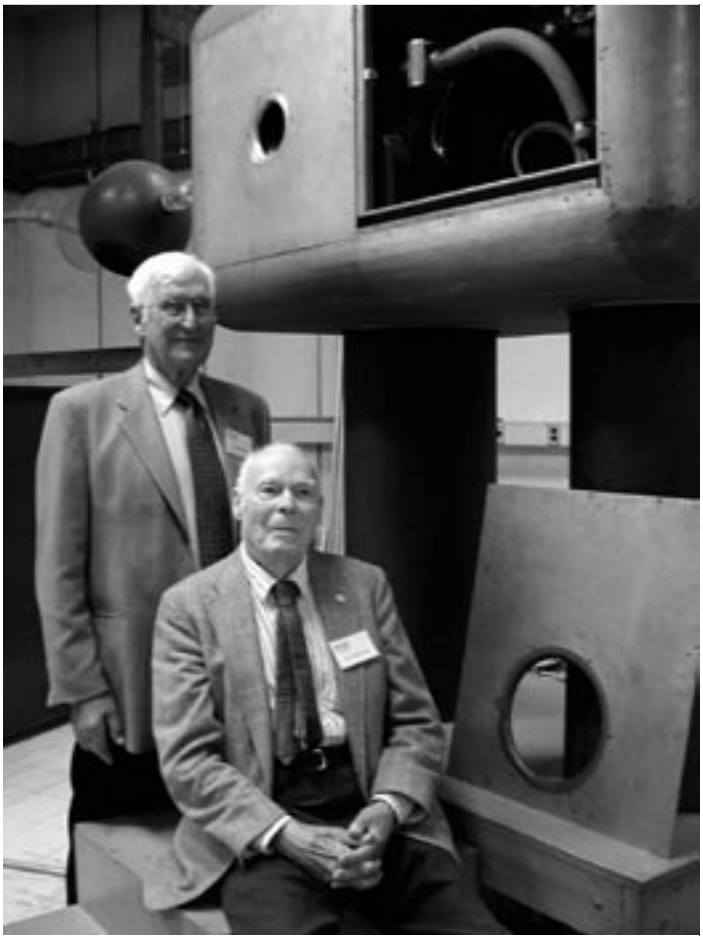
Thanks to Department Chair **Roger Kirby,** incidental expenses such as secretarial assistance and refreshments were provided by the Department. Roger also gave a talk to the group on the present and future of the Department and conducted a tour of some of the research laboratories. And, of course, we also visited the old

accelerator. It is still in use but slated for demolition before the year is out. An evening reception at the Kirby's home provided an opportunity to meet current faculty members.

Although the chief activities for the two-day meeting were conversations with old friends and viewing old photographs, there were two additional talks. Eugene described the early history of the Department and also conducted a tour of the Department museum, where several alums found familiar pieces of apparatus from years past.

But the highlight for many was a talk by 97-year old **Ted Jorgensen** about the beginnings of the atomic physics program at Nebraska. He expanded the scope of his talk by telling about his youth on a farm in South Dakota, his early education in a school operated by his mother, and his later work on the physics of golf that resulted in a best-selling book.

Frisbee players Chet Sautter, Wayne Lang, Don Lorents, John Park, and Eugene Rudd had to stop and rest up.



Charles Cook with Professor Jorgensen. The accelerator in the background was built about 1950 by the two of them, Emerson Jones (another student), and the Department machinist, John Heiser.

During our student days we would often relax during the noon hour by playing a round of Frisbee golf using a course consisting of various landmarks on the campus near Brace Lab. So naturally we scheduled a Frisbee golf tournament during the reunion. Most of the old landmarks had disappeared but some new ones were found and after we limbered up our stiff, old throwing arms and adjusted our sights, we made it around the course. Some of the young students walking by were surprised to see a group of old geezers out on the lawn throwing Frisbees! The winner of the prize (a copy of the Department history book) was Bruce Anspaugh. He did so well that some grumbled that he must have been practicing all those years.

Since most of the alums had not seen each other for 40 years, there was a lot of catching up to do. There seemed to be agreement that it was a great idea and that we shouldn't wait another 40 years for the next reunion! ■

## Al-Omari Wins Shoman Award

**Imaddin Al-Omari** (Ph.D. 1996) was named the recipient of the 2003 Abdul Hameed Shoman Award for Young Arab Scientists in the field of physics. There were 129 applicants from 17 Arab countries competing for awards in 6 fields. The award includes a $10,000 stipend.

**Imaddin Al-Omari**

Al-Omari carried out his doctoral studies at UNL under the supervision of Professor **David J. Sellmyer**. He is currently an assistant professor of physics at Sultan Qaboos University in the Sultanate of Oman. His research is focused on Mössbauer spectroscopy and magnetic properties of materials.

The Award for Young Arab Scientists is given annually by the Abdul Hameed Shoman Foundation of Amman, Jordan, to young scholars who are teaching and/or doing research at a university or research institute located in an Arab country. The awardees must have demonstrated exceptionally significant achievements in scientific research. Al-Omari received the award in Amman in March 2003. ■

*Research Contributions in Cancer Detection, Optical Engineering recognized*

# 'Million-Dollar Professor' Richards-Kortum Wins 2004 Sharon Keillor Award

**Rebecca Richards-Kortum** (B.S. 1985 with Highest Distinction) has been selected to receive the 2004 Sharon Keillor Award for Women in Engineering Education by the American Society for Engineering Education (ASEE).

Rebecca Richards-Kortum

The award, which carries a $2,000 honorarium, cites Richards-Kortum for her seminal research contributions in cancer detection and optical engineering, as well as her teaching and mentorship. This recent recognition follows upon her selection in 2002 by the Howard Hughes Medical Institute as one of only 20 research scientists to receive $1 million each to develop programs that will attempt to bridge the gap between the classroom and the laboratory, thereby enriching undergraduate education. Richards-Kortum is using these funds to develop courses for undergraduates in her research specialty, biomedical engineering. Together with her colleagues and collaborators she is also developing — with support of the Hughes grant — clinical engineering internships in biomedical imaging for biomedical engineering majors; the interns apply biomedical imaging technologies to problems in human health.

Rebecca Richards-Kortum is the Cockrell Family Chair and Distinguished Teaching Professor in Biomedical Engineering at the University of Texas–Austin. Her research seeks to identify cancer in very early stages, when the disease can be more effectively treated. She specializes in the development and use of laser spectroscopy for diagnosing diseases in human tissue, specifically early stage cancers in the cervix, head, and neck. Her work on screening for cervical cancer has been highlighted in the April 2004 issue of *Technology Review* (p. 24). The traditional current screening method (i.e., the Pap smear) has a high rate of false positives, leading to an unnecessarily high number of costly and painful biopsies. Together with collaborators, Richards-Kortum has developed a pencil-sized probe that shines ultraviolet and visible light onto the cervix; pre-cancerous cells fluoresce at these wavelengths. The technology could be ready for Food and Drug Administration approval by next year.

Richards-Kortum was greatly stimulated by doing undergraduate research in the condensed matter physics group of Professor **David J. Sellmyer** at UNL. Initially her sights were set on becoming a high school mathematics teacher. However, the experience in a research lab changed her life. She decided to focus on research that would have an immediate impact on humanity. When she heard about the field of biomedical engineering, she knew that was the field for her.

She received her Ph.D. in Medical Physics in 1990 from MIT and has received numerous recognitions for her research and teaching since then, including an NSF Presidential Young Investigator Award (1991), the Becton Dickinson Career Achievement Award of the Association for the Advancement of Medical Instrumentation (1992), the University of Nebraska Outstanding Young Alumni Achievement Award (1994), and the Y.C. Fung Young Investigator Award of the Bioengineering Division of the American Society of Mechanical Engineers (1999). As a Howard Hughes Medical Institute Professor, she hopes to give undergraduates the same early exposure to research that influenced her own career. ■

# Dedication Earns Reed 2003 APS Wheatley Award

**Kennedy Reed** (Ph.D. 1978) received the 2003 John Wheatley Award of the American Physical Society (APS). The purpose of the Wheatley Award is "to honor and recognize the dedication of physicists who have made contributions to the development of physics in countries of the third world. It was established in 1991 with support of the APS Forum on International Physics. Reed, a physicist in the Physics and Advanced Technologies Division at Lawrence Livermore National Laboratory (LLNL), was selected for the award for his "multifaceted contributions to the promotion of physics research and education in Africa." The citation praises Reed "for developing agreements for exchange of faculty and students between USA and African institutions, for organizing and conducting international workshops and conferences on physics in Africa, and for advocating increased USA and international involvement with physics in Africa."

Kennedy Reed

Kennedy Reed did his doctoral research at UNL in theoretical atomic physics under the direction of Professor **Joseph Macek**. He has over 100 scientific publications. His research has focused on atomic collisions in high temperature plasmas, and has contributed to the understanding of electron-impact excitation and ionization of highly charged ions. At LLNL, Reed is also director of the Research Collaborations Program for Historically Black Colleges and Universities and Minority Institutions.

Reed is a Fellow of the APS and has served as President of the National Society of Black Physicists. He has been active in the programs of the International Center for Theoretical Physics in Trieste, Italy. He has served as Vice Chair of the APS Committee on International Science Affairs. He is a co-founder of the National Physical Science Consortium Graduate Fellowship Program for women and minorities.

Reed has been a visiting scientist at numerous universities including the University of Dakar in Senegal and the University of Cape Coast in Ghana. ■

# Moore Leads ADAPT Workshop in Chile

**Christopher J. Moore** (M.S. 1992) presented a workshop on "College Teaching and the Development of Reasoning" to more than 30 faculty at the Universidad de Tarapacá in Arica, Chile during 14–15 November 2002. Moore's invitation stemmed from the interest of the faculty at the University of Tarapacá to initiate a multidisciplinary program for college students patterned after the successful ADAPT (Accent for Developing Advanced Processes of Thought) program developed and taught at the University of Nebraska under the leadership of Professor **Robert Fuller** from 1975–1997. Moore worked with Fuller in the ADAPT program and also helped develop materials for undergraduate hands-on multimedia physics laboratories.

The ADAPT program provided an environment for college freshmen to develop cognitive reasoning patterns based on the work of Jean Piaget (a Swiss cognitive psychologist who studied the phases and processes of intellectual development in children and young adults) and Dr. Robert Karplus (a physicist at the University of California–Berkeley who used Piaget's ideas to develop the learning cycle method to teach reasoning skills to students in science classes). Upon receiving the request for such a workshop from the faculty at Tarapacá University, Fuller suggested that it would be most appropriate for Moore to present the workshop as he had lived and been raised in Chile.

During the workshop, for which Moore translated all materials into Spanish, participants took part in active learning activities that examined how students reason. They also learned methods for developing student cognitive skills, and how to incorporate these into college teaching. Faculty participants included the Dean of Education and Humanities, the Director of the Education department, and professors from over 8 different disciplines including anthropology, physics, biology, math, and linguistics.

Moore is currently the Educational Outreach Coordinator at the Synchrotron Radiation Center of the University of Wisconsin–Madison. On November 16, 2002, before returning to Wisconsin, Moore gave a lecture to the faculty of the Universidad Arturo Prat in Iquique, Chile on why it is important for college students to develop formal reasoning. The faculty expressed an interest in having a similar ADAPT workshop presented at their university. ■

Christopher J. Moore lectures in Iquique, Chile

# Debra Fickler Speaks at Recognition Luncheon

**Debra J. Fickler (formerly Cleveland)** (B.S. 1988) spoke on May 8th, 2003 at the Department's Recognition Luncheon, held annually to honor Department graduates. Fickler is currently an intellectual property lawyer, dealing primarily with patents, trademarks, copyrights, etc. She is in private practice living and working just outside Chicago.

**Debra J. Fickler (formerly Cleveland)**

The title of her address was "Physics and Everyday Life," in which she discussed how physics has influenced her career and contributes to her avocation (drag racing). She related how physics was the only subject in which she did not have a grade of "A" in high school. A serious gymnastics accident that led to much time in hospitals had her thinking of pursuing nursing as a career. Thus she entered UNL as a biology major. She credits Professor **Paul Burrow,** who taught Physics 141 for Life Science students, and the Department's strong laboratory courses with influencing her to become a physics major.

Upon graduation from UNL, Fickler went to work for McDonnell Aircraft Company in St. Louis, where she worked in the engineering department on non-destructive materials testing. She was the only one in her group without an engineering degree.

She was involved with using ultrasound, holographic imaging, x-ray imaging, and both electrical and magnetic methods to test various materials (such as, e.g., graphite, plastics, and advanced metals) that are used in aircraft. Among the aircraft she tested for damage from takeoffs and landings were the F-4 Phantom, the F-5 Eagle, the F/A-18 Hornet, and the AV-8B Harrier. For example, she was involved with testing the trailing edge flap of the F/A-18 Hornet, which is a carrier-based jet. She noted to graduates that whereas science is "pure," engineering requires one to think outside the box to analyze real-world situations using the science one knows.

Fickler became involved in a marketing project, which led McDonnell to send her to the University of Montana to study intellectual property law. She found the study of law intellectually challenging. She was a member of the University of Montana's Trial Advocacy Team that won (in its category) the American Trial Lawyer Association's national championship. She returned to St. Louis to continue working for McDonnell, finishing her law degree at the University of St. Louis. Upon getting her degree, she took an internship in environmental engineering with the U.S. Justice Department.

While Fickler's current profession is law, her passion is drag racing. She races herself. She also takes great interest in the technology and physics that make for winning race cars. She specializes in intellectual property related to high performance automobiles. She and her husband Kyle are involved with a company called Aeromotive, Inc. that makes components for race cars and also sponsors race cars. Debra is also a Board Member and General Counsel to the Drag Racing Association of Women (DRAW). Among her other accomplishments, Debra was named Miss South Dakota in the 1984 Miss America Pageant. She and her husband became parents on 31 December 2003 with the birth of a girl, Danika Carrera. ■

# Backhaus Cited Among Top 100 Young Innovators

**Scott Backhaus** (B.S. 1990) was selected by *Technology Review* as one of 100 Top Young Innovators for his invention of a novel, high-efficiency engine powered by sound waves. Backhaus's work was described on p. 102 of the October 2003 issue as part of a feature on the TR100, "*Technology Review*'s latest selection of 100 brilliant young innovators whose vision and hard work are shaping our future."

Backhaus is currently a member of the technical staff in the Condensed Matter and Thermal Physics Group at Los Alamos National Laboratory.

Scott Backhaus

Backhaus joined Los Alamos National Laboratory (LANL) in 1998, holding a prestigious Director's Postdoctoral Fellowship. He worked in the group of another alumnus, **Gregory W. Swift** (B.S. 1974 with High Distinction). When Scott started at LANL, thermoacoustic energies were too inefficient for useful applications. The principle of the engine is to use heat to produce sound waves that can then do useful work. The material medium used is helium gas inside a pipe. Scott developed a feedback loop that increased the efficiency of the engine dramatically, making the device practical for use as a chiller (or refrigerator). Backhaus and Swift published a report on their 30% efficient thermo acoustic engine with a kilowatt of acoustic power output in the May 27, 1999 issue of *Nature*. In October 2003, Swift and Backhaus filed a patent on the principle of the device. Already some industrial companies have taken an interest in commercializing the engines for use in liquefying natural gas, thereby making it easier to transport to end users. ■

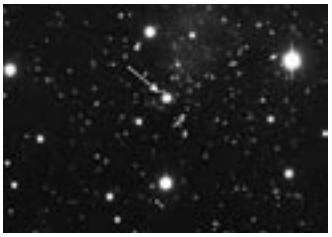
# Schneider Recognized for Scientific Impact in Space Science

**Donald P. Schneider** (B.S. 1976) has been recognized for his scientific impact over the past two decades by the Institute for Scientific Information (ISI), which monitors scientific citations worldwide. Schneider was listed as one of 249 "highly cited" researchers from 14 nations in the area of space science based upon the number of times their work has been cited in scientific papers published since 1981.

Donald P. Schneider

Schneider is a professor in the Department of Astronomy and Astrophysics at Pennsylvania State University. He is also the Chairman of the Quasar Science Group of the Sloan Digital Sky Survey, a large international effort that aims to observe 100,000 quasars, measure distances to a million galaxies, and produce a digital map of the sky. Schneider has published over 240 scientific papers.

At a January 2003 meeting of the American Astronomical Society, Schneider's research team announced the discovery of 3 of the 4 most distant quasars known, including the most distant one. (Quasars — or "quasi stellar objects" — are unusually bright and distant galaxies; their intense light is emitted by matter falling into massive black holes at their centers.) Distant quasars inform scientists about conditions in the early universe as well as about how galaxies are formed. Quasars also help scientists study dark matter, which is increasingly thought to play a large role in the evolution of the Universe. At the time the ambitious goals of the Sloan Survey were announced, astronomers had only discovered about 6,000 quasars. As of January 2003, the survey had discovered over 15,000 new quasars, thus silencing skeptics, who initially scoffed at the ambitious goal of finding 100,000 new quasars. The discoveries announced in January 2003 were subsequently published in the April 2003 issue of *The Astrophysical Journal*.



An arrow indicates a distant quasar in the Ground-based Image taken by the Wiyn Telescope, Kitt Peak National Observatory, Arizona

Schneider is a native of Heartwell, Nebraska and graduated from Minden H.S. in 1973 in the same class as Doug Kristensen, who is now Chancellor of the University of Nebraska at Kearney. Schneider majored in both mathematics and physics at UNL and received his Ph.D. in 1982 at California Institute of Technology.

Following a research fellow appointment at Cal Tech, in 1985 he took a research position at the Institute for Advanced Study in Princeton, NJ before joining the faculty at Penn State in 1994. Schneider received a University of Nebraska College of Arts and Sciences Senior Alumnus Award in April 2002 for his many scientific achievements. ■

## Sun Awarded Lindbergh Certificate of Merit

**Zhenhua Sun** (M.S. 1997, Ph.D. 1999 with High Distinction) was awarded a Certificate of Merit by the Charles A. and Anne Morrow Lindbergh Foundation for his research project on "Developing Biodegradable Film Polymers using Modified Starch." Sun is a postdoctoral research associate working in the group of Professor Ya Jane Wang in the Food Science Department at the University of Arkansas in Fayetteville. Sun's research project addresses the environmental problem of polymer waste (i.e., one-time use polymers) that is overwhelming available landfills. Sun's focus is on the development of biodegradable polymer materials that can degrade completely in less than a year when buried in soil. (Nondegradable polymers take several decades to break down.) This work will lessen dependence on petroleum products and provide economic benefits to farmers, especially those producing corn.

The Lindbergh Foundation awards Certificates of Merit to unfunded projects that are deemed worthy of special recognition. It is hoped that this recognition will result in funding by other sources. In the 2001 competition, out of 168 applications, 10 received funding and 3 received Certificates of Merit. The Lindbergh Foundation is located in Anoka, MN. Its focus is on furthering a balance between technological advancement and environmental preservation. ■

# We Heard That…

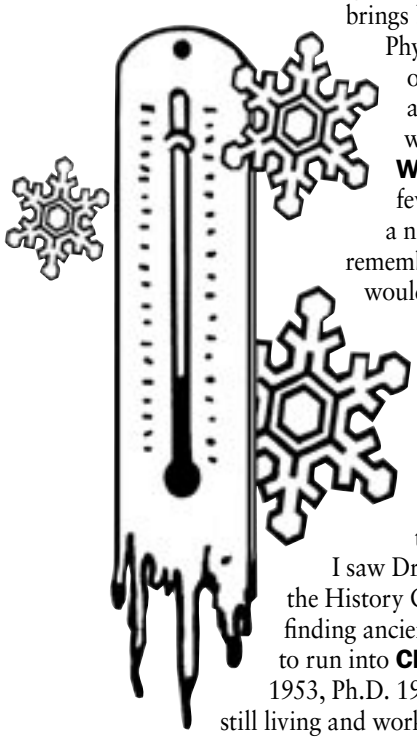
- **Alston, Steven G.** (M.S. 1979, Ph.D. 1982), 1703 20th St. NW, East Grand Forks, MN 56721 is Dean of Academic Affairs at Northland College in East Grand Forks, MN. He previously was Dean of the School of Natural and Social Sciences at Wayne State College in Wayne, NE.

- **Angel, Gordon** (Former Postdoctoral Research Associate) 3 Sunset Rd., Salem MA 01970 is a Senior Scientist working for Varian Semiconductor Equipment Associates, Inc. (VSEA). VSEA designs, manufactures, and services semiconductor processing equipment used in the fabrication of integrated circuits. Gordon and his wife, Lorraine, attended the 2003 ICPEAC meeting in Stockholm, Sweden, at which Gordon represented VSEA. Email: ***Gordon.angel@vsea.com***

- **Bao, Minqi** (M.S. 1992, Ph.D. 1995), 548 Tarter Ct., San Jose, CA 95136 has enrolled part-time in the M.B.A. program at the University of California–Berkeley's Haas School of Business. He continues working for Platform Computing, which sells the most comprehensive "desktop to supercomputer" grid software solutions for managing IT resources. MinQi and his wife, Jing Jin, have a two-year-old daughter, Adelaide. Email: ***mqbao@yahoo.com***

- **Bass, Robert J.** (B.S. 1985), 102 Windsor Ct., Coeur d'Alene, ID 83815, is teaching physics, mathematics and computer science at Coeur d'Alene Charter Academy in northern Idaho, where he is the Chairman of the Mathematics Department.

- **Bryan, Blaine** (B.S. 1960 ) wrote to Roger Kirby on 4 October 2002 of his recollections of some of our faculty and alumni: "The mention [in a message from Kirby] of **Dr. Pearlstein** brings back a lot of memories of the Physics Dept. I recall in the middle of winter (with temperatures about zero or below and the wind howling away) Drs. **Weymouth** and Pearlstein and a few others would go to coffee at a nearby restaurant. The picture I remember was hilarious. Dr.Weymouth would be bundled up from head to foot and Dr. Pearlstein would be wearing, at most, his regular clothes, a sport coat, and a pair of gloves. If it were REALLY cold he might actually don a pair of earmuffs! It's good to hear that he is still around. I think I saw Dr. Weymouth not long ago on the History Channel — something about finding ancient civilizations. Also, I used to run into **Chris Kuyatt** (M.S. 1952, MA 1953, Ph.D. 1960) occasionally while he was still living and working at the National Bureau of Standards — now called the National Institute of Standards and Technology. I was working in the Standards and Calibration Laboratory here at the Kennedy Space Center at the time. Chris was a Ph.D. candidate while I was working in the Physics Dept.; he was a really great guy. I get back to Nebraska every few years to a family reunion. I haven't been there long enough to visit the UNL campus, however… I am presently retired and my wife still works. However, I may have to go back to work if the stock market keeps going down." Email: ***bbryan2@cfl.rr.com***



- **Cerny, Richard** A. (B.S. 1968)12 Military Rd., Worcester, MA 01609-1627 is President and CEO of Telecast Fiber Systems, Inc., the world's leading manufacturer of fiber optic systems for radio and television broadcast production.

- **Chopra, Dev R.** (M.S. 1960), 19138 Dove Creek Drive, Tampa, FL 33647, is Regents Professor of Physics at Texas A&M University–Commerce.

- **Gao, Bo** (M.S. 1986, Ph.D. 1989), 7153 Finchley Ct., Toledo, OH 43617 has been promoted to Associate Professor with tenure in the Department of Physics and Astronomy of the University of Toledo. He recently took a sabbatical leave at the National Institute of Standards and Technology in Gaithersburg, MD working with the quantum processes group on the theory of cold atom collisions. Email: ***bgao@physics.utoledo.edu***; Web page: ***http://bgaowww.physics.utoledo.edu/***

- **Gray, David M.** (B.S. 1977), 47678 Woolcott Square, Sterling, VA 20165, is with American Management Systems developing multimedia training programs for clients' software applications.

- **Heeger, Alan J.** (B.S. 1957), 1042 Las Alturas Rd., Santa Barbara, CA 93103-1608 was recently elected to the National Academy of Engineering.

- **Jacobs, Loyd D.** (M.S. 1958), 2004 128 Avenue SE, Bellevue, WA 98005-3916.

- **Keifer, David W.** (B.S. 1968), 12 Princeton Ave., Hopewell, NJ 08525, works at FMC Corporation.

- **Keim, Chris P.** (M.S. 1932, Ph.D. Chemistry/Physics 1940), 360 Laboratory Rd #300, Oak Ridge, TN 37830-6847 is in excellent health and enjoying retirement in Oak Ridge, TN. He retired from Oak Ridge National Laboratories in the late 1960s, but has held a variety of consulting positions since then. He remembers fondly his days as Director of the Stable Isotopes Division at ORNL, and also his early life as a student in Nebraska.

- **Kelton, Phillip W.** (B.S. 1970), 5713 Marilyn Dr, Austin, TX 78757-4420 is the Assistant Director of the McDonald Observatory of the University of Texas.

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continued on page 24

**WE HEARD THAT**
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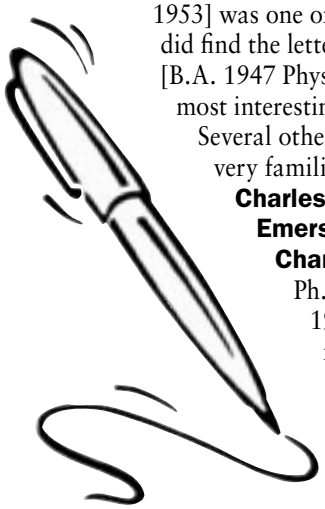
- **Kemeny, Peter** (Former Postdoctoral Research Associate), Unit 2, 59A Pakington Street, St. Kilda, Victoria 3182, Australia, is self-employed.

- **Lang, Wayne W.** (Ph.D. 1964), 222 Lambeth Walk, Fairview, NC 28730 recently retired as Professor of Computer Science at the University of North Carolina–Asheville. He now gives three day workshops on computer hardware design for Xilinx Corporation.

- **Lockard, Ronald J.** (B.S. 1965), 720 Brookside Dr., Lincoln, NE 68528-1019 is Chairman and CEO of Transaction Applications Group (in Lincoln, NE), which provides support for the insurance industry. Prior to founding TAG, Ron was Assistant Director of Computing Services at the University of Nebraska.

- **Liu, Chien-Nan** (M.S. 1995, Ph.D. 1999) is an Assistant Professor of Physics at Fu Jen Catholic University, 510 Chung Cheng Rd, Hsinchuang, Taipei Hsien 24205 Taiwan, Republic of China. Email: ***cnliu@mails.fju.edu.tw***

- **Lugn, Alvin** L. Jr. (MA 1950) 1234 "K" St., Apt C4, Lincoln, NE 68508, wrote on 16 August 2002 about an omission in the Winter 2002 issue of *Spectrum*: "I have just received the latest issue of Spectrum. Since Dr. **T.T. [Theodore Townsend] Smith** [former faculty member in the Dept. from 1919–1953] was one of my teachers in the department, I did find the letter from **Andy [Andrew N.] Smith** [B.A. 1947 Physics/Math with High Distinction] most interesting. I was …acquainted with Andy. Several other names mentioned by Andy were very familiar, too. I knew and well remember **Charles J. Cook** [M.A. 1950, Ph.D. 1953], **Emerson Jones** [Ph.D. 1953], and **Charles B. Ackerman** [ M.A.1950, Ph.D. 1954]. **Bob Chambers** [B.A. 1944 Chemistry/Physics] is an old friend and a Lincoln H.S. classmate, whom I have visited with in Lincoln several times in recent years at LHS Class of 1940 reunions. So also was the late …Dick Sill [who died in an airplane crash in Reno in 1980] an old …friend and a schoolmate …at LHS. I guess the primary reason for responding …is to point out an error of omission in Andy's letter. **R.C. Sill** is identified with the degrees (B.A. 1945, M.A. 1950). As I am sure you know, Dick also earned his Ph.D. in physics at Nebraska …under the direction of Dr. **Adam S. Skapsi** [faculty member in the Dept. from 1948–1953], in the field of solid state physics. It might also be mentioned in passing that Adam Skapsi was himself a very interesting (even somewhat colorful) member of the physics department staff at that time."



*Editor's note: The error mentioned is not the fault of Andy Smith, but of the editor, who routinely adds degree and/or position information to alumni and faculty names that are mentioned in letters such as this one. Lugn is correct; R.C. Sill did receive the Ph.D. degree from our department in 1954. R.C. Sill was probably a faculty member at the University of Nevada–Reno at some point following his graduation from UNL, according to Roger Kirby. Also, prior to joining UNL in 1948, Skapsi was a scientific staff member at the James Franck Institute for Metals at the University of Chicago; he left UNL in 1953 to join the University of Vermont. Prior to WWII, Skapsi had had a distinguished career as a faculty member at the Jagiellonian University in Crakow, where he organized and headed the Institute for Physics and Chemistry of Metals. But after capture by Russians, slave labor in Siberia, and service for the Polish government in exile in London, he emigrated to the U.S.A. at the end of WWII. Further information on Skapsi may be found in M.E. Rudd's book,* Science on the Great Plains *(University of Nebraska Studies No. 71, Lincoln, 1992).*

- **Lund, Christina** (B.S. 2000), 6022 S Drexel Ave, Apt 112, Chicago, IL 60637-2635 received an M.S. degree in Medical Physics from the University of Chicago and is now job hunting.

- **Maeda, Kaichi** (Ph.D. 1960), 402-27-21-3 Shimizu Minami-ku, Fukuoka 815-0031, Japan.

- **McAvoy-Rybnicek, Tara** (M.S. 1997) is working on ion implantation technologies for ABB Semiconductors, 3 Fabrikstrasse, CH-5600 Lenzburg, Switzerland.

- **Moberg, Robert** (Former Postdoctoral Research Associate) is a Sales and Business Development Manager with Gammadata Scienta AB, P.O. Box 15120, SE-750 15 Uppsala, Sweden. Gammadata Scienta is a leading supplier of high-resolution spectroscopy equipment, including ultra high resolution electron spectrometers and X-ray emission spectrometers. Robert represented Gammadata at the 2003 ICPEAC meeting in Stockholm, Sweden. Email: ***Robert.moberg@gammadata.se***

- **Niva, Gordon D.** (M.S. 1975, Ph.D. 1979) has been working for the Missile Defense National Team Systems (NDNTS) in Arlington VA on "temporary assignment" since January 2002. His wife, Susan, is an Army Reserve Pharmacy Officer who was ordered to active duty for Operation Iraqi Freedom and assigned to Walter Reed Hospital. They invite friends and colleagues to visit when in the Washington, D.C. area. Tel.: (703) 861-1321.

- **Otnes, Robert K.** (B.A. math/astronomy 1953; M.S. math/physics 1958), 2160 Middlefield Rd., Palo Alto CA 94301 is the Editor of the *Journal of the Oughtred Society*, which is dedicated to the history and collection of slide rules. In a letter dated 14 July 2002 he writes: "I obtained a Ph.D. in

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continued on page 24

**WE HEARD THAT**
continued from page 23

engineering from UCLA and co-authored a couple of books on time series, both now long out of print. Most of my career was spent in government work. While still doing some consulting, most of my time is now spent on the Oughtred Society and the writing of a booklet on small adding machines. I have an old, unpublished paper by one of the Keuffel family. It concerns the making of what they claim to be the first optical quality glass in the U.S. during the First World War." Email: ***botnes@pacbell.net***

- **Pareek, Prem N.** (M.S. 1980, Ph.D. 1983) is Director of Physics at The Kirklin Clinic at Acton Road, 2145 Elmer J. Bissell Rd, Birmingham AL 35243. Email: ***ppareek@uabmc.edu***

- **Pinkerton, Fred** (B.S. 1976) is now working on hydrogen storage technologies for General Motors. Previously his research concerned magnetic materials; he discovered the strong NdFeB permanent magnets, which are now used extensively in the automotive and other industries.

- **Schlegel, Mark O.** (B.S. 1987) 3209 Orient Fishtail Rd., Laurel MD 20724-2931.

- **Schmidt, James J.** (B.S. 1956, M.S. 1957), 187 Eastside Road, Deer Lodge, MT 59722

- **Serra, Efren** (M.S. 1994), 2520 Begonia Place, Santa Cruz, CA 95062 (Tel. 831-465-9604), is a software engineer with expertise in Sun Microsystem's Java language (specifically Java 2, Micro Edition or J2ME). He worked for Sun from 2000–2002 writing software for handheld devices such as cell phones and pocket PCs. In 2003 he joined Renesas Technology America, which was created to combine the U.S. resources of Mitsubishi Electric and Electronics and Hitachi Semiconductor. There he worked on software for electrically erasable, programmable read-only memory (EEPROM) devices. Then in 2004 he joined NanoAmp Solutions, Inc., which designs, manufactures, and markets low-voltage and ultra low-power memory solutions for the wireless communication, industrial control, medical and networking markets. He is currently a Senior J2ME Software Engineer with the company. Email: ***efren.serra@sbcglobal.net***

- **Shahabi, Siamuk** (M.S. 1977, Ph.D. 1983), 3442 Nappe Dr., Middleton, WI 53562-2372 is Chief Technical Editor & Managing Editor of Advanced Medical Publishing in Madison, WI. AMP provides publications in radiation oncology, diagnostic radiology, and related fields.

- **Shi, Xueying (Robin)** (M.S. 1987, Ph.D. 1992) survived a summer 2002 tornado in Massillon, OH. Her husband, Donghai Chen, ran upstairs to get her just as the house collapsed upon them. They both fell 2 floors during the collapse. He suffered a broken nose and collar bone; she escaped injury. Both Robin and Donghai returned to Lincoln in August 2002 to attend Gordon and Gay Gallup's 75th birthday celebration. (Chen did his doctoral research in chemistry with Gallup.)

## WE WANT TO HEAR FROM YOU!

You may send us your news by using the postcard included with the mailing of this newsletter. Alternatively, send your news to:

**Professor Roger D. Kirby, Chairman**
**Dept. of Physics & Astronomy**
**116 Brace Laboratory**
**The University of Nebraska–Lincoln**
**Lincoln, NE 68588-0111**

**Email: RKIRBY1@UNL.EDU**

**Simperman, Roy F.** (M.S. 1965), 5609 80th Avenue S.E., Mercer Island, WA 98040, is the chairman and chief executive of Semaphore Corp. in Seattle, Washington.

- **Stevenson, Roger** D. II (B.S. 1998), 1342 Locust St. #1416, Philadelphia, PA 19107 received an M.S. degree in Physics from the University of Pennsylvania and now is with the Memorial Sloan-Kettering Cancer Center in New York City.

- **Waldfried, Carlo** (Ph.D. 1998) is in the Advanced Technology Group at Axcelis Technologies, a semiconductor equipment supplier in Rockville, MD that provides semiconductor manufacturers with tools for ion implantation, rapid thermal processing, curing, and cleaning of semiconductor wafers. Waldfried's work is focused on advanced processing development, including removal of photoresists and residues from semiconductor wafers using plasmas and developing advanced curing techniques for dielectric materials using plasma and UV technologies. Carlo and his wife have a 4-year-old son, Alexander, and a nearly 2 year old daughter, Jessica.

- **Xu, Yuan-Guang** (M.S. 1997, Ph.D. 2001) is a postdoctoral research associate in the Radiation Oncology Department at Columbia-Presbyterian Medical Center in upper Manhattan, New York. In December 2001 he wrote about how the terrorist attack the prior September affected him: "…like everybody else here in New York, my life was certainly affected quite a bit by Bin Laden. I don't know to what extent people outside New York City can understand what the terrorist attack has brought to people here. My own experience is that I was highly stressed for a long time, feeling anxious, scared and being sensitive to any unusual sound and light, even at home and at the office…. I still have not gathered enough courage to take an airplane at this time." Yuan-Guang is currently applying for permanent positions in medical physics. Email: ***yx2010@columbia.edu***

- **Zeidler, James R.** (Ph.D. 1972), 11829 La Colina Road, San Diego, CA 92131, is a Research Scientist and Senior Lecturer with the Department of Electrical & Computer Engineering at the Universiy of California, San Diego. ■

*In Memorium*

# Department Stunned by Khuskivadze Death

One of the Department's most brilliant graduate students, **Amiran Khuskivadze** (Ph.D. 2004), was tragically killed in a horrific automobile accident on Interstate 80 near Wood River, NE on January 30th, 2004. Amiran's wife, Yelena Kosheleva, a graduate student in the Psychology Department, was critically injured and hospitalized for over one week in Grand Island. (She has since recuperated well from her physical traumas.) Amiran was on his way to Boulder, Colorado to interview for a postdoctoral position.

Amiran was born and raised in the Republic of Georgia and began his higher education at Tbilisi State University in Tbilisi. In Georgia he received numerous awards in various mathematics, physics, and computer science competitions. In 1994 his parents moved to Voronezh, Russia and Amiran transferred to Voronezh State University, where he received the B.S. degree in physics with a thesis on nuclear beta decay. He received the M.S. degree in physics with honors from Voronezh State University in 1998 with a thesis on the structure of light nuclear potentials based on the analysis of Bremsstrahlung radiation and nuclear photodisintegration. His thesis research was carried out under the supervision of the Head of Theoretical Physics, Professor I.V. Kopytin. At Voronezh State Univeristy, he held George Soros Foundation Fellowships. In 2000, Amiran was nearly ready to defend his Ph.D. thesis in nuclear physics, but instead took the opportunity to join the group of Professor **Ilya I. Fabrikant** at UNL to do research for a Ph.D. degree in theoretical atomic, molecular, and optical physics.

At UNL, Amiran continued to exceed expectations. Together with Fabrikant, he co-authored four papers in leading research journals on negative ion photodetachment processes and on molecular Rydberg states. He presented talks on this research at national and international conferences, including ones in Japan and in Sweden. What made Amiran exceptional was that he always sought to understand physical processes at a deep, fundamental level. He also minored in computer science and presented a talk at a national meeting on algorithms he developed together with Professor Alvin J. Surkan of the UNL Computer Science and Engineering Department. During the 2003–4 academic year, Amiran worked on plans for his future research in a postdoctoral position in a leading AMO group. Among his plans were new methods for treating atomic processes in the presence of external fields and also proposals for quantum computation with trapped neutral atoms.

Amiran's untimely death brought together literally scores of friends and colleagues, not only from the Physics and the Psychology Departments, but from throughout the University and even from outside the State. They came not only to mourn the loss of Amiran but also to support and comfort his wife. Amiran and

**Amiran Khuskivadze**

Lena had clearly brightened the lives of all who knew them. The AMO faculty also felt a professional loss: the loss of the scientific advances Amiran would have certainly made in AMO physics. As Amiran had essentially completed all requirements for the Ph.D. degree, the Department petitioned the Graduate College to award his degree posthumously. This request was approved. Amiran's diploma is scheduled to be received by his wife at the May 2004 graduation ceremonies. Ellen M. Weissinger, Executive Associate Dean for Graduate Studies, has also arranged a memorial luncheon for faculty, staff, friends, and relatives. ■

• ***George Anton Freund, Jr. (M.S. 1976, Ph.D. 1979)***

George Freund, Jr. died on 20 July 2002 as a result of a bicycle accident on Sunday, 14 July 2002. He, his wife, and friends were cycling on the Sammamish River Trail north of Redmond, Washington, when an oncoming cyclist lost control and crashed into Freund. Despite wearing a helmet, Freund was knocked unconscious and never recovered. Freund was a

**George A. Freund, Jr.**

Chief Engineer for Boeing and was transferred from Wichita to Seattle in 1990. He was a father of four: three sons and one daughter. His wife, Patricia, noted that "He was always reading, always researching and interested in all kinds of things, how things worked and why things happened." His family has established a scholarship in his memory at Loras College in Dubuque, IA, where Freund received his B.S. in physics in 1969 and from which his father, George Freund, Sr., retired in 1985 as Vice President for Advancement. At UNL, Freund did his thesis research on "Raman Scattering from Mixed-Crystal Layered Compounds" under the supervision of Professor **Roger Kirby,** who notes that Freund's thesis was "excellent," that "he was always excited about what he was doing," that "he especially enjoyed interacting with others," and that "I have heard from colleagues that George's work at Boeing on thermal emission signatures from jet engines was widely known and respected." Both Roger and Sue Kirby "remember with great fondness a wonderful dinner with George,

wife Pat, daughter Rachel, and mother-in-law Margaret Keefe (former Department Business Manager) at the Cornhusker Hotel a few months before George's passing. We will miss him greatly."

• *Howard H. Gatliff (Former Staff)*

Howard Gatliff, the Department's Electronics Shop Manager from 1967–1976, died on Saturday, 14 February 2004 in Lincoln. He was 92 and is survived by a son and a daughter. Gatliff taught at Milford Trade School prior to joining the Department. Professor Edgar Pearlstein recalls that "he believed in education beyond just what is specifically needed for a particular job." Consequently he taught the trade school students mathematics and science as well as electronics. At UNL, Professor **Duane Jaecks** recalls that Howard impressed one by his strong basic knowledge of electronics. When queried about how to solve an electronics problem for an experimental measurement, "he would sit with you…and analyze the problem in considerable detail, most often coming up with a solution."

• *Donald Clark Moore (B.A. with High Distinction 1942; Former Faculty)*

Donald C. Moore died on his 82nd birthday, 14 October 2002, of leukemia in Sequim, Washington. Born in Omaha, Moore spent most of his youth in Inman, Nebraska. At UNL he majored in both mathematics and physics. Following his undergraduate degree, he worked on the Manhattan Project and earned his Ph.D. degree in physics from the University of California at Berkeley. He was an Assistant Professor at Rensselaer Polytechnic Institute in Troy, NY before joining the physics faculty at UNL in 1948 as an Assistant Professor. At UNL, he carried out experimental work on the lifetime of positrons. This research was supported by the National Science Foundation. In 1953 he was appointed Acting Chair of the Department and in 1954 was promoted to Associate Professor. He resigned from the Department in December 1955 to join Schlumberger Well Services Corp. in Ridgefield, Connecticut. According to Professor Ed Pearlstein, who arrived shortly after Moore left, Moore was very well-liked by his faculty colleagues. In later life, Moore held a variety of positions with both educational institutions and industrial companies. These include serving as Dean of Housatonic Community College in Bridgeport, Connecticut and working for Bendix Field Engineering in Grand Junction, Colorado. He was also a Fulbright Fellow in San Luis, Argentina. He is survived by his wife, a son, and two daughters.

• *Thomas M. Stephen (M.S. 1982, Ph.D. 1988)*

Thomas Stephen, a former graduate student in the Department, died on Sunday 15 February 2004 from pneumonia, a complication stemming from cancer. He was an Associate Professor of Physics and Chair of the Physics Department at the University of Denver. At the University of Denver, Stephen's most recent research involved high resolution studies of nitrogen dioxide spectra using Fourier transform spectroscopy. At UNL Stephen did his doctoral thesis research on "An Electron Scattering Apparatus for Studies of Temporary Negative Ion Formation in Complex Molecules" under the supervision of Professor **Paul Burrow**. Burrow reports that Tom was one of the "most talented students I ever encountered." Burrow notes that while he was a graduate student, Stephen published three papers, "constructed the most complex electron scattering apparatus in the research group," and "managed to survive a bout with leukemia." Stephen is survived by his wife, Barbara, and his son and daughter. His twin brother, Buck (Joseph), also received his Ph.D. degree from UNL (in mathematics, under the supervision of Professor John Meakin; he is currently an Associate Professor of Mathematics at Northern Illinois University). Buck notes that his brother was "strong in character and resolve…[and that] his last hours were quiet and spent with family…"

**Thomas M. Stephen**

• *Glen M. Underhill (M.S. 1957, Ph.D. 1963)*

Glen Underhill, 78, died on Friday 28 November 2003 at his home in Riverdale, NE. Underhill graduated from McCook High School in 1942 and his B.S. in physics from the University of Nebraska at Kearney in 1955. Following his graduate work at UNL, he joined the physics faculty at the University of Nebraska at Kearney (UNK). He was also Director of the Planetarium at UNK. He retired in 1991. He also served as mayor of Riverdale, NE from 1978 to 2003. Survivors include his wife, two sons, and three daughters.

**Glen M. Underhill**

At UNL, Underhill did his doctoral thesis research on "A Study in Simple Models for the Be-9 Nucleus" under the supervision of Professor **Henry S. Valk.**

• *Maurice Witten (M.A. 1960)*

Maurice Witten, a former graduate student in the Department, died on 23 November 2002 in Colorado doing what his family says he loved most — skiing. He was nearly 71 years old. Born in Missouri in 1931, he served in the U.S. Air Force from 1950–53, whereupon he earned his B.S. in mathematics and science from Emporia State University in 1956. Following his M.S. degree from UNL in 1960, he joined the physics faculty of Fort Hays State University (FHSU) in Fort Hays, KS. He earned his Ph.D. degree from the University of Iowa in 1967 in science education. He served as Department Chair at FHSU from 1969–1989. He retired in 1998.

**Maurice Witten**

After retirement, Witten focused more than ever upon his skiing, which he had been doing for nearly 40 years. Upon turning 70 in 2001 he made it a personal goal to ski at all 24 Colorado ski resorts. As of February 2002 he had skied at 19, leaving only the 5 in Southwestern, Colorado. Fort Hays State University has renamed the Foucault pendulum in its Tomanek Hall in honor of Witten. Witten had donated the pendulum to FHSU anonymously. At the renaming ceremony, a member of the Kansas State Senate commended Witten for his many years of service in the Civil Air Patrol. Survivors include a son and two daughters ■

# Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 2001–31 October 2003. These contributions have been made in support of major items of capital equipment, an endowed professorship, graduate fellowships, undergraduate scholarships, and invited lectures as well as for unrestricted purposes. Those who have not been contacted by one of the University of Nebraska Foundation's telephone campaigns or who might be considering an additional tax-deductible gift to us should note that we have the following general accounts at the UN Foundation.

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**Vanvilai Katkanant** (M.S. 1979, Ph.D. 1983)
**Chris P. Keim** (M.S. 1932, Ph.D. Chemistry/Physics 1940)
**Rebecca Richards & Philip T. Kortum** (B.S. 1985)
**Byron Krauter** (B.S. 1976)
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**Donald C. Moore** (B.A. 1942)
**Jerry & Frances Ruckman** (B.S. 1962)
**M. Eugene & Eileen Rudd** (Ph.D. 1962)
**James J. Schmidt** (B.S. 1956, M.S. 1957)
**Theodore J. & Alice Schuldt, Jr.** (B.A. 1959, M.A. 1961)
**David J. & Catherine J. Sellmyer**
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**Joseph R. Steele** (B.S. 1988)
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*Thank you very much!*

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