Spectrum

a Newsletter for Alumni and Friends of the Department of Physics and Astronomy and the University of Nebraska-Lincoln

Winter 1996 Timothy Gay, Editor

Snow on the Top Quark Team

In February, 1995, two large experimental collaborations working at the Fermi National Accelerator Laboratory in Batavia, Illinois, announced the discovery of a fundamental building block of matter, the top quark. Associate Professor **Gregory Snow** is a member of one of these collaborations, called the DZERO Experiment. Analyzing data collected between 1992 and 1994, the two collaborations each observed a handful of instances where top quarks were produced among the debris of high energy proton-antiproton collisions at Fermilab's Tevatron Collider. The top quark is the sixth and most massive quark to be discovered. Quarks combine in pairs or triplets to form the category of elementary particles called hadrons – those particles which feel the strong nuclear force. Examples include protons, neutrons, and pi-mesons. A most intriguing aspect of the top quark discovery is that its mass has been measured to be at least 175 times that of the proton, which itself consists of three of the lighter quarks. The discovery of the top quark is considered a major step in our understanding of elementary particles, and the announcement of the discovery was received with wide acclaim throughout the science world.

Searching for the top quark has been the primary concern of Snow's DZERO experiment for several years. Since joining the collaboration in 1988, he has contributed to many aspects of the experiment ranging from the development and construction of part of the enormous DZERO detector to computer analysis of the data. After coming to UNL in 1993 to form a new research group in experimental high energy physics, Snow arranged for UNL to be an official collaborating institution in the DZERO project. Snow presently supervises a UNL graduate student who will earn his Ph.D. degree based on research at DZERO. The collaboration will continue to study the production and decay properties of the top quark as well as many other particle production processes for several years to come.

Professor Gregory Snow

Aylesworth Named APS Congressional Fellow

Kevin Aylesworth

The American Physical Society recently selected Kevin Aylesworth (M.S. '86, Ph.D. '89) as a 1995-1996 Congressional Fellow. Kevin is working as a Legislative Assistant with the Honorable Tom Harkin, Democratic Senator from Iowa. He will inform and advise Senator Harkin on defense appropriations, disarmament, energy, and environmental issues. His duties include writing bills, amendments, floor statements, and speeches. Kevin expects this to be a very interesting year to be on Capitol Hill because of the tension between the various segments of Congress.

While at UNL, Kevin studied the magnetic and structural properties of thin films and multilayers with Professor **David Sellmyer**. He spent two years as a postdoctoral associate at the Naval Research Laboratory, and subsequently worked as a technical assistant/paralegal for a Massachusetts attorney whose caseload often involved scientific issues.

During his tenure at NRL, Kevin became increasingly concerned about the limited job market for young scientists. This led him in 1990 to form an electronic bulletin board called the Young Scientists' Network (YSN), which resulted in considerable visibility and some notoriety for Kevin. The purpose of YSN was to publicize the difficulties facing young scientists and to help them discover career alternatives. It currently has a membership of over 2,000 from many branches of science. His involvement with YSN and employment issues resulted in invitations to testify before Congress and to meet with representatives of the NSF and the Office of Science and Technology Policy. Since then, he has participated in numerous panel discussions on employment related issues, and he has coauthored a book with Sheila Tobias dealing with the same subject.

The Department, of course, wishes Kevin well in his new challenge and assumes that he will attack it with his unique combination of enthusiasm and vigor.

Alumnus Wins Balzan Prize

Alan J. Heeger, Professor of Physics at the Institute for Polymers and Organic Solids at the University of California-Santa Barbara has been awarded the prestigious Balzan Prize for his research in conducting polymers. The award statement reads in part:

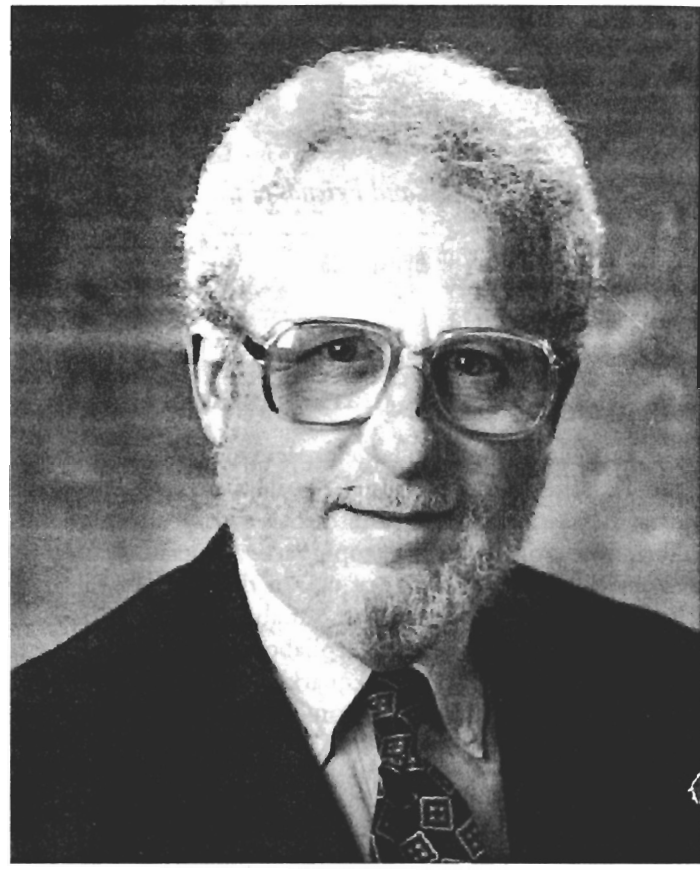
"For his outstanding contributions to Materials Science and his leadership in disciplines which merged in the new and interdisciplinary field of the semiconducting and metallic polymers.

"He has thoroughly covered this new field from the founding discoveries to the realization of new materials exploitable by both high-tech and consumer products industries."

Professor Heeger received the B.S. degree with High Distinction from the University of Nebraska in 1957 and completed his Ph.D. at the University of California-Berkeley in 1961. After a distinguished career at the University of Pennsylvania, Professor Heeger joined the University of California-Santa Barbara where he is currently Director of the Institute for Polymers and Organic Solids. His many honors and awards include a Sloan Foundation fellowship, and the Oliver Buckley Prize for Solid State Physics (1983). Last year, he was given the Charles A. Stiefvater Lectureship Award from the Department of Chemistry at UNL.

Professor Heeger currently is Editor in Chief of the journal entitled "Synthetic Metals," which was instituted to publish original research papers on and applications of synthetic metals (as distinguished from naturally-occurring metals and metal alloys). He is also founder, President and Chief Scientist of UNIAX, a company whose mission is to develop polymer LED materials.

The Balzan Foundation was established in 1961 to "foster culture and science, outstanding humanitarian ventures, and peace and brotherhood among peoples, regardless of nationality, race or creed." At the present time, the Foundation awards three prizes, each worth 350,000 Swiss francs every year, for Letters, the Moral Sciences and the Arts and Physical, Mathematical and Natural Sciences, and Medicine. From time to time, at intervals of not less than three years, the Humanity, Peace and Brotherhood among Peoples Prize is also awarded. Previous winners of the Balzan Prize include Martin Schwarzschild, Sir Fred Hoyle, Jean Piaget, Pope John XXIII, and Mother Teresa. Heady company indeed.



Alan J. Heeger

James Zeidler Named IEEE Fellow

James Zeidler (Ph.D. 1973) has been named an IEEE Fellow for his "contributions to adaptive signal processing and its applications." Zeidler has been employed at the Naval Command, Control and Ocean Surveillance Center since 1974, and has been involved in a number of significant programs associated with this assignment in addition to his work on adaptive signal processing. One of the projects was a continuation of some of his research at Nebraska on making electrical contacts on semiconducting diamond. He dusted off his old laboratory notebooks and obtained funding from the Office of Naval Research to perfect electrical contacts on diamond using ion implantation techniques. His work led to two patents and the demonstration of the first diamond transistor with positive voltage gain. Zeidler carried out his Ph.D. research with Professors **Frank Ullman** and **John Hardy** of our department on the optical absorption in ferroelectric materials.

Chairman's Letter

Professor Roger Kirby

As discussed elsewhere in this issue of the Spectrum, Tony Starace has stepped down from his position as Department Chair after eleven years of outstanding service. The Department was fortunate to have someone of his caliber as both a scientist and an administrator to guide our affairs for such a long time and his steady hand will be sorely missed. To my surprise (and perhaps to many others') the Dean asked me to replace Tony, and to my even greater surprise, I accepted. When one is faced with a decision whether to take on a new assignment which will require a major adjustment in the way day-to-day business is carried out, a certain amount of soul searching is necessary. One first looks at the negatives. A chair must spend considerable time carrying out the routine and not-so-routine functions of the department. While many of these tasks are important, some of them are simply time consuming and required, but their consequences will be insignificant or nil. Because of these activities, there will be less time for research and creative thought, a major reason why many of us chose the academic life. There will also be less substantial contact with graduate and undergraduate students, which for most of us is a source of considerable joy (and on occasion, frustration). There will be even less time to actually step into a laboratory and turn the occasional switch (I suspect my graduate students feel that this is a positive). My expectation was that it would be difficult to find the time to do a good job as Chair, continue to do research at the same level, and to still teach effectively. However, there are also some positives associated with being Chair. First and foremost, one feels a certain responsibility to the Department and its faculty and students. Someone has to do the job, and perhaps it is your turn to do it. However, this isn't a good enough reason to accept the job. One has to feel that it is actually possible to accomplish something - to improve our teaching programs, to increase the Department's stature in research, to enable the faculty to be more effective in achieving their goals, and to help build an infrastructure which supports such efforts. Without these hopeful thoughts, little could be accomplished and the job would be a continuing source of frustration. Needless to say, I was able to identify some areas where I thought it was possible make a difference and help move the Department forward, and I accepted the job. I now look forward with considerable enthusiasm to helping the department continue to progress.

This year promises to be an interesting one. Our research funding has reached another new high, which is reflective of the faculty's continuing efforts to submit more research proposals to granting agencies. In the past year the department was awarded $3.4 million from various agencies, and this funding is used to support many of our current 57 graduate students and nearly 20 postdocs and visiting faculty of various kinds. These latter individuals not only contribute significantly to our research; they also bring new ideas, new knowledge and considerable vitality to our department. In addition, a significant fraction of our undergraduates continues to be employed by our research groups, and these activities make an important contribution to their education. However, we collectively worry about the future of our research funding as there is currently considerable congressional debate about the level at which NSF, DOE and the various DOD agencies will be funded in coming years. Our department however has a very positive attitude. We have received permission to hire two new experimentalists this year (one in condensed matter physics and one in high energy physics), and we expect that these new hires will strengthen our research capabilities in these important areas of physics.

Lest one think that our research efforts are overshadowing our teaching efforts, our department has also made strides in this area. Our elementary laboratories are undergoing considerable changes, with microcomputer-based laboratories being implemented under the supervision of our Laboratory Manager, Vicki Plano Clark. The department Academic Planning Committee, headed by Bob Hardy, has nearly completed a substantial revision of our undergraduate program and course structure which will be implemented in the next year. In addition, two new undergraduate courses for non-majors are being developed. The Academic Planning Committee's next task will be to undertake revision of the graduate program. This will likely prove to be more of a challenge, as graduate education is rapidly becoming more complex. The current employment difficulties faced by advanced degree recipients in almost every subject area are a matter of concern for all of us, but especially for the students. It seems clear however that departments will have to take a broader view of graduate education in the coming decade. It is no longer sufficient to provide a degree in which the student's efforts are focused only on a very specialized topic in physics; it will also be necessary to help the student develop more effective oral and written communication skills, to broadly educate them in several areas of physics or astronomy, and to make them aware of the kinds of challenges that are available in science-related fields. It will likely be necessary to broaden the base of our program and encourage the student to take ancillary courses in such disciplines as business or computer science. And all of this needs to be accomplished while shortening the time to the degree.

One of the benefits being Chair is increased contact with alumni and other friends of the department. Already, I have had occasion to write or phone several alumni, and I have thoroughly enjoyed these interactions. I encourage each of you to contact me anytime throughout the year to bring us up to date on your activities. The department would particularly appreciate any comments or suggestions that you have about our undergraduate and graduate programs. For those of you who can't find the time for a more complete report, please fill out the enclosed card.

Sincerely,

Roger D. Kirby

Roger D. Kirby
Professor and Chair

Starace Retires from Chairmanship

Professor Anthony Starace

After serving the Department as its Chairman since 1984, **Anthony Starace** stepped down this August. During Tony's tenure, the Department underwent major positive changes, and with his guidance, a new plan for the future has emerged. Starace authored and obtained faculty consensus on a departmental strategic research plan. Essentially, we will concentrate our efforts in four major areas: astronomy; atomic, molecular, and optical physics; condensed matter physics and materials analysis; and high energy physics. There will also be a focus on physics teaching studies. Within the scope of this plan, the departmental emphasis has become more balanced with regard to experimental vs. theoretical research. In the early 80's there were only 7 experimental faculty. That number has risen to 12 as new faculty have been hired, with the condensed matter group (incorporating the Center for Materials Research and Analysis, CMRA) having experienced the greatest growth. The high energy group, which until 1993 had been exclusively theoretical, will now hire a total of three or four experimentalists as the older theorists retire during the next decade.

This strengthening of experimental effort has significantly increased external grant research funding, from $1,454,000 in 1983-4 to $3,325,000 last year, as well as the number of graduate students (33 in 1983-4 *vs.* 57 last year). But it has also increased dramatically the need for modern lab space. During Starace's chairmanship, the department received funds to renovate the basement of Ferguson as a high-energy physics lab, and to move the Departmental main office and library from the second floor of Behlen to Brace. This has freed up the space in Behlen for new laboratories. In addition, a number rooms in Brace have also been renovated, including the main lecture hall, other class and meeting rooms, the advanced laboratories, and the business offices.

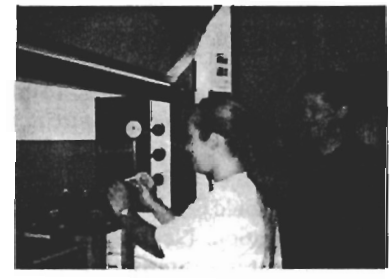
The Department's budget picture also improved under Tony's stewardship, even though the University weathered some severe financial problems during the late 80's. Tony initiated several fund-raising efforts, and instituted laboratory fees for our elementary courses, as well as return of the royalties from the sale of the lab manuals used in these courses. The combination of these efforts has provided the Department with a permanent endowment of more than $50,000, and have allowed much-needed improvements in the quality of the teaching laboratory equipment.

At the end of the summer, the Department held a surprise "Thank-you" party and banquet for both Tony and his wife, Katherine, at the Lincoln Ramada Inn. More than 60 faculty, staff, and students attended. This past fall, Tony was on sabbatical leave at the Institute for Theoretical Atomic Physics, Harvard–Smithsonian Center for Astrophysics.

New NSF Programs Target Undergraduate Research

The first annual Research Experience for Undergraduates (REU) in the Nanostructured Materials program was held this summer. Eighteen physics, chemistry and engineering students from universities and colleges across the United States spent 11 weeks working on research projects under the direction of UNL faculty members. The National Science Foundation-sponsored program provides students with intensive research experience early in their careers. In addition to strengthening the students' interest in science and reinforcing concepts learned in coursework, the research experience makes students more competitive in the job market or for admission to graduate school.

Student participants received travel expenses, a stipend and room and board in the graduate dorms. Social activities helped the group get to know each other, graduate students and faculty mentors. Response to the program was enthusiastic from both participants and UNL faculty, despite a few logistical difficulties inherent in running a program for the first time. Students enjoyed the myriad research opportunities and the chance to meet science and engineering students from other parts of the country. UNL faculty were impressed with the motivation and enthusiasm of the participants and hope to see some of the REU students return as UNL graduate students in the future.



Professor Steve Ducharme with REU student Kim Loewen of Bethel College, Kansas

In addition to research, students participated in a seminar series featuring talks on research and on the development of professional skills useful to scientists and engineers. Each participant wrote a final report and presented the results of their research during a two-day mini conference. Research activities ranged from deposition and measurement of magnetic thin films to the development of an optically-pumped spin-polarized electron source. Faculty participants in the Department of Physics and Astronomy were: **Paul Burrow, Peter Dowben, Stephen Ducharme, Tim Gay, Roger Kirby, Diandra Leslie-Pelecky, Sy-Hwang Liou,** and **David Sellmyer.**

Department Celebrates the 90th Birthday of Professor Jorgensen

Emeritus Professor **Theodore Jorgensen** was in good health and high spirits on November 9, 1995 when he attended a celebration of his 90th birthday at the department's colloquium coffee. His actual birthday, November 13, 1905, came just 42 days after the death of DeWitt Bristol Brace, the founder and first chairman of the Physics Department.

Jorgensen came to the University of Nebraska as an undergraduate in 1923 and received his M.S. degree in 1930 before going to Harvard University, where he received the Ph.D. in 1935. After a year as an instructor at Harvard and two years teaching at Clark University, he joined the faculty at Nebraska. During World War II he spent three years at Los Alamos, New Mexico where he worked on neutron scattering cross sections in the Manhattan Project. When he returned to Nebraska, he started the present program in atomic physics, one of the areas of greatest strength in the department ever since. With a $5000 university grant he designed and built the 350-keV Cockroft-Walton accelerator, a facility which has been in continuous use for nearly half a century. His research was supported by contracts with the Atomic Energy Commission which totaled over $400,000 during the period 1949-1967, when research dollars went much farther than they do today! Largely because of that research facility and the financial support it brought, a new Ph.D. program in physics was instituted and two of the first three graduates were Jorgensen's students.

From 1949 to 1952 he took on additional duties as chairman of the department. He was well-known for the course in atomic and nuclear physics that he taught for many years. In later years he developed and taught such innovative courses as "Issues in Science and Religion" and "Physics, the Changing View." He was a Centennial College Fellow and in 1963 he won the Department's first University-wide Distinguished Teaching Award.

Ted, as he is affectionately known to many of us, retired in 1975. At that time, three of his Ph.D. graduates spoke at the Symposium on Atomic Physics held in his honor and the speaker at the banquet was Henry Margenau, Eugene Higgins Professor of Physics and Philosophy at Yale University. Margenau and Jorgensen had been roommates while students at Nebraska. Even after retirement Jorgensen did occasional teaching in the department and the period from his first employment at the University as an undergraduate to his most recent teaching assignment spanned a record 60 years.

Theodore Jorgensen at his birthday party.

While at Harvard, Jorgensen learned the art of Chinese cooking, a skill he rapidly developed to a high degree of perfection. He also became interested in golf, another subject which he treated with typical Jorgensen thoroughness by developing a theoretical description of the swing of the golf club. This led to his immensely successful book, *The Physics of Golf*, published by the American Institute of Physics (see the article in last year's *Spectrum*). The book has since become AIP's best seller and has now been translated into Japanese.

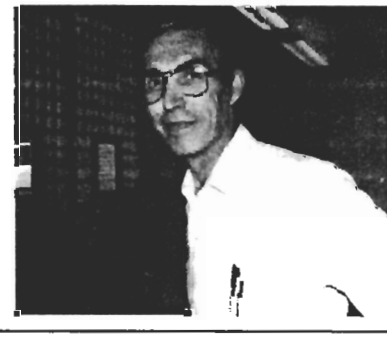
At the party in November some of these accomplishments were recounted and several faculty members volunteered additional stories. Ted also told about how he became a Centennial College Fellow. A set of photographs and clippings of him and his work were on display and a single candle was lit on a large birthday cake. Happy 90th Birthday, Ted!

IN MEMORIAM

Walter Lueken (1930-1995)

Our machine shop staff lost one of its most highly skilled instrument makers when Walter Lueken died on February 3, 1995 at the age of 64. Lueken was born and raised in Beatrice, Nebraska and served in the Navy submarine service before going to work as a machinist at Dempster Manufacturing Co. in Beatrice. After a period at Ellis Manufacturing Co. in El Monte, California, he returned to Nebraska to work at Hy-Gain Electronics Co. in Lincoln. It was there that he met Jack Loos, now the manager of our instrument shop. On Valentine's Day 1970, Walt began work in the Department shop where he served until his death. He leaves his wife Elaine and two children, Scott and Kristi.

Walt will be remembered both by his fellow shop employees and by the faculty members and students not only for his friendly personality and willingness to help but also as one who was able to do the most delicate, high-precision machine work. Jack Loos said it for all of us, "He was one of the best. He will really be missed."



Walter Lueken

Richards-Kortum Speaks at Recognition Luncheon

At the annual Department of Physics and Astronomy Recognition Luncheon, held on May 4, **Rebecca Richards-Kortum** was the featured speaker. This annual luncheon is held in honor of those who have received degrees in physics during the past year and others in the department who have received various honors.

Rebecca received a B.S. with Highest Distinction at UNL in 1985 and a Ph.D. at the Massachusetts Institute of Technology in 1990. In the same year, she was awarded a National Science Foundation Presidential Young Investigators Award and in 1993 was named a Presidential Faculty Fellow (see the articles in the *Spectrum* for Fall 1991 and 1993). In the spring of 1994 she received the University of Nebraska Outstanding Young Alumni Achievement Award. Richards-Kortum was recently promoted to Associate Professor of Electrical and Computer Engineering at the University of Texas at Austin. She and her husband have two children.

In her talk, entitled "The Use of Lasers for Diagnosis of Pre-Cancer," she described her work at the University of Texas College of Engineering on some of the applications of optical fluorescence spectroscopy to biomedical engineering. She and her colleagues are developing new diagnostic techniques for pre-cancer and cancer which can potentially provide rapid, accurate and painless diagnoses without the need for biopsies. These techniques are based on the interaction between tissue and low levels of visible and near infra-red light; they can visualize biochemical changes which precede even the visible erythema of preinvasive lesions. Their diagnostic system couples excitation light to tissue via a flexible fiber-optic probe. These probes can be made from multiple fibers to sample large areas of accessible tissue such as the skin, mouth, or cervix. They have also constructed small probes which can be introduced through endoscopic devices to study hollow organs by returning fluorescence or Raman scattering, and directing it to a sensitive spectrometer which records signal intensity as a function of emission frequency. They recently completed clinical trials to measure spectra of normal and neoplastic human cervixes in 250 patients and oral cavities of 15 patients. Results indicated that spectroscopic methods can detect pre-cancer with a false negative rate similar to that of experienced practitioners, but with a significantly lower false positive rate. Thus, optical techniques may be able to provide real-time, automated diagnosis of precancer and cancer. In a diagnostic setting, this may enable combined diagnosis and therapy in a single office visit, which can dramatically reduce health care costs. Such techniques may also prove useful in the screening setting, where accurate, real-time diagnosis by less experienced practitioners, without the need for biopsy, may increase the proportion of the population receiving adequate screening.

Richards-Kortum also spoke about her very positive experience in making the transition from physics to engineering. In her work she collaborates with scientists and clinicians at the University of Texas Medical Branch at Galveston and with engineers in the Biomedical Engineering Program at the University of Texas at Austin.

Rebecca Richards-Kortum

Distinguished Visitors

Val Fitch, the James S. McDonnell Distinguished University Professor of Physics Emeritus at Princeton University, received an Honorary Doctor of Science degree at graduation ceremonies in May. In 1980, Fitch and his associate James Cronin received the Nobel Prize in physics for the discovery of violations of fundamental symmetry principles in the decay of neutral K-mesons. From 1976-1981 he was chairman of the physics department at Princeton. He has also been president of the American Physical Society, a member of the President's Science Advisory Committee, and a member of the Physics Advisory Committee to the National Science Foundation. Originally from Merriman, Nebraska, Fitch attended Chadron State College, McGill University and Columbia University where he earned his doctoral degree. While on campus he was hosted by **Greg Snow** of our department.

Dr. **Elaine Seddon**, a Senior Staff Scientist at Daresbury Laboratory, England, visited **Timothy Gay's** polarized electron group in October. Seddon and Gay are collaborating on a study of photoemission from chiral, or "handed" molecules. A number of experimental apparatuses are being developed at UNL that will ultimately be used at the Daresbury Synchrotron Radiation Source.

Instrument Shop Continues its Fine Tradition

In many fields of experimental physics, translating new ideas of inquiry into the concrete measurement of physical parameters can only be carried out with specially designed and custom-built apparatus. Thus, the continued success and competitiveness of the department's experimental research program depends heavily on our department's Instrument Shop. Over the years, the shop has admirably fulfilled this support role and continues to be one of the major strengths of the department.

This past year the shop was the subject of a front page feature article, complete with color photograph, in the *Lincoln Journal-Star*. Despite a few factual errors, it nicely described some of the recent successful projects, while informing the public about a little known but important facility that makes up a research university.

In recent years the shop has completed a variety of interesting construction projects. The largest single piece of apparatus made in the shop was a stainless steel vacuum chamber for Professor **Jaecks** that measured approximately 1m x 1m x 1m. The size was limited by what would go through the laboratory door! This chamber contains a large parallel-plate electrostatic energy analyzer almost two feet long which is presently being used by **Lisa Wiese** for her Ph.D. thesis research. A miniature mass spectrometer that fits inside a vacuum chamber, a zero-energy electrostatic analyzer, and a rotatable ultra-high vacuum polarizer for ultraviolet synchrotron radiation were recently built for Professor **James Samson**. The shop also built an innovative six-inch Coudé refracting telescope designed by Professor **Don Taylor** to mount on a second story window for use by astronomy students.

There have been a few changes in the staff of the Department since last year. The new people are (l-r) Steve Penas (Accounting Clerk III), Deborah Lyon (Staff Secretary II), and Pat Pribil (Instrument Maker III).

Several years ago the shop made an intricate device for Professor **Eugene Rudd** to measure ionization cross sections. He took the apparatus to one of the national laboratories to use with their accelerator facilities, and while it was sitting on his desk prior to installation, a steady stream of other scientists stopped in to admire the beautiful workmanship on the apparatus.

The Instrument Shop is headed by **Jack Loos**. Jack joined the shop as an instrument maker in 1970 and has 35 years of shop experience. Other long-time machinists are **Loren Marks**, who started part-time in 1972, and **Gerry Moore** and **Gordon McConnell** who both began in 1981. McConnell is in charge of the student shop, a facility in Behlen Laboratory which is available for use by qualified students and faculty members. The most recent additions to the shop staff, **Jack Gilliam** (1994) and **Pat Pribil** (1995), have already shown that they have the abilities to continue the long tradition of excellence established by the old- timers.

The impressive expertise and facilities assembled in our shop are also available to support the student laboratories and lecture demonstrations, and a number of well-constructed pieces of apparatus for those purposes have been built. While the shop is maintained primarily for the Department of Physics and Astronomy, other departments make use of it as well. The Snow and Ice Research Group, which is part of the Polar Ice Core project, e.g., has made extensive use of both the Instrument Shop and the Electronics Shop.

Professor Pearlstein Retires

Edgar Pearlstein formally retired from the faculty this year, having been on half-time appointment for two years. Ed received his B.S. (1947) and D.Sc. (1950) degrees from Carnegie Institute of Technology. Following postdoctoral appointments at Carnegie Tech and the University of Illinois, he joined our department as an Assistant Professor in 1956. He carried out research on defects in alkali halides for many years and supervised the dissertations of five Ph.D. students. At one time, his research program was the longest-running program funded by the AEC. Ed is an almost legendary figure in our department, and stories abound regarding his questions directed to colloquium lecturers. One story which has been passed along (the editors cannot vouch for its authenticity) is that following a colloquium by a noted scientist, Professor Pearlstein made one comment. "Your result seems to violate the uncertainty principle," to which the speaker responded, after a torturously long moment's reflection, "My graduate student did this work." His quick mind and broad understanding of almost any topic in physics earned him great respect among his experimental and theoretical colleagues. Indeed, many of our faculty and students have benefited from discussions with Ed over the years and still remember fondly his blunt criticism of incorrect physical arguments. He was honored with a Distinguished Teaching Award in 1988.

Ed still maintains an office in the department and comes in every day. He reads the journals religiously (or in Ed's case, atheistically) and points out interesting articles that we may have missed. We expect that he will continue to grace our department for a long time and give us the benefit of his great knowledge of physics and his considerable wisdom. Those readers who wish to contact Ed can reach him through the department or at the e-mail address listed elsewhere in this issue of the *Spectrum*.

Research Highlights

Atomic and Molecular Physics

Paul Burrow's group (**Kayvan Aflatooni, Burrow,** and **Gordon Gallup**) continues to study the dissociative attachment (DA) reaction, $e + AB \rightarrow AB^- \rightarrow A + B^-$, in organic molecules bearing one or more chlorine atoms. This process occurs in a number of technologically important areas in disciplines ranging from physics and engineering to biology. At present, no one has been able to calculate the cross sections for this resonant process from first principles for any molecule with more than two atoms. The group's experimental work focuses on the role played by the structure of the hydrocarbon "backbone" in the yield of negative chlorine ions. Measurements of total DA cross sections are now underway on compounds with two chlorine atoms present on opposite sides of the molecule. The data suggest that different conformations of the molecules are important. These are being investigated by Gordon Gallup using quantum chemical structure calculations.

Sam Cipolla of Creighton University uses our 350-keV accelerator to study atomic inner-shell ionization by 50-300 keV protons in order to test the ECPSsR theory. This theory is based on the plane-wave Born approximation with perturbed stationary state corrections for binding energy and polarization effects, Coulomb deflection, and relativistic effects. In particular, he is measuring absolute subshell x-ray production cross sections for K-shells of selected elements from carbon through germanium, L-shells of scandium through yterbium, and M-shells of tin through lead.

Ilya Fabrikant and his graduate students, **Yuanguang Xu** and **Robyn Wilde**, are working on theoretical descriptions of collisions of slow electrons with molecules. These collisions lead to energy exchange between the electron and molecular rotations and vibrations. Also, electrons can be captured followed by a break-up of the molecule (dissociative attachment). Many of his results provide a theoretical description of experiments performed by **Paul Burrow**, and by F.B. Dunning at Rice University. The dissociative attachment process might be very sensitive to temperature and environment. For example, in collaboration with an experimental group at the University of Sherbrooke, Fabrikant has shown that placing a molecule on a surface can increase the rate of this process by several orders of magnitude. Fabrikant also studies, in collaboration with **Anthony Starace**, the behavior of atomic negative ions in external electric, magnetic and laser fields. Placing negative ions in different combinations of these fields allows manipulation of the rates of atomic processes.

Timothy Gay's polarized-electron group (**Marty Johnston, Hasan Al-Khateeb, Ben Birdsey, Ken Trantham, Travis Bowen, Erik Fagerquist,** and **Mike Reno**) concentrated on two areas during the last year: scattering from metastable heavy noble gases such as neon and argon, and scattering from chiral molecules. One important process in the scattering of electrons by metastable atoms is the so-called "superelastic," or exothermic channel. In scattering of this type, the electron leaves the collision volume with more energy than it had originally. Superelastic processes can be viewed as the time-reversed version of normal inelastic scattering, and studying such collisions can provide interesting information about scattering physics unavailable from experiments on inelastic processes. Chiral targets are those whose mirror images cannot be superimposed on the original molecule. Such targets can be thought of as being analogous to left- and right-handed nuts. The corresponding "bolts" that are used in these experiments are polarized electrons whose spin is either parallel or anti-parallel to their momentum. Essentially, left- or right-handed electrons are scattered from, e.g., left-handed molecules to see if atomic interactions of this type are ambidextrous. These latter experiments have led Gay's group into a collaboration with a group of scientists from Daresbury Laboratory in England. Ken Trantham, one of Gay's graduate students, gave an invited talk on this work at an international symposium on electron scattering held in Canada this summer.

Following **Gordon Gallup's** retirement from the Chemistry Department, he continues to enjoy the support of his friends in the Department of Physics and Astronomy while working on the theory of interesting problems in electron scattering. His latest activities have concentrated on electron scattering from dipolar molecules. This work involves methods for deducing the angular distribution in dissociative attachment and details of low-energy quasi-elastic scattering from non-planar symmetric- and asymmetric-top molecules. In collaboration with Tim Gay, he also has a continuing interest in the interaction of polarized electron beams with chiral molecules.

Duane Jaecks leads a group consisting of **Lisa Wiese, Orhan Yenen, Kenneth McLaughlin, Phillip Wagner,** and **Brandon Thaden** in making correlation studies in atomic systems. Studies of collective electron motion and charge shape in $(Ar^+)^*$ formed in He^* + Ar transfer-excitation processes are made by measuring the alignment and orientation parameters in coincidence with the scattered $He(^1S)$. New techniques will be used to extract the alignment and orientation of individual orbitals to study collective motion and charge shape correlation. Similar techniques will be used in the photoionization of argon using linearly-, circularly-, or elliptically-polarized synchrotron radiation. The Stokes parameters of the fluorescent radiation from the excited residual $(Ar^+)^*$ will be measured in coincidence with the energy-analyzed free electron. In another project, studies of the correlated motion of three massive coulomb-interacting particles will be continued by making a complete experimental determination of all of the dynamic parameters defining the continuum states of $H^* - H^- - H^*$. The laboratory energy and scattering angle of each particle will be measured in triple coincidence after the decay of the fast moving $(H_3^+)^{**}$. The measurements will be transformed to the center of mass of the moving system to determine all of the c.m. energies and mutual angles. The distribution of these angles will provide quantitative tests of the theory for the three body interactions. Dalitz plots will be used to display the c.m. energy distributions of the three particles.

Eugene Rudd retired two years ago, but continues to do research. The January 1996 issue of Physical Review A is scheduled to have the last two of a series of four articles that came out of research on the energy and angular distribution of secondary electrons from

ion impact on atomic and molecular hydrogen. This work was done by George Kerby, Ying-Yuan Hsu, and Mark Gealy with theoretical collaboration by David Schultz and Carlos Reinhold of Oak Ridge National Laboratory. The hydrogen atom apparatus is now at Kansas State University where similar measurements are being made in collaboration with Pat Richard using 30 MeV C^{6+} incident on H and H_2. Rudd also has an active collaboration with Yong-Ki Kim of the National Institute of Standards and Technology at Gaithersburg on modelling electron-impact ionization. This has resulted in the development of the "Binary-encounter Dipole" and the "Binary-encounter Bethe" models which have been very successful in predicting differential and total cross sections for electron ionization of a wide variety of atoms and molecules.

The recent photoionization studies of **James Samson** have concentrated on understanding the mechanism for producing multiply ionized atoms by single photons. In particular, the ejection of an inner-shell electron from an atom causes a redistribution among the remaining electrons, which results in the ejection of a second electron (the Auger electron). This process is being studied at the threshold for inner-shell ionization because of the interesting phenomenon called post-collision interaction, i.e., the interaction of the slow photoelectron and the fast Auger electron. This interaction can be sufficiently strong to cause the photoelectron to be recaptured. Samson's recent studies have verified this phenomenon and have also shown that a fixed percentage (66%) of the captured electrons will be re-emitted by the process of autoionization.

Anthony Starace, who is on leave at the Harvard-Smithsonian Institute for Theoretical Atomic and Molecular Physics (ITAMP), is working on problems in laser atomic physics in collaboration with his graduate students and postdocs. **Minqi Bao, Chien-Nan Liu** and **Mircea Marinescu** have joined him at Harvard for the fall semester and **Qiaoling Wang** is in communication by email, telephone, and fax. Current projects include studies of high harmonic generation by atoms in both an intense laser field and in a static electric field (which permits generation of even harmonics); studies of the correspondence between classical and quantum physics in short-pulse laser detachment of negative ions in crossed electric and magnetic fields (in which the electronic wave packets generated by the short-pulse lasers move almost classically); and studies of doubly-excited states in negative ion photodetachment processes (where the group is in contact with experimentalists and aims both to predict new features and to interpret observed structures). Much excitement has been generated by last summer's experimental observation of Bose-Einstein Condensation (BEC) in a dilute gas by researchers at Colorado-Boulder. Experimental groups at MIT and Harvard are heavily involved in their own studies of BEC, and theorists at ITAMP are involved in predicting properties of the Bose-Einstein condensate. Starace and his group are following these developments with an eye to possible new directions for their own research. They participated in the workshop "Multiparticle Atomic Systems in Intense Laser Fields," which was held in late October. The group is working on developing efficient methods for treating the time-dependence of intense laser interactions with many-electron atoms and ions.

Condensed Matter Physics

There were sixteen contributed papers and one invited paper from the Center for Materials Research and Analysis (CMRA) at the 1995 Conference on Magnetism and Magnetic Materials, the largest number from any university. Professors **Sitaram S. Jaswal** and **David J. Sellmyer** coauthored the invited talk with their colleagues Mr. Robert Lorenz and Prof. Jürgen Hafner of the Technical University in Vienna, Austria. The invited talk was based on their paper in the May 1, 1995 issue of Physical Review Letters dealing with the effect of atomic disorder on the properties of permanent-magnet materials.

Professor **Stephen Ducharme** and Research Associate **Alexander Boune**, in collaboration with Dr. Vladimir Fridkin's group at the Institute of Crystallography of the Russian Academy of Sciences, have demonstrated ferroelectric switching for the first time in ultrathin polymer films. This phenomenon has potential for application as nonvolatile computer memories or data storage media. A report on this work will appear soon in Applied Physics Letters.

The collaboration of theorists and experimentalists, including Professors **David McIlroy, Sy-Hwang Liou, Sitaram Jaswal** and **Peter Dowben**, and Research Associate **Sabiryanov**, has been able to show a relationship between the electronic structure, and bulk conductivity and magnetic properties of $La_{1-x}Ca_xMnO_3$, a system of much current interest worldwide for its colossal magnetoresistance. This clear demonstration of such a relationship between local electronic structure and bulk properties has been long sought in the condensed matter community. This work recently appeared in Physics Letters A, with complementary papers to appear in Solid State Communications and elsewhere.

High Energy Physics

The newly-formed Experimental High Energy Physics group in the Department is gaining momentum every day. Group leader **Gregory Snow** joined the faculty as Associate Professor in the autumn of 1993, and since that time he has established a program which will enable UNL physicists to perform research at the forefront of the field for many years to come. For the upcoming 5 years, the primary focus of the group will be the DZERO Experiment at Fermilab in Batavia, Illinois, which studies proton-antiproton collisions at the world's highest energies. This group announced the discovery of the top quark early in 1995. Snow also participates in a shorter-term experiment at Fermilab, called APEX, which aims to determine whether the antiproton is a stable particle with an infinite lifetime similar to the proton. As an investment for the future, Snow has joined the CMS Collaboration, based at the CERN laboratory in Geneva, Switzerland. This experiment, presently in its planning stage, will study proton-proton collisions at a new higher energy frontier when the Large Hadron Collider being built at CERN is completed in the year 2003. Graduate students in the Department have become active in each of these projects.

The University has been very supportive of the high energy

research program. During the summer of 1995, a new laboratory space was renovated for use by the group in the basement of Ferguson Hall. In addition, the Department was approved to search for a second faculty member in Experimental High Energy Physics who will join the group in the autumn of 1996. In the last two years, the group has arranged for several prominent high energy physicists to visit the Department to present colloquia and to keep everyone informed about the current issues being addressed in this exciting subfield of physics.

Astronomy

Research by the astronomy group this past year has covered many areas of interest, so only a few are mentioned here that indicate the scope. As in past years variable stars have been one of the central themes, and **Ed Schmidt's** massive survey, using the Behlen Observatory 30-inch telescope, of 1800 variable stars that have hitherto been only poorly studied is a large part of it. So far Ed has completed observations of 400 of these and has found a number of stars with interesting peculiarities, including one binary star that has a period of variation that is decreasing at an unusually high rate. He is also looking for stars which are now variable but may have experienced episodes of non-variability in the past. Ed is also working on the analysis of wide-field far-ultraviolet images in collaboration with George Carruthers of NRL. This data will be used to analyze the far-ultraviolet extinction curve in a region spanning 40 degrees across the sky.

Norm Simon, working with Shashi Kanbur (a former member of our department), has been comparing observations of long-period Cepheids with hydrodynamic models using the technique of Fourier decomposition and found that while there was a crude agreement there were also some significant differences. Norman has also been working on the difficulties for current evolutionary tracks in accounting for observed stars in both the long- and short-period domains. Working with Todd Young, Norman has looked at long-period Cepheids in external galaxies, and studied how the structure of the instability strip might affect the determination of cosmic distances.

Behlen Observatory has been playing a role in the largest project ever undertaken in extra-galactic astronomy. **Martin Gaskell**, now an associate professor in the department, and former astrophysics undergraduate Jon Dokter, were part of a large international consortium that used the Hubble Space Telescope (HST), the International Ultraviolet Explorer satellite (IUE), and 20 other ground-based observatories in 17 countries to study a quasar 250 million miles away in the center of a galaxy called NGC 5548.

Gaskell was one of the pioneers in what is now called "reverberation mapping." This let astrophysicists study details in the quasar in NGC 5548 about 10,000 times smaller than could be seen in previous Hubble images. Astrophysicists can study the positions and motions of gas clouds as close as one light day from the black hole believed to be in the center of NGC 5548. This gas is the main focus of Gaskell's research.

"All quasars seem to vary in brightness and all have glowing gas around them. This gas seems to be an integral part of how they work," Gaskell says. "The gas glows because it is ionized by the radiation from the quasar. When the quasar gets brighter the gas gets brighter. We can exploit this to learn about the structure of quasars because of the time delay in when the gas responds after the quasar energy source varies."

Gaskell compares the process to the echo effect in some canyons on earth: "You can time the echo's delay and find out how big the canyon is. This is what we're doing with quasars. There is a time delay in the light and we're using this to try to map out the quasar."

The most widely used mathematical technique for recovering this information was developed by Gaskell and another member of the consortium, Linda Sparke (University of Wisconsin). It was the development of this technique that led to massive observational efforts such as this study of NGC 5548. To get the good temporal coverage needed a lot of telescopes and a lot of observers - so many in fact that merely listing their names and institutions in small print took up a page and a half in the Astrophysical Journal! Gaskell likes to joke: "We've lowered observational extra-galactic astronomy to the level of experimental high energy physics!"

With press releases from NASA, the American Astronomical Society and a number of major universities, the research gathered quite a bit of media attention. "Nebraska Nightly" had a ten minute feature on Behlen Observatory's involvement. UNL's contribution was also featured in a radio slot during one of the University's basketball games. Unfortunately, according to one listener the main point that came across in the latter was that the research had no direct relevance to anything here on earth! Hmm, we wonder if any regents were listening!

The consortium was only able to obtain the massive amount of Hubble time needed because of the initially flawed optics. Gaskell does not think that NASA will ever allocate such a large amount of HST again, but the consortium is busy with many other satellites. More projects with the IUE satellite are underway and next year the group will be using the just launched Infrared Space Observatory and the X-ray Timing Explorer. Behlen Observatory observations are going to be needed for a long time to come.

Kam-Ching Leung was the Chairman of the Scientific Organizing committee of the Third Pacific Rim Conference on Recent Developments on Binary Star Research, held in Chiang Mai, Thailand this October. This conference has been held every five years since 1985, when it first met in Beijing, China. The second meeting was held in Korea in 1990. The meeting focuses on observations, interpretations, and modeling of both close and wide binary systems. This year, participants were able to observe the total solar eclipse that occurred north of Bangkok just before the meeting.

Faculty Honors and Promotions

Ilya Fabrikant, left, and Peter Dowben who were promoted to Professor this year.

Peter Dowben was promoted to Professor in September. A condensed-matter physicist who joined the department in 1993, Dowben is the author of approximately 160 scientific articles in a wide variety of physics and chemistry journals. He is the principal investigator on two research grants and a co-principal investigator on six others. His specialty is the study of electronic phase transitions such as magnetism and nonmetal-to-metal transitions using various photoemission processes.

Ilya Fabrikant was given tenure and promoted to Professor in September. Fabrikant, an atomic collision physics theorist, emigrated from Latvia in 1988 and came to the University of Nebraska the following year. His research, supported by the National Science Foundation, has produced 21 scientific publications since joining the department. His research areas are electron scattering from polar molecules and the photodetachment of negative ions.

Robert Fuller was one of ten UNL faculty members selected as members of the Distinguished Teachers Academy for 1995. This special honor, based on peer and student documentation of a faculty member's contributions, provides a $1000 stipend permanently added to his or her base salary. Fuller has won two Distinguished Teaching awards at UNL as well as the Outstanding Teaching and Instructional Creativity award. The American Association of Physics Teachers has honored him with a Distinguished Service Citation and with the Robert A. Millikan Medal. He recently developed *InfoMall*, a CD-ROM of 35,000 electronic pages containing the text and graphics of 18 textbooks, 3900 articles from *Physics Today*, and other teaching materials intended for high school physics teachers.

Timothy Gay was elected to fellowship in the American Physical Society. This is a highly competitive honor which is restricted to approximately 10% of the society membership. His citation reads, "For his studies of fundamental atomic collision processes, particularly with regard to spin-dependent effects, and for important contributions to the development of polarized electron technology." Gay came to the department from the University of Missouri-Rolla in 1993.

Thomas Morgan was one of fifteen UNL faculty members to be given College Legislative Teaching Awards in 1995. Each received a $1000 cash award provided by the Nebraska Legislature along with an engraved medallion and a certificate.

Associate Professor **Gregory Snow** received tenure. Snow came to UNL from the University of Michigan in 1993 to lead the new experimental high-energy physics group. His research is supported by the National Science Foundation and several internal grants from Fermilab, where he does much of his work. This year, Snow was involved in the discovery of the top quark (see article in this issue of the *Spectrum*).

John Weymouth was the 1995 recipient of the Asa T. Hill Award given by the Nebraska State Historical Society in October. Hill, a Hastings banker in the 1920s, was an amateur archeologist and an early president of the Historical Society. Weymouth, an emeritus professor of physics, was cited for his teaching of physical techniques to archeology students as well as for his research and survey work. He is an internationally recognized pioneer in the development and use of magnetometers to discover buried archeological sites. The photograph shows him at one of the sites which he recently surveyed.

Professors **Timothy Gay** and **Norman Simon**, and graduate student **Ken McLaughlin** (now a postdoc with **Duane Jaecks**), were awarded Certificates of Recognition for Contributions to Students by the Parents Association of UNL. This award is given yearly to about seventy faculty and teaching assistants. This year marked the fifth time Simon has won this award.

Weymouth, right, inspecting the Diamond Springs Pony Express site south of Brule, Nebraska with Steve Holen, left, principal investigator for the proposed Nebraska National Trails Museum survey and Dan Watson, center, field director for the museum survey. Weymouth conducted both magnetic and electrical resistance surveys of the site this spring.

Physics and Astronomy Hits the Web!

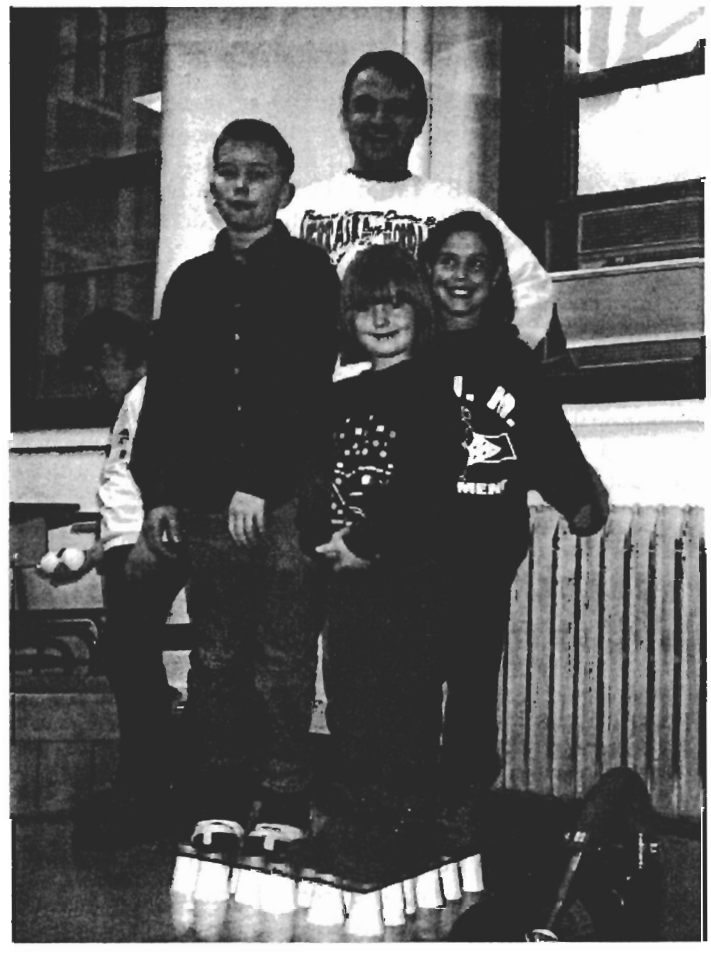
The Department now has its own home page on the World-Wide Web. We can be reached directly at http://www.unl.edu/physics/, or through UNL's Home Page at http://www.unl.edu/. Our home page is quite rudimentary at present, but significant additions and changes will be made throughout the academic year. If you have any suggestions for additions or improvements to the Home Page, please contact Christopher Moore at cmoore@unlinfo.unl.edu. In addition, most faculty and staff have e-mail address. Please feel free to contact any of us at the addresses listed below:

Clifford L. Bettis,
cbettis@unlinfo.unl.edu
Paul Burrow,
pburrow@unlinfo.unl.edu
William B. Campbell,
campbell@unlinfo.unl.edu
Patty Christen,
christen@unlinfo.unl.edu
Sam Cipolla,
samcip@creighton.edu
Mark Clark,
mclark@unlinfo2.unl.edu
Peter A. Dowben,
pdowben@unlinfo.unl.edu
Stephen Ducharme,
ducharme@unlinfo.unl.edu
Ilya I. Fabrikant,
iif@unlinfo.unl.edu
Brian Farleigh,
farleigh@unlinfo.unl.edu
Paul Finkler,
pf@unlinfo.unl.edu
Robert G. Fuller,
rfuller@unlinfo.unl.edu
Gordon A. Gallup,
ggallup@unlinfo.unl.edu
C. Martin Gaskell,
gaskell@unlinfo.unl.edu
Timothy J. Gay,
tgay@unlinfo.unl.edu
Kay Haley,
khaley@unlinfo2.unl.edu
John R. Hardy,
hardy@unlinfo.unl.edu
Robert J. Hardy,
rhardy@unlinfo.unl.edu
Duane H. Jaecks,
djaecks@unlinfo.unl.edu
Sitaram S. Jaswal,
phys034@unlvm.unl.edu
C. Edward Jones,
cej@unlinfo.unl.edu
Robert Katz,
rkatz@unlinfo.unl.edu
John R. Kelty,
jkelty@unlinfo.unl.edu
Roger D. Kirby,
rdk@unlinfo.unl.edu
Shelli Krupicka,
cmra@unlinfo.unl.edu
Diandra Leslie-Pelecky,
diandra@unlinfo.unl.edu
Kam-Ching Leung,
kleung@unlinfo.unl.edu
Sy-Hwang Liou,
sliou@unlinfo.unl.edu
Deb Lyon,
lyon@unlinfo.unl.edu
Marilyn McDowell,
mmcdowel@unlinfo.unl.edu
Kenny McLaughlin,
kwm@unlinfo.unl.edu
Chris Moore,
cmoore@unlinfo.unl.edu
Thomas A. Morgan,
tmorgan@unlinfo.unl.edu
Edgar A. Pearlstein,
e_p@unlinfo.unl.edu
Steve Penas,
spenas@unlinfo.unl.edu
Vicki Plano Clark,
vpc@unlinfo.unl.edu
Jean Rolofson,
jrolofso@unlinfo.unl.edu
M. Eugene Rudd,
erudd@unlinfo.unl.edu
James A.R. Samson,
jsamson@unlinfo.unl.edu
Leo Sartori,
lsartori@unlinfo.unl.edu
Edward G. Schmidt,
eschmidt@unlinfo.unl.edu
David J. Sellmyer,
cmra@unlinfo.unl.edu
Norman R. Simon,
nsimon@unlinfo.unl.edu
Gregory R. Snow,
gsnow@unlinfo.unl.edu
Anthony F. Starace,
astarace@unlinfo.unl.edu
Wayne Stolte,
wstolte@unlinfo.unl.edu
Donald Taylor,
dtaylor@unlinfo.unl.edu
John Weymouth,
weymouth@unlinfo.unl.edu
Beth Wilhelm,
eaw@unlinfo2.unl.edu
Beverly Wisehart,
physmail@unllib.unl.edu
Orhan Yenen,
oyenen@unlinfo.unl.edu

ScienceWorks

Walking into a ScienceWorks outreach appearance can be a shock to those who think that science is a somber enterprise entered into by scientists in white lab coats and shirt-pocket protectors. ScienceWorks is a graduate-student-based outreach group with a twofold mission: to improve the education, skills and marketability of science and engineering graduate students, and to share the excitement and relevance of science with the public. As the societal context surrounding science has changed, the scientific community has realized that the manner in which students are trained for scientific careers must also change. ScienceWorks, initiated and administered by Research Assistant Professor **Diandra Leslie-Pelecky**, is funded by a grant from the National Science Foundation, with additional funding from the Center for Materials Research & Analysis, the Center for Electro-Optics and the Office of the Dean of the College of Arts and Sciences. Eight graduate students involved with science and engineering research devote a fraction of their time to the development of demonstrations illustrating how science is relevant to everyday life. Modules include one that allows participants to put their hand into the middle of a miniature tornado, a series of experiments illustrating how seat belts and airbags prevent injury, and an exercise in how chemicals are used in food, clothing, medicine and other applications. In addition to hands-on modules, presentations illustrating some of the fundamental principles in science are available. These presentations rely heavily on audience participation and focus on a single topic, such as pressure or temperature. The presentation format allows a larger group to be involved and provides a more controlled environment for demonstrations such as lying on a bed of nails, or dipping a flower in liquid nitrogen.

In addition to outreach, ScienceWorks also sponsors a series of professional development activities. The ScienceWorks Journal Club improves technical speaking skills not only by increasing speaking opportunities, but also by providing a constructive critique of the talk that allows students to identify problem areas. A Professional Skills Seminar will begin in the Spring semester and will include talks on topics such as: how to write your resume/vita, the process of publishing in a journal, interviewing for industrial vs. academic positions, and starting your own business. Although participation in ScienceWorks is open to anyone, the graduate students funded by the grant have been selected on the basis of their potential for outstanding research and leadership skills in the scientific community. The 1995-96 participants are: Leonie Boshoff-Mostert (Chemical Engineering), Perry Howell (Electrical Engineering), Martin Liphardt (Physics), Sudhir Malhotra (Physics), Darby Sloss (Chemistry), Carlo Waldfried (Physics), Lisa Wiese (Physics) and Mark Woehrer (Electrical Engineering).



Martin Liphardt, ScienceWorks participant, demonstrates the structural rigidity of styrofoam to several eagerly attentive elementary students

Department Welcomes New Graduate Students

Eight new graduate students joined the department for the fall 1995 semester. **Tara McAvoy** (Mary Washington College), **Geeta Kharadia** (University of Missouri), **Kahraman Tovim** (University of Nebraska-Omaha), **Cyrus Hall** (University of Hawaii) and **Stephen Michalski** (University of Nebraska-Omaha) are the new teaching assistants. New research assistants are **Chunping Luo** (Physics Institute of the Chinese Academy of Science, working with Prof. **Sellmyer**), **Yuanguang Xu** (Wuhan University, working with Prof. **Fabrikant**), and **Michael Bonder** (James Madison University, working with Prof. **Leslie-Pelecky**). Two additional new students are expected in January.

We Heard From...

Backhaus, Scott (BS 1990) 917 Cerrito St., Albany, CA 94706. Is a graduate student at the University of California-Berkeley.

Burmester, William L. (MS 1975, Ph.D. 1975) 4473 Pali Way, Boulder, CO 80301-3827. Is a staff scientist at Bell Areospace in Boulder.

Chen, Jian (Former postdoc with Professor Sellmyer) Is a staff scientist with CVC Products Inc., 525 Lee Road, Rochester, NY 14603-1886.

Crooks, Geoffrey (BS 1965, MS 1967, Ph.D. 1970) 417 S. Cotner Blvd., Lincoln, NE 68510. Is President of Spectrum Chromatography.

Duffey, James R. (MS 1972, Ph.D. 1978) 2501 Yale Blvd. SE #300, Albuquerque, NM 87106-4200. Is principal scientist with S-Cubed Division of Maxwell Corporation in Albuquerque. He and his wife, Ginger, and daughters, Barbara and Susan, are all doing well. (e-mail at ji3m@scubed.com)

Fagerquist, Randy L. (BS 1980, MS 1981, Ph.D. 1985) 7193 Rangeline Rd., Union, OH 45322-9600. Is a staff scientist at Diconix Corporation in Kettering, OH. (e-mail atrfagerqu@scitexdpi.com)

Freund, George A. Jr. (MS 1976, Ph.D. 1979) 12111 SE 96th Pl., Renton, WA 98056-2441. Is still with Boeing Corporation in Seattle, WA.

Greene, Christopher H. (BS 1972) University of Colorado, Department of Physics, P.O. Box 390, Boulder, CO 80309-0390. Is a Professor of theoretical atomic physics and director of the Joint Institute for Laboratory Astrophysics. Chris was in the area last Spring when Ashland-Greenwood High School invited its distinguished graduate to be the keynote speaker at the 1995 Scholarship Dinner.

Haggard, Kenneth V. (BS 1962) 117 Pine Creek Dr., Hampton, VA 23669-1245. Is retired from NASA.

Hieggelke, Curtis (MS 1966, Ph.D. 1971) 2314 Mason, Joilet, IL 60435. Is Physics Professor at Joliet Junior College. Received the Distinguished Service Citation from the American Association of Physics Teachers in January, 1994. Is the Principal Investigator and Co-Project Director of a National Science Foundation funded two-year college physics faculty enhancement and curriculum development workshop project. Over the past 3 years, 17 workshops have served 358 participants from 174 two-year colleges. Four workshops have been scheduled for 1995 in Illinois, California, Texas and Pennsylvania.

Hollman, Kyle (BS 1988) 6032 McPherson, St. Louis, MO 63112. *"I applied for and received a postdoc grant from NRL/NIST. I will be finishing my Ph.D. in December and starting the two year postdoc December 15, at the NIST Lab in Boulder, CO. Thanks to everyone at the UNL Physics Dept."*

Homan, Dean M. (BS 1991) 3859 Belleau Wood Dr., Apt. 3, Lexington, KY 40517. Is a Research Assistant at the University of Kentucky.

Katkanant, Vanvilai (MS 1979, Ph.D. 1983) Department of Physics, California State University, Fresno, CA 93740. Is a Professor of Physics at California State University, Fresno, CA.

Keifer, David (BS 1968), 42 Spring Hill Rd., Skillman, NJ 08558-1416. Early in December we had a visit from David. He had been employed as a laboratory assistant by Professors **Duane Jaecks** and **Eugene Rudd** while he was an undergradute student. David has advanced degrees in biophysics and plant physiology and is now a weed scientist in New Jersey. [See the article about him which appeared in last year's *Spectrum* newsletter.] A meeting on his speciality brought him to Omaha so he came a day early to visit the department. He found a few familiar faces but many things had changed, of course. He especially remarked on how the new, nearly empty accelerator laboratory he worked in is now packed with experimental apparatus.

Wilma Carol Marcy LaBelle (BS 1955) 6166 S. Packard Ave., Apt. 208, Cudahy, WI 53110. Is a research engineer and founder of Omega Research Corporation, P.O. Box 93, Greendale, WI 53129. Wilma visited the Department last year while in Lincoln.

MacMillan, Richard D. (MS 1970). 267 Center Road, Frankfort, IL 60423-1601. Is a Planning and Design Analyst for AMOCO Corporation specializing in all aspects of the distributed computing environment, PC, LAN, WAN, etc. Richard writes that he also moonlights in computer solutions for small businesses. His wife is teaching sixth grade. His son is a civil engineering major at Bradley University. His daughter is married, and Richard has three grandchildren.

Maher, Robert L. (MS 1975, Ph.D. 1980), 807 S. Alfred, Apt. 3, Alexandria, VA 22314. Is a scientist at Kaman Sciences, Alexandra, VA. Currently working on Sun computers and doing data analysis at NRL.

Marquard, Paul (MS 1986) 1624 Begonia, Casper, WY 82604-3764. Is an Instructor at Casper College.

McCarthy, James D. (BS 1985) 2260 Manchester Ave. Cardiff By The Sea, CA 92007-1944. Is with Radiation Oncology Computer Systems in Carlsbad, CA.

McKee, Robert J. ("Bob") (BS 1966) 1109 S. Grandview, Papillion, NE 68046. Is an Instructor teaching physics and math at ITT Technical Institute and is currently working on a MS in mathematics at the University of Nebraska-Omaha.

Moore, Burton Eberle (BS Math 1935) 937 Bowman Rd., Apt. 271, Mt. Pleasant, SC 29464-3227

Park, Chang Hwan (Ph.D. 1984)

Perera, Harold (MS 1985, Ph.D. 1990) 133 Europa Blvd., Cherry Hill, NJ 08003. Is an Assistant Professor, Department of Radiation Oncology & Nuclear Medicine, Hahnemann University, Philadelphia, PA.

Pearl, Don (MS 1989, Ph.D. 1994) Klarenbergstr 41/1, 73525 Schwabisch, Gmuend, Germany. Recently visited the Department. He is teaching for the University of Maryland, University College in Schwaebisch Gmuend, Germany.

Shen, Jian (MS 1992, Ph.D. 1994) 5773 Encina Rd., #205, Goleta, CA 93117. Is a staff scientist at Applied Magnetics in Goleta, CA.

Stricklett, Ken (MS 1981, Ph.D. 1987) 469 W. South St., Frederick, MD 21701-6326. Is a Physicist with National Institute of Standards and Technology, Gaithersburg, MD.

Teays, Terry (Ph.D. 1986) 8811 Magnolia Drive, Lanham-Seabrook, MD 20706. Is Director of the Center for Scientific Research at Computer Sciences Corporation. *"I am continuing as the Director of CSC's Center for Scientific Research. The fiscal situation has been rather depressing for pure research. When is the Department going to have a home page on WWW?"*

Webster, Gary L. (Ph.D. 1981) 17 Mountain Pine Dr., Littleton, CO 80127-3566.

Wesely, Scott (BS 1990) P.O. Box 22070, Lincoln, NE 68542-2070. Is the State Coordinator for Nebraskans Against the Death Penalty.

A Letter from Scott McCartney

A letter received this summer from Scott McCartney (BS 1990) is an outstanding testimonial to the undergraduate education he received at UNL. He is presently working on his Ph.D. in Astronomy at the University of Oklahoma and expects to complete it in August, 1996.

"The undergraduate program at UNL did an overall fine job of preparing me for graduate school. In particular, I feel the astronomers provided me with an excellent foundation. My undergraduate astronomy courses offered a wide range of important topics in astrophysics. This was important in allowing me to learn something about different research areas. In turn, this allowed me the opportunity to look at a wide range of graduate astrophysics programs as I had developed an interest in several topics.

"Another positive among the astronomy classes (and many of the senior level physics classes as well), was that I had to compete in the same class with the graduate students. This was crucial in preparing me for graduate level coursework.

"Some of the teaching techniques practiced were particularly useful. Dr. Leung had us read and discuss journal articles. Dr. Taylor had us do supplemental computer programming, so we could get our hands 'dirty' and learn a little about the practical side of physics. By having us go to the observatory, Dr. Schmidt's observing class was able to provide us with a realistic introduction to professional observing. I feel this is significant. Many programs have their undergraduates use some small telescope to make observations, but not many places allow undergraduates access to a research grade instrument. This was an important component of my education. At Oklahoma, we have 2nd and 3rd year graduate students who are finally getting a chance only now to do their first professional observations. This situation is repeated in many programs around the country. I am quite happy that I didn't have this handicap as an undergraduate.

"As stated above, I feel the physics courses also did a fine job of preparing me. The only criticism I offer is one of omission. Typically, mathematical techniques were used in the physics courses prior to the math courses I took. Trying to learn these techniques, in addition to the physics, was very difficult at times. My suggestion is that some sort of 'Math Methods in Physics' course be taught to sophomore or junior level physics majors. I understand that the department has integrated a course such as this into the curriculum.

"Overall, I feel I received a very good undergraduate education, particularly in the astronomy area. UNL has done a fine job of preparing me for my further academic pursuits."

Scott's address:
The University of Oklahoma,
Department of Physics and Astronomy
440 West Brooks, Room 131
Norman, OK 73019-0225.

Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1994 – 31 October 1995. 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:

(1) Physics & Astronomy Development Fund (for unrestricted gifts) (Account No. 2557.0)
(2) Physics & Astronomy Lecture Endowment Fund (Account No. 3321.0)
(3) Physics & Astronomy Scholarship Endowment Fund (Account No. 3303.0)

Contributions to any of these may be made conveniently using the contribution card and return envelope enclosed with the mailing of this newsletter. Checks should be made payable to the University of Nebraska Foundation and should indicate for which account the money is intended. Those contributors whose employers have a matching gift program should indicate this. Thank you very much!

Richard C. Altrock (BS 1962)
Amoco Foundation, Inc.
Terry L. Anderson (MS 1971, PhD 1975)
John C.Angle
AT&T Foundation
Baltimore Gas
Marvin E. Bowman (BS 1969)
Thomas E. Bullock (MS 1979)
Louis J. Caplan (MS 1964, PhD 1975)
Geoffrey B. Crooks (MS 1967, PhD 1972)
Jonathan B. Crooks (PhD 1974)
Robert DuBois (MS 1972, PhD 1975)
Daniel E. Dunn (BSE 1984)
FMC Foundation
Robert G.Fuller
David M. Gray (BS 1977)
Maxwell H. Halderson (BSEE 1934, MS 1936)
Bert H. Hartzell (BA 1939)
Alan J. Heeger (BS 1957)
Kyle W. Hollman (BS 1988)
Hughes Aircraft Co.
IBM Corporation
David W. Keifer (BS 1968)
Roger D. Kirby
Wilma C. LaBelle (BS 1955)
John E. Lahiff (BS 1964)
Richard D. MacMillan (MS 1970
Robert L. Maher (MS , PhD 1975)
Nasser Maleki (MS 1977, PhD 1981)
Paul Marquard (MS 1986)
Robert L. McKenzie (BA 1948)
Everald E. Mills (BS 1962)
Harold Perera (MS 1985, PhD 1990)
Jerry E. Ruckman (BS 1962)
M. Eugene Rudd (PhD 1962)
Chester A. Sautter (MA 1958, PhD 1964)
James J. Schmidt (MS 1957)
Donald P. Schneider (BS 1976)
David Sellmyer
Anthony Starace
Ken Stricklett (MS 1981, PhD 1987)
Terry Teays (PhD 1986)
Maurice H. Witten (MA 1960)
United Technologies

No Known Address:

Please let us know any information you may have on these "missing alumni."

Richard L. Bretthauer (B.S.ED. 1975, Math/Physics)
Gary C. Christensen (B.S. 1965)
Harvey E. Clark (B.S. 1968)
Debra J. Cleveland (B.S. 1988)
Robin L. Collins (B.A. 1979)
Duane A. Courter (M.S. 1960, Physics/Ed. Psych.)
Richard V. Denton (B.S. 1965)
Clarence M. Deyong Jr. (B.S. 1958)
James A. Eder (M.S. 1966)
Burrell O. French (B.S. 1961)
Carolyn J. Gold (M.S. 1990)
Jimmie D. Gordon (B.S. 1960)
George W. Graft (M.S. 1963)
Andrew T. Groebner (B.S. 1989)
Steve T. Gunther (B.S. 1992)
Vincent D. Harmon (B.S. 1988)
Gerald J. Henderson (B.S. 1965, M.S. 1967)
Medhi Homayoonfar (M.S. Ph.D. 1971)
King-Chung A. Ip (B.S. 1980)
William C. Keller (B.S. 1981)
Ki T. Kim (M.S. 1967)
Kisik Kim (M.S. 1983)
Roy B. Kreigh (B.A. 1949, M.A. 1950, Math/Physics)
Chulan Kwon (M.S. 1983)
Sharon L. Lackey (M.S. 1974)
Yan-Feng Li (M.S. 1984, Ph.D. 1986, M.S. 1989, Physics, Elec. Eng.)
Mei L. Lin (M.S. 1962)
Arthur C. Lindberg (M.A. 1951, Math/Physics)
Donald E. McArthur (B.S. 1959, Ph.D. 1967)
Jing Meng (M.S. 1993, Elec. Eng./ Physics)
Daniel J. Miller (B.S. 1979)
Edward E. Moreland (M.A. 1954)
Albert C. Mueller (M.S. 1941, Ph.D. 1943, Physics/Chemistry)
Venkatraramanam Natarajan (M.S. 1981, Ph.D. 1984, Physics/Engineering)
Keanmun Ng (B.S.ED. 1990, Physics/ Phys. Ed., M.P.E. 1993)
William H. Odell (B.S. 1965)
Winfred P. Pikelis (B.S. 1980)
Labros E. Pilalis (B.A. 1978)
David E. Rodgers (B.S. 1971)
Frank P. Ross (B.A. 1958)
Leroy G. Schulz (M.S. 1941)
David P. Sheetz (M.S. 1951, Ph.D. 1952, Physics/Chemistry)
Gregory E. Stephens (B.S. 1990)
John Taube (B.S. 1966)
James A. Thomassen (B.S. 1969)
Robert A. Worsing (M.A. 1949, Math/ Physics)
Albert D. Yeye-Odu (B.A. 1975, Math/ Phyiscs, M.A. 1978, Psych.)
Todd A. Yilk (B.S. 1986, M.S. 1990)
Suriyati B. Yusoff (B.S. 1986, M.S. 1990)

The Record

A Documentary Record of Facts and Figures for the Department of Physics and Astronomy of the University of Nebraska-Lincoln

No. 11 Winter 1996 Roger D. Kirby, Editor

1994-95 DEGREE RECIPIENTS

Bachelor of Science

Scott A. Annin (May 1995)
Andrew J. Black (May 1995)
Oceana P. Francis (May 1995)
Mary Krasovec (May 1995)
Donald C. Stafford (May 1995)
Chun Bun Tan (May 1995)
Christopher J. Williams (August 1994)

Master of Science

Hasan Al-Khateeb (May 1995)
Benjamin G. Birdsey (May 1995) Doctoral work with T. Gay
Ismail Gobulukoglu (May 1995)
John P. Krane II (August 1994) Doctoral work with G. Snow
Minsun Lee (August (1994)
Hanqing Li (May 1995) Doctoral work with S. Liou
Chien-Nan Liu (May 1995) Doctoral work with A. Starace
Carl L. Lundstedt (May 1995) Working with G. Snow
Maciej Ossowski (December 1994) Doctoral work with J. Hardy
Nancy M. Sauer (May 1995) Job hunting in Lincoln
Stephanie A. Snedden (May 1995) Doctoral work with M. Gaskell
Kendra J. Stahl (May 1995)Adjunct Instructor Hawkeye Community College, Waterloo, Iowa.
Mingjun Yu (December 1994) Doctoral work with D. Sellmyer

Doctor of Philosophy

George W. Kerby III (Dec. 1994)
Donald M. Pearl (August 1994)
Jian Xiang Shen (Dec. 1994)

HONORS

1994-95 Fellows

Diane S. Eschliman	Avery Fellowship
Chien-Nan Liu	Joseph L. Parker Fellowship
J. Mark Meldrim	Avery Fellowship
Todd S. Young	Avery Fellowship

1994-95 Scholarships

Jennifer S. Bandy	Joel Stebbins Fund Scholarship
Matthew M. Bergren	John E. Almy Scholarship
Shilo J. Hilger	Henry H. Marvin Memorial Scholarship
Elizabeth S. Klimek	Physics & Astronomy Alumni Scholarship
Mary Krasovec	Henry H. Marvin Memorial Scholarship
Robert B. Nickeson	Henry H. Marvin Memorial Scholarship
Jeremy A. Vetter	U.S. Harkson Scholarship and Henry H. Marvin Memorial Scholarship

1995 Distinguished Teaching Assistant Awards
Adam S. Green
Todd S. Young

1994-95 Recognition Award for Contributions to Students
Timothy J. Gay
Kenneth McLaughlin
Norman R. Simon

Academy of Distinguished Teachers
Robert G. Fuller

College of Arts & Sciences Distinguished Teaching Award
Thomas A. Morgan

Fellow of the American Physical Society
Timothy J. Gay

1994-95 Society of Physics Students Officers
Michael L. Gordon, President
Scott A. Annin, Vice President
Mary Krasovec, Secretary
Jeremy A. Vetter, Treasurer

Faculty Professional Activities

In addition to service on Departmental, College and University-wide committees, for 1994-95 a number of the faculty were active in local, national and international professional activities, as follows:

Clifford L. Bettis: Physics Instructional Resource Association

Paul D. Burrow: Gaseous Electronics Conference Executive Committee.

William B. Campbell Rocky Mountain Consortium for High Energy Physics, Steering Committee.

Stephen Ducharme: NSF/SBIR Review Panel Member.

Robert G. Fuller: Interactive Physics CD-ROM (NSF/SBIR grant) (Consultant); Multinational Multimedia Bicycle Project (Co-director); Physics Academic Software Steering Committee.

John R. Hardy: Army Ballistics Research Lab, Aberdeen, MD (Consultant); U.S. Naval Research Laboratory (Consultant).

Duane H. Jaecks: 8th International Symposium on Polarization & Correlation in Electronic and Atomic Collisions (July 1994), Vancouver, BC Organizing Committee ICPEAC General Committee.

Sitaram S. Jaswal: Program Committee, International Conference on Magnets Division of Condensed Matter Physics of American Physical Society (Teller).

Robert Katz: (Emeritus) Collaborating with NASA on radiation hazards to astronauts.

Kam-Ching Leung: AAS Chétien Research Grants Committee; (Chairman) *Chinese Astronomy & Astrophysics* Editorial Board (Pergamon Press); *Information Bulletin on Variable Stars* Editorial Board; Scientific Organizing Committee (Chairman), The Third Pacific Rim Colloquium; Shaanxi Observatory, Academia Sinica, China (Distinguished Professor); United Nations Working Group, Astronomical Facility in the Pacific.

M. Eugene Rudd: (Emeritus) Report Committee for the International Commission on Radiation Units and Measurements (Chairman)

James A.R. Samson: Advanced Light Source, Berkeley, CA, Atomic Physics Beamline Committee; Argonne National Laboratory, Atomic Physics Review Committee; Fellowships Committee, Division of Atomic, Molecular, and Optical Physics; NASA Planetary Atmospheres Review Panel NASA UV, Visible, and Astrophysics Review Panel.

David J. Sellmyer: Advisory Committee, Magnetism and Magnetic Materials-Intermag Conference; Magneto-Optical Recording Conference 1994-96, International Organizing and Program Committee; NSF Young Investigators Panel; National Storage Industry Consortium Technical Council; Nebraska Experimental Program to Stimulate Competitive Research (EPSCoR) Committee; Nebraska Science and Technology Planning Task Force.

Gregory R. Snow: NSF Teacher Preparation & Enhancement Program Review Panel; SciTech Museum, Aurora, IL, Exhibit Development Committee; NSF Site Visit Team for 6 Scope, Sequence, and Coordination Projects.

Anthony F. Starace: APS Committee on Investments; APS Division of AMO Physics, Nominating Committee; Institute for Theoretical Atomic and Molecular Physics, Harvard-Smithsonian Center for Astrophysics (Advisory Board Chair); *Physical Review A* (Editorial Board).

John Weymouth: (Emeritus) NATO Science for Stability Program (Outside Consultant); Professional Training in Archaeological Site Discovery and Site Evaluation Techniques sponsored by the National Park Service and the Society for American Archaeology, Minneapolis, May 3-4, 1995 (Instructor); Remote Sensing and Geophysical Techniques for Cultural Resource Management sponsored by the National Park Service, Cahokia Mounds State Historical Site, Illinois, May 22-26, 1995 (Instructor).

1995-96 Visiting Staff Members

Visiting Professors this year are **Sam Cipolla** (Ph.D. 1969, Purdue), **George Hadjipanayis** (Ph.D. 1979, Manitoba, Canada), and **Daqui Zhou** (Beijing University).

C. Martin Gaskell (Ph.D. 1981, California-Santa Cruz) remains an Associate Professor this year.

Visiting Assistant Professors this year are **Mark Clark** (Ph.D. 1988, North Carolina) and **Charles Lang** (Ph.D. 1975, Kansas State), both working with Professor Fuller; other Visiting Assistant Professors are **Shaukat Goderya** (Ph.D. 1995, UNL), **Stephen Platt** (Ph.D. 1991, University of Chicago), **Linxiang Zhou** (B.S. 1960, Xiamen University) working with Professor John Hardy, **Chuanxing Zhu** (M.S. 1988, Shanghai University), working with Professor Ducharme and **Roberta Lang** (M.S. 1991, University of South Florida) working with Professor Fuller.

Research Assistant Professors this year are **Diandra Leslie-Pelecky** (Ph.D. 1991, Michigan State) and **Zhengsheng Shan** (Ph.D. 1990, Nebraska) both working with Professor Sellmyer. **David N. McIlroy** (Ph.D. 1993, Rhode Island) and **Jiandi Zhang** (Ph.D. 1994, Syracuse) are Research Assistant Professors working with Professor Dowben.

Research Associates during the 1995-96 academic year are **Alexander Boune** (Ph.D. 1992, Moscow Institute of Crystallography) working with Professor Ducharme, **Seong-Don Hwang** (M.S. 1991, Syracuse) and **Charles Hutchings** (Ph.D. 1994, Heidelberg University), working with Professor Dowben and Professor Sellmyer, **Martin Johnston** (Ph.D. 1993, Univ. of California, Riverside) working with Professor Timothy Gay, **Ruolin Li** (Ph.D. 1995, University of Mainz) working with Professor John Hardy, **J. Ping Liu** (Ph.D. 1995, U. of Amsterdam) working with Professor Sellmyer, **Ying Lu** (Ph.D. 1995, University of Tsukuba-Ibaraki) working with Professor Samson, **Mircea Marinescu** (Ph.D. 1995, Bucharest University) working with Professor Starace, **Kenneth W. McLaughlin** (Ph.D. 1995, Nebraska) working with Professor Jaecks, **Christopher Moore** (M.S. 1992, UNL) working with Professor Fuller, **Brian Patterson** (Ph.D. 1991, University of Delaware) working with Professor Sellmyer, **Vicki Plano-Clark** (M.S. 1993, Michigan State) working with Professor Fuller, **Renat Sabiryanov** (Ph.D. 1993 Institute of Chemistry of Solids, Ekaterinburg, Russia) working with Professor Jaswal, **Wayne Stolte** (Ph.D. 1994, Nevada-Reno), working with Professor Samson, **Qiaoling Wang** (Ph.D. 1991, Louisiana State University) working with Professor Starace, and **Orhan Yenen** (Ph.D. 1986, Nebraska) working with Professor Jaecks.

Chun Ping Luo (M.S. 1990, Chinese Academy of Sciences) is a Visiting Research Assistant with Professor Sellmyer.

1994 Fall Semester Colloquia

September 1: Professor Thomas A. Morgan, University of Nebraska
"Berry Phase: A Fundamental Insight to Quantum Mechanics"

September 8: Professor Laurie Fathe, Occidental College, Los Angeles
"Science Policy Directions Through the Year 2000"

September 15: John Kelty and Brian Farleigh, University of Nebraska
"Summer on Ice: Scientific Exploration of the 3km Thick Greenland Icecap"

September 22: Professor Michael E. Fisher, University of Maryland
"Critical Phenomena and the Symmetries of Space"

September 29: Professor Louis A. Bloomfield, University of Virginia-Charlottesville
"Magnetic Order in Clusters of Rhodium and Other Metals"

October 6: Professor Priscilla W. Laws, Dickinson College, Pennsylvania
"Using the Outcomes of Physics Education Research to Improve Curriculum"

October 13: Dr. Yves U. Idzerda, Naval Research Laboratory
"Interaction of Light and Magnetic Films"

October 20: Dr. Eric Chason, Sandia National Laboratories
"Roughening Instability and Enhanced Surface Transport on Sputtered Surfaces"

October 27: Dr. Peter J. Feibelman, Sandia National Laboratories
"Atomic Valence and Surface Energetics"

November 3: Professor Bruce Harmon, Iowa State University
"Something Old, Something New, Something Borrowed, Something Blue: Magneto–Optics"

November 10: Dr. Ronald H. Ono, National Institute of Standards and Technology
"Fundamental Physics and Applications of Superconducting Electronics"

November 17: Professor David W. Duquette, University of Nebraska
"Still Life With Atoms: Taking a Picture of Atomic Processes with Nanosecond Laser Pulses"

December1: Dr. Goetz H. Oertel, Association of Universities for Research in Astronomy (AURA)
"AURA and the National Astronomy Centers: Issues and Outlooks"

1995 Spring Semester Colloquia

January 19: Leo Jablonski, Lincoln General Hospital
"Job Opportunities for a Physicist in Medicine"

January 26: Dr. Paul M. Borsenberger, Eastman Kodak Co.
"Charge Transport in the Disordered Molecular Solid State"

February 2: Dr. David McIlroy, University of Nebraska
"The Past, Present, and Future of Non-Metal to Metal Transitions"

February 9: Dr. Mark Markes, Kaman Sciences Corporation
"The Effects of Nuclear-Weapon Generated X- Rays on Satellites and Missiles"

February 16: Dr. Orhan Yenen, University of Nebraska
"Charge Circulation and Shapes of Temporary Atomic Magnets Formed in Collisions"

March 1: Professor Tai-Chang Chiang, University of Illinois at Urbana-Champaign
"Quantum-Well States in Layered Metallic Materials"

March 2: Professor Bruce A. Sherwood, Carnegie Mellon University
"A New Approach to Introductory Calculus-Based Electricity and Magnetism"

March 9: Professor Roscoe C. Giles, Boston University
"Large-Scale Simulations of Magnetic Recording and Magneto-Optic Media"

March 30: Professor Kay Kinoshita, Virginia Polytechnic Institute and State University
"b-Quark Physics from the Cornell Electron-Positron Collider"

April 6: Professor Phillip M. Duxbury, Michigan State University
"Coalescence and Percolation: The Growth Morphology of Thin Metal Films"

April 13: Dr. Jabez J. McClelland, National Institute of Standards and Technology
"Nanofabrication Using Atom Optics"

April 20: Dr. Warren E. Pickett, Naval Research Laboratory
"Regularities Among the Classes of Superconductors: Are there any?"

April 27: Dr. George Carruthers, Naval Research Laboratory
"Ultraviolet Space Astronomy"

1994 Faculty Publications

ASTRONOMY AND ASTROPHYSICS

C.M. Gaskell, "Structure and Kinematics of the BLR: What We Have Learned and Where We Are," *Reverberation Mapping of the Broad Line Region in Active Galactic Nuclei*, edited by P.M. Gondhalekar, K. Horne, and B. M. Peterson (Astronomical Society of the Pacific Conference Series, Vol. 69), p. 111 (1994).

C.M. Gaskell, "Supernova 1994W in NGC 4041," International Astronomical Union Circular No. 6048 (1994).

G.A. Reichert,... **C.M. Gaskell**, et al., "Steps Toward Determination of the Size and Structure of the Broad Line Region in Active Galactic Nuclei. V. Intensity Variations of the Ultraviolet Continuum and Emission Lines in NGC 3783," Astrophysical Journal, **425**, 582 (1994).

K.C. Leung, "Ancient Astronomical Instruments in China," *Oriental Astronomy from Guo Shoujing to King Sejong*, edited by F.R. Stephenson and I.S. Nha (Seoul: Kyoungshin 1994).

Y. Lu and **K.C. Leung**, "The Tian Yuan Fa Wei By Bao Yulong," *Oriental Astronomy from Guo Shoujing to King Sejong*, edited by F.R. Stephenson and I.S. Nha (Seoul: Kyoungshin 1994).

K.C. Leung, "The Need for Medium Sized Astronomical Facility in the Pacific Region," Third United Nations/ European Space Agency Workshop on Basic Space Science, edited by H.J. Haubold (New York: AIP 1994).

K.C. Leung and D.Q. Zhou, "Contact Systems With Large Temperature Differences Between Components," Third United Nations/ European Space Agency Workshop on Basic Space Science, edited by H.J. Haubold (New York: AIP 1994).

G.R. Carruthers, B.C. Dohne, K.K. Shephard, S.A.C. Reed and **E.G. Schmidt**, "Photometric Calibrations of the AFP-675 Far Ultraviolet Cameras Experiment," Proceedings of the Society of Photo-Optical Engineers **2282**, 184 (1994).

S.N. Goderya and **E.G. Schmidt**, "Be Stars in Young Clusters," Astrophysical Journal **426**, 159 (1994).

N.R. Simon and S.M. Kanbur, "Opacity, Metallicity and Cepheid Period Ratios in the Galaxy and Magellanic Clouds," Astrophysical Journal **429**, 772 (1994).

S.M. Kanbur and **N.R. Simon**, "Comparative Pulsation Calculations with OPAL and OP Opacities," Astrophysical Journal **420**, 880 (1994).

D.J. Taylor, "Behlen Observatory Annual Report," Bulletin of the American Astronomical Society **26**, 1 (1994).

ATOMIC, MOLECULAR AND OPTICAL PHYSICS

K. Bartschat, A.R. Johnston and **P.D. Burrow** , "Evidence for the $(6p^2)\ ^3P_2$ Resonance in Electron Scattering from Caesium Atoms," Journal of Physics B **27**, L231 (1994).

D.M. Pearl and **P.D. Burrow**, "Dissociative Attachment in Selected Monochloroalkanes," Journal of Chemical Physics **101**, 2940 (1994).

Dongjin Byun, Sunwoo Lee, Yong-Feng Hu, G.M. Bancroft, Seong-Don Hwang, J.A. Glass, Jiandi Zhang, J.T. Spencer, Jian Ma and **P.A. Dowben**, "Photoemission from Gaseous and Condensed Molecular Carborane Cluster Molecules," Journal of Electron Spectroscopy and Related Phenomena **69**, 111 (1994).

I.I. Fabrikant, D.M. Pearl, **P.D. Burrow** and **G.A. Gallup**, "Dissociative Attachment in CH_3Cl and C_2H_5Cl: Experiment and Theory," *in Electron Collisions with Molecules, Clusters and Surfaces*, edited by H. Ehrhardt and L.A. Morgan (Plenum Press, New York, 1994), pp. 119-125.

I. Fabrikant, "Semiempirical Calculations of Inelastic Electron-Methylchloride Scattering," Journal of Physics B **27**, 4325 (1994).

M.T. Frey, S.B. Hill, X. Ling, K.A. Smith, F.B. Dunning, and **I.I. Fabrikant**, "Inelastic Electron-Dipole-Molecule Scattering At Sub-Millielectronvolt Energies: Role of Dipole-Supported States," Physical Review A **50**, 3124 (1994).

I.I. Fabrikant, "Photodetachment From the S– and Cl– Ions in a Static Electric Field and Low-Energy Electron Scattering by the S and Cl Atoms," Journal of Physics B **27**, 4545 (1994).

V.D. Irby, **T.J. Gay**, J.T. Park, S.W. Bross, and A.D. Gaus, "Superelastic and Inelastic He^{2+} + He State-Selective Electron Capture," Physical Review A **50**, 2292 (1994).

T.J. Gay, J.A. Brand, M.C. Fritts, J.E. Furst, M.A. Khakoo, E.R. Mell, M.T. Sieger, and W.M.K.P. Wijayaratna, "Clean Ultra-High Vacuum from Single-Structure Diffusion Pumps," Journal of Vacuum Science and Technology **12**, 2903 (1994).

G. Csanak, S. Trajmar, J.C. Nickel, G.F. Hanne, J.W. McConkey, **T.J. Gay**, and M.A. Khakoo, "Comments on the Percival-Seaton Hypothesis," Comments on Atomic and Molecular Physics **30**, 165 (1994).

A.D. Gaus, W.T. Htwe, J.A. Brand, **T.J. Gay**, and M. Schulz, "Energy Spread and Ion Current Measurements of Several Ion Sources," Review of Scientific Instruments **65**, 3739 (1994).

B.W. Moudry, O. Yenen and **D.H. Jaecks**, "Alignment and Orientation of Ar^+ in He^+ – Ar Collisions," Zeitschrift fuer Physik D **30**, 199 (1994).

D. Calabrese, O. Yenen, L.M. Wiese, and **D.H. Jaecks**, "A Two–Stage Parallel–Plate Analyzer for Simultaneous Detection of Positive, Negative, and Neutral Particles," Review of Scientific Instruments **65** (1), 116 (1994).

D. Calabrese, L. M. Wiese, O. Yenen, **D.H. Jaecks**, "Identification of Inelastic Processes in H–He Collisions Using L_α–Photon–Particle Coincidence Techniques," Physical Review A **50**, 4899 (1994).

Yong-Ki Kim and **M.E. Rudd**, "Binary-Encounter-Dipole Model for Electron-Impact Ionization," Physical Review A **50**, 3954-67 (1994).

Mitio Inokuti and **M. Eugene Rudd**, "Secondary Electrons Resulting From Charged-Particle Interactions," ICRU News, (Published by the International Commission on Radiation Units and Measurements in Aachen, Germany, Dec. 1994).

J.A.R. Samson, Z.X. He, L. Yin, and G.N. Haddad, "Precision Measurements of the Absolute Photoionization Cross Sections of He," Journal of Physics B **27**, 887 (1994).

M.D. Daybell, M.A. Gruntman, D.L. Judge, and **J.A.R. Samson**, "A Rare Gas Optics Free Stable EUV Photon Spectrometer for Solar Systems Studies," Optical Engineering **33**, 445 (1994).

J.A.R. Samson and G.N. Haddad, "Total Absorption Cross Sections of H_2 From 18 To 113 eV," Journal of the Optical Society of America **11**, 277 (1994).

J.A.R. Samson, Z.X. He, R.J. Bartlett, and M. Sagurton, "Direct Measurement of He^+ Ions Produced by the Compton Effect Between 2.5 keV and 5.5 keV," Physical Review Letters **72**, 3329 (1994).

C. Pan, **A.F. Starace**, and C.H. Greene, "Parallels Between Highly Doubly Excited State Spectra in H^- and Li^- Photodetachment," Journal of Physics B **27**, L137 (1994).

N.Y. Du, **A.F. Starace**, and M.Q. Bao, "Photodetachment of the $2p^2$ ($^3P^e$) State of H^-," Physical Review A **50**, 4365 (1994).

CONDENSED MATTER PHYSICS

Sunwoo Lee and **P.A. Dowben**, "The Properties of Boron Carbide/Silicon Heterojunction Diodes Fabricated by Plasma–Enhanced Chemical Vapor Deposition," Applied Physics A **58**, 223 (1994).

Jiandi Zhang, Dongqi Li and **P.A. Dowben**, "Electronic Properties of Metallic Hg Monolayers on W(110)", Journal of Physics: Condensed Matter **6**, 33 (1994).

Dongqi Li, **P.A. Dowben**, J.E. Ortega, and F.J. Himpsel, "Unoccupied Surface Electronic Structure of Gd(0001)," Physical Review B **49**, 7734 (1994).

Hong Zeng, Dongjin Byun, Jiandi Zhang, G. Vidali, M. Onellion and **P.A. Dowben**, "Adsorption and Bonding of Molecular Icosahedron on Cu(100)," Surface Science **313**, 239 (1994).

Dongjin Byun, Seong–don Hwang, **P.A. Dowben**, F. Keith Perkins, F. Filips, and N.P. Ianno, "Heterojunction Fabrication by Selective Area Chemical Vapor Deposition Induced by Synchrotron Radiation," Applied Physics Letters **64**, 1968 (1994).

Jiandi Zhang, D.N. McIlroy and **P.A. Dowben**, "Changes in Localization, and Density of States Near EF Across the Nonmetal–Metal Transition in Mg Overlayers," Physical Review B **49**, 13780 (1994).

Jiandi Zhang, Dongqi Li and **P.A. Dowben**, "The Layer by Layer Growth of Hg on W(110)," Journal of Vacuum Science and Technology A **12**, 2190 (1994).

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HIGH ENERGY PHYSICS

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New Research Grants and Contracts

during the period 1 November 1994 - 31 October 1995 the following new and renewal grants and contracts were received by our faculty

Principal Investigator	Title (Source of Funds)	($ Thousands)
Burrow	Electron Scattering Studies of Temporary Anion Formation in Hydrocarbons (NSF)	94.0
Dowben	Metallicity of Surfaces/Metal Thin Film Overlayers (NSF)	75.0
Dowben	Fabrication & Characterization of Micron Scale Ferromagnetic Features (DOE)	133.0
Dowben	Fabrication and Characterization of Nanoscale Structures Using Advanced Scanning Probe Technologies (MMES)	35.0
Ducharme	Engineering Research Equipment: Pulsed Laser System for Dynamical Studies of Photonic Materials (NSF)	32.8
Ducharme	Real Time Space Materials Degradation Monitor Using Ellipsometer: Extension (WC)	27.1
Fabrikant	Atomic Processes Involving Negative Ions (NSF)	60.0
Fuller	CD-ROM Toolkit (NSF)	273.5
Fuller	Teaching Physics Using Interactive Digitized Media (NSF)	2.5
Fuller	Research and Development in Hypermedia for Knowing Physics (NSF)	112.5
Fuller	Thinking and Doing Physics: An Institute for Crossover Physics Teachers in Small Schools (CCPE)	63.3
Fuller/Plano-Clark	Integrating Multimedia-Based Activities into University Physics Laboratories (NSF)	40.0
Gaskell	A Study of Emission Line Profiles in Low Redshift Quasars (STSI)	69.7
Gay	Polarized Electron-Atom Collision (UM-R)	13.4
Gay	Polarized Electron Physics (NSF)	172.4
J.R. Hardy	First Principles Theoretical Studies of Ferroelectric Lattice Instabilities (ONR)	50.0
J.R. Hardy	Microwave Optics of Ionic Molecular Solids: Theory and Development (ARO)	85.0
Jaecks	Research Experiences for Undergraduates (NSF)	10.0
Jaecks	Experimental Study of Collective Motion, Charge Distributions and Bound-Free Electron Correlations in Unusual State of AR: Correlation Studies Of...(NSF)	180.0
Katz	Theory of Biological Effectiveness (DOE)	42.0
Leslie-Pelecky	Strengthening Graduate Education in Science and Engineering Through Systemic Involvement in Research and Outreach Activities (NSF)	152.1
Leslie-Pelecky/ Ducharme	Summer Research Experience for Undergraduates in Nanostructured Materials Research (NSF)	60.0
Liou	Structural Defects and Interface in HG- and TL-Based Superconducting Films (MSC)	25.0
Liou	Structural Defects and Interface in HG- and T1-Based Superconducting Films (MSC)	85.0
Samson	Interaction of Radiation with Planetary Gases (NASA)	51.0
Samson	Photoionization Studies of Atoms (NSF)	116.2
Samson	Ultraviolet and X-Ray Bombardment of Planetary Atmosphere (NSF)	75.0
Sellmyer	Fundamental Studies of Novel Permanent-Magnet Materials (DOE)	75.0
Sellmyer	Surface Studies of Metal Film Resistors (Dale)	5.0
Sellmyer	Ultra High Density Recording: Optical Recording Component; (IIIA)Blue Sensitive Optical Recording Media Subcomponent (NSIC/ARPA)	33.0
Sellmyer	Tailored Magnetic Materials (UC)	55.0
Sellmyer	Acquisition of a Physical Property Measurement System (UNF)	44.6
Sellmyer/ Woolam	Magnetism and Magneto-Optics of Artificially-Structured Materials (NSF)	70.0
Sellmyer	Materials Research on Nano-Structured and Complex Systems (EPSCoR)	1,049.4
Simon	A Test of New Radiative Opacities and Their Incorporation into Improved Cephid Pulsation Models (NASA)	18.4
Snow	High Energy Physics at the CERN Laboratory (UNF)	4.7
Starace	Coherent Control of Continuum Quantum Processes (NSF)	75.0
Starace	Dynamics of Collision Processes (DOE)	66.0
Taylor	REU Supplement to AST-8815806 (NSF)	3.4
Weymouth	Geophysical Studies of Hopewell Sites in Ohio (NPS)	5.0
Weymouth	Lewis & Clark Lower Portage Camp (MSU)	3.3
	Total	**$3,643.3**

ARO - Army Research Office
Dale - Dale Electronics
CCPE - Coordinating Commission for Postsecondary Education
DOE - Department of Energy
EPSCoR - Experimental Program to Stimulate Competitive Research
MMES - Martin Marietta Energy Systems, Inc.
MSC - Midwest Superconductivity Consortium
MSU - Montana State University
NASA - National Aeronautics and Space Administration
NPS - National Park Service
NSF - National Science Foundation
NSIC/ARPA - National Storage Industry Consortium/ Advanced Research Projects Agency
ONR - Office of Naval Research
STSI - Space Telescope Science Institute
UC - University of Chicago
UM-R - University of Missouri-Rolla
UNF - University of Nebraska Foundation
WC - Woollam Company