Spectrum

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

No.18 Fall 1997 Anthony F. Starace, Editor

Doudin Joins Department

Bernard Doudin

The Department welcomed new Assistant Professor **Bernard Doudin** to its ranks this August. Doudin is a condensed matter experimentalist who has done some very novel work in nanostructured magnetic materials. He earned the Ph.D. degree from the University of Lausanne in 1991 for his investigations of structural phase transitions and modulated phases in organo-metallic compounds. During his dissertation research, he collaborated with well-known theoretician Volker Heine (Cambridge University) on the theoretical aspects of this work and carried out parts of his experimental work at Grenoble (neutron diffraction) and ETH-Zürich (high-sensitivity x-ray diffraction). Bernard subsequently joined Professor J.-Ph Ansermet's group at École Polytechnique Fédérale de Lausanne, where he created a new laboratory dedicated to the study of magnetic and transport properties of cluster-assembled materials. He has since become a leader in the fabrication of interesting and novel nanostructured materials using electrodeposition in nanoporous membranes. He recently collaborated with Professor B. Barbara's group (Laboratoire de Magnétisme Louis Néel in Grenoble) to publish an article entitled *Measurements of magnetization switching in individual nickel nanowires* (Phys. Rev. B **55**, 11552 (1997)), which is probably the definitive work to date on magnetization reversal in fine wires. His most recent publication (*Magnetoresistance governed by fluctuations in ultrasmall Ni/NiO/Co junctions*, Phys. Rev. Letters **79**, 933 (1997)) revealed an unusual hierarchical structure in the magnetoresistance fluctuations of a tunnel junction.

Bernard is currently setting up his new laboratory, where he will continue to fabricate and study interesting nanostructured magnetic materials. We wish to welcome Bernard and his family (wife Donatella, children Marco and Shanti) to our Department.

Royal Society honors Dowben

An Arts and Sciences physicist presented his theories about the insulating properties of metals to the prestigious Royal Society on April 11 in London. "It's something I may never have the opportunity to do again," said Professor **Peter Dowben**. "It's a tremendous honor." Founded in 1660, the Royal Society is Great Britain's oldest scientific society, and one of the world's most respected. Christopher Wren wrote the preamble to its charter; Issac Newton, James Halley and Joseph Glanville are among its other distinguished alumni.

Peter Dowben

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Reaching the peak of academic excellence

Jeremy Vetter's first interview with the Rhodes Scholarship trustees, in Kansas City last December, went smoothly. Then they called him back for a second one. "It was the most grueling interview I've ever undergone, by far," said Vetter, who will earn an Arts and Sciences degree in May. "There were times when they'd ask me a question and I'd just stare down at the table for 20 seconds before I could say a word. I'm a risk-taker academically. I like to take courses that are a little bit beyond my background. That interview was really difficult, but you have to have no fear." Vetter's fearlessness paid off that December morning when he and 31 other young Americans were selected as Rhodes Scholars. He will spend the next two or three years

Jeremy Vetter

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Chairman's Letter


Roger D. Kirby

This has been another interesting year at UNL. Our research efforts continue unabated, with many faculty successfully obtaining renewals of existing proposals and with several new research initiatives being undertaken. The numbers of publications and invited talks at conferences continue to increase, suggesting that our faculty is becoming increasingly productive and visible in the physics/astronomy community. We have also hired one new faculty member in experimental condensed matter physics [see article on Bernard Doudin], and a search is underway for a new Assistant Professor in experimental atomic physics. Thus our research activity continues to increase. However, the College of Arts and Sciences is now directing all departments to place more emphasis on undergraduate education, and thus our efforts have increased to deliver the highest quality educational progams.

In a University-wide reallocation of funds last spring, the University shifted considerable funds to strengthen the Honors program; as a consequence the Department is now offering Honors sections of Physics 211 and 212 and Astronomy 103, and our list of Honors offerings will be further expanded over the next few years. While the Honors program is directed largely at identified high-ability students, it may also lead to more rigorous upper division courses since a significant subset of our students will likely be better prepared. In conjunction with this, the Department will also seek to expand our efforts to give our undergraduates a significant research experience. As many of you know, a sizable fraction of our undergraduates has been involved in research, either as paid employees or through undergraduate research courses. Many students have reported that a research experience was one of the best parts of their undergraduate education, so we hope to be able to expand participation in the near future. We have of course gained additional experience in doing this with our NSF-funded Research Experience for Undergraduates program, directed by Professors Leslie-Pelecky and Ducharme.

Brian Foster, Dean of the College of Arts and Sciences, has established the Math/Science Education Area of Strength (M/SAoS). This college-funded initiative is intended to improve Math/Science instruction throughout the campus and is expected to foster increased collaborations between departments in educational initiatives and research. The Department expects to play a significant role in this new venture, as the Department Chair is automatically a member of the Steering Committee of M/SAoS. Those faculty with significant programs in education and outreach (currently Professors Fuller and Leslie-Pelecky) are members of the Program Committee. The M/SAoS also supports conferences on education. Last spring, it held a conference devoted to graduate education, with science and math faculty from around the country attending. Representatives from industry also attended to inform us of what is expected of their new employees. A similar conference on undergraduate education will be held this coming June.

UNL is also instituting Outcomes Assessment procedures in all educational programs. Thus far, we have developed an assessment plan for our undergraduate majors which included first establishing learning objectives for each majors course, and then developing multiple ways of assessing whether or not the students have achieved the learning objectives. The primary motivation for developing an Outcomes Assessment procedure is to find ways of improving our programs. This has proven to be a fair amount of work, and we hope that we learn enough to justify it. This year, we also have to establish Outcomes Assessment procedures for our graduate programs. This will in some ways be easier, as student achievement is already assessed through Qualifying and Comprehensive examinations, and through dissertations and publications. It should be noted that one component of these assessment efforts will be alumni surveys, so should you receive one, please give us your honest comments.

We recently hosted a Project Kaleidoscope Workshop entitled *Undergraduate Physics Curricula: What Works and What Needs to be Done*. Professor Leslie-Pelecky was the local organizer for the workshop, and Visiting Professor Robert Hilborn (*Lisa and Amanda Cross Professor of Physics* at Amherst College) also helped with organization. The workshop was attended by teams of physicists from about 30 universities and colleges across the nation. Donal Burns (*Associate Executive Vice President and Provost, as well as Professor of Physics*) gave the welcoming address, and Professors Ducharme, Fuller and Snow all gave presentations at the workshop. The UNL team included Professors Claes, Ducharme, Robert Hardy, and Schmidt.

As a consequence of programs like the PKAL Workshop, it appears that a "mini-revolution" is beginning to take place in the classroom. Evidence is mounting that physics students learn better if they are actively engaged during classroom time, and APS and AAPT are both working hard to encourage faculty across the nation to use active engagement/peer instruction techniques (I should note that Bob Fuller has been telling us this for years, but we hardly paid any attention. Now that physicists outside the university are telling us this, we seem to be more receptive). Several faculty are now making significant use of active engagement/peer instruction techniques, even in our large introductory courses. While it is too early to report assessment of learning, faculty using these methods report improved student participation and interest. It should be noted that while our younger faculty (particularly Professors Leslie-Pelecky and Claes) are perhaps leading us in these directions, some of our "more mature" faculty are also embracing these techniques.

The Department is also considering the adoption of several "tracks" for physics majors. Our current B.S. program is really designed for those students who continue on to the Ph.D. degree in physics. Historically however, only about 15% of B.S. graduates eventually obtain a Ph.D. degree in Physics or Astronomy, and the

question arises as to whether our program could better address the needs of those students who wish to enter the work force or professional school directly after the baccalaureate degree. To this end, we are considering possible new "tracks" for majors, including an Applied Physics track, a Pre-Medical track, and possibly a Computational Physics track. For example, in the Applied Physics track, a student might substitute courses in materials science, applied optics, or directed research for a few of our currently-required upper-division physics courses. Students enrolled in an Applied Physics track should obtain a broader education in the knowledge and methods of modern technology, but at the expense of depth in their traditional physics education. Such a trade-off might be what some students desire. You can be of help in this regard. If you chose to seek employment directly after the baccalaureate degree, please write me a letter (or send an e-mail to me: rdk@unlinfo.unl.edu) with your thoughts and experiences on this issue.

Finally, let me note that we have been selected as Host Institution for the AAPT 1998 summer meeting to be held August 3rd–8th. Our designation as Host Institution was largely due to the efforts of Professors Leslie-Pelecky and Fuller and Visiting Professor Hilborn (who is immediate Past President of the AAPT). AAPT expects about 1200 attendees at the meeting, and many UNL alums are already planning to attend.

I encourage you to think of the Summer 1998 AAPT meeting as a chance for a homecoming of sorts. You will have the opportunity to return to your "roots," be surrounded by physicists and astronomers from all kinds of institutions, and see the changes which have taken place in the University, the Department, and the City of Lincoln. Begin your plans now. Inexpensive housing will be available in on-campus dorms. The Department of course will plan some special events for alums and their families. If you are able to attend, please send me a note so we can better plan our programs.

Finally, I urge you to keep in touch with us, even if only through a short note, phone call, or e-mail. For your convenience you will find enclosed with this mailing an information card and return envelope to inform us of your activities. We also enjoy seeing you when you are in Lincoln and, with some advance notice, can give you a tour of the Department so you can see the changes that have occurred. Best wishes until next year.

Sincerely,

Roger D. Kirby

Roger D. Kirby
Professor and Chair

CMRA Turns Ten


David J. Sellmyer

Centers provide channels for new knowledge to flow meaningfully to the service of society. They also enable and foster excellent education, creating bonds between learning and inquiry so that students can share the joy of discovery and creativity and researchers can engage more fully with the learning process. Centers are places where research, knowledge transfer and education intermingle and enrich each other. Centers are not so much an entity or place as they are a process with a home address. Like a magnet, they draw together resource–physical and human–to form the critical mass of interactions necessary for progress.

... Neal Lane, NSF Director, Oct. 28, 1997

These words of Neal Lane well describe the aspirations of the Center for Materials Research and Analysis (CMRA), which will turn ten years old at the end of the 1997-98 academic year. CMRA was founded by the Board of Regents as the result of the Nebraska Research Initiative (NRI). The Nebraska state government started NRI in 1988 in response to U.S. West's search for a site for its new laboratory, and in recent years UNL has been receiving about $8 million per year for work in several areas including materials.

The *mission* of CMRA is to provide for the State of Nebraska and the University of Nebraska a nationally recognized center of excellence in Materials Research Science and Engineering. CMRA's *goals* are to: perform and publish world-class research; educate students in the relevant scientific and engineering disciplines; promote interdisciplinary group and single-investigator grants to improve UNL's national research competitiveness; and to contribute to the economic development of Nebraska through industrial collaborations, spin-offs, materials analyses, and tech transfer to companies.

In the first nine years of CMRA's existence, 1890 papers were published, and 187 M.S. degrees and 116 Ph.D. degrees were awarded under the supervision of CMRA faculty. In 1988 there were about 40 faculty in CMRA with about $1.2 million per year in research expenditures. By 1996-97, these numbers had grown to 66 faculty and $7.3 million per year, respectively. A strength of the Center is its rather broad research purview, with participation by a wide variety of science and engineering faculty. The major departments participating in CMRA are Chemical Engineering (7 faculty), Chemistry (16), Electrical Engineering (8), Engineering Mechanics (7), Mechanical Engineering (8), and Physics (16). Since 1988 some 27 materials research faculty have been hired, many of them receiving significant setup funds from CMRA. About 151 graduate students, 8

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CMRA Turns Ten (continued from page 3)

undergraduate students, 30 postdocs or visiting scientists, and 4 technical staff are involved in research in the Center. The state-aided portion of the budget is devoted mainly to external grant matches, operation of Central Service Facilities such as Electron Microscopy, X-Ray Materials Characterization, etc., new faculty startup, and partial salaries of several recently-hired faculty.

The research thrust areas of CMRA include: Nanostructured Materials and Complex Systems, Materials Research for Information Technologies, Molecular Design of Advanced Materials, Mechanics and Processing of Materials, Cluster Science and Applications, and Biomolecular Materials Science. The sources of CMRA's research budget are 74% federal grants, 16% state/university, and 10% industry/private sector. Thus the ratio of external to state funding is 5.3, which is excellent for a UNL research center.

In addition to its research focus, CMRA is heavily involved in education, human-resource development, and outreach. It provides a multidisciplinary graduate education with excellent career opportunities in academia or the private sector. It has promoted a highly successful, NSF-supported Research Experiences for Undergraduates (REU) Program for 3 years. This brought about 18 students from all over the country to UNL for 10 weeks of research, technical and professional-development seminars, and fun. The program included approximately 50% women and minority students. CMRA also has promoted ScienceWorks, a nationally recognized, NSF-funded outreach program that uses innovative, interactive programming to share science with the public. CMRA faculty also are involved in an effort to create an interdepartmental graduate degree program in materials science and engineering.

An important component of CMRA's mission is industrial collaboration and technology transfer. It aims to utilize industrial expertise in planning and carrying out research, provide students and faculty the opportunity to better understand industrial needs, effectively transfer university research to companies, and build relationships that promote long-term high-tech development in Nebraska. CMRA faculty have many industrial interactions and joint R & D efforts with materials-technology companies, including more than 14 in Nebraska and 11 nationally. Since 1988 CMRA faculty have generated some 21 invention disclosures, 10 patent filings, and 5 patent issuances.

Among the major goals of CMRA is the promotion of longer and larger center and group grants. Examples of these already underway are: Nanostructured Materials (NSF), Extremely High-density Magnetic Recording (NSIC), Midwest Superconductivity Consortium (DOE), and Advanced Magnetic Materials Initiative (DOD). Proposals are pending on a DOD Advanced Magnets Consortium and an NSF/NSIC Consortium on Frontiers of Magnetic Recording. In FY 1995-96 CMRA's share of UNL's external research funding was 16%; it seems clear that growth of research in materials helped UNL to achieve recently Carnegie I Research University status.

In the recent UNL Delphi reputational survey, Materials Science and CMRA were ranked among the top 15 departments/areas of strength. Materials science also is among the highest UNL and University of Nebraska priorities for new research funding and capabilities. In the United States Congress there are growing bipartisan efforts to increase federal support for science, including information and materials sciences, and biotechnology among others. Thus conditions seem auspicious for healthy growth of materials research at UNL for the foreseeable future.

-David J. Sellmyer

Reaching the Peak (continued from page 1)

studying at Oxford University, all expenses paid.

Vetter (BS 1997), excited and surprised to receive the nation's highest undergraduate honor, said Oxford will be "another challenge." The challenges he set for himself at UNL included majoring in six fields: physics, history, philosophy, political science, economics and psychology (and maybe anthropology, which he is now minoring in). By the time he graduates he will have earned between 280 and 290 credit hours, more than twice the number needed to graduate. He has channeled his multiple interests into his senior honors thesis, which studies the influences of 20th century theoretical physics on the social sciences. Vetter will continue studying the relationships between science and other disciplines at Oxford, where he will earn his degree in either the history of science or the philosophy of science. As a Rhodes scholar, Vetter will earn an M.A. from Oxford; he may stay to earn a Dph, the British equivalent of the Ph.D. His goal is to teach at an American university or college.

Academic and intellectual excellence are the primary qualities applicants for the Rhodes must have, but social awareness and leadership skills also are important. "They won't choose you unless you're a leader or involved in social issues," said Vetter, who is active in many academic, religious, and social causes. He has served as president of UNL's Student Board, an advocacy group for honors students; was a Nebraska delegate to the United Methodist Church's General Conference in Denver; and is an active opponent of domestic abuse and the death penalty and a supporter of gay and human rights.

While the majority of Rhodes Scholars are chosen from Ivy League schools—only six of this year's 32 recipients came from state universities—and UNL has not had a recipient in over 20 years, Vetter believes his UNL education is as good as he would have gotten anywhere. "The University of Nebraska is the kind of place that has the resources and the outstanding faculty if you go looking for them," he said. "I think you can get an outstanding education here if you're willing to apply yourself and search out those challenging courses."

Rhodes scholars receive about $20,000 a year, which covers tuition, fees, room and board allowance, and travel expenses.

–Andy Nelson

Reprinted from the Spring 1997 issue of Columns, *the College of Arts and Sciences Alumni Nuewletter.*

Research Highlight: On the Nature of Metals and Insulators

Editor's Note: The number of scientific articles being published by our atomic, condensed matter, and high energy physics groups in letters journals and as rapid communications has become too great for us to summarize the key results, even briefly, as done in the past. We are therefore becoming more selective. This year, we discuss the work of Professor Peter Dowben's group, which led to his invitation to speak before the Royal Society, as reported elsewhere in this issue.

The problem of when a material is a good conductor of electricity has long fascinated physicists. Normally metals are good conductors, whereas nonmetallic materials such as wood, plastic, glass, and jewels such as emeralds and diamonds are not very good conductors. Dowben's group has shown that many materials generally considered to be metals may, under special circumstances, become insulators. A consequence of his discoveries is that there is strong support for the idea that the surface of many metals may not be metallic at all. This was first suggested by two theorists (A.R. Miedema and J.W. F. Dorleijn) in 1981, but has been very difficult to prove. Dowben's experiments have consequently changed the way physicists look at metals and provoked considerable discussion. The results are also very important to developing deeper understanding of the fundamental origins of magnetism, as the transition from metallic behavior to insulating behavior is often related to the appearance of magnetism in many materials.

Dowben's work became possible through the development of a relatively unusual spectroscopy, resonant photoemission. This spectroscopy allows one to probe how easily electrons move on the surfaces of solids composed of different specific elements. Such indirect measurements are the only probe one has of conductivity in the top layer of atoms in a solid. More specifically, resonant photoemission is sensitive to the "free" electron density (an indicator of metallic behavior) in a great number of elements in a solid. What is actually measured is the Thomas-Fermi (TF) electron screening length, and various models are used to derive the corresponding free electron density. [A graduate student in the group, Jiandi Zhang, won the Sigma Xi graduate student award for using the technique to confirm experimentally the Brickman-Rice theorem (1970) that the TF screening length of an electron in a solid depends on the square root of the electron's effective mass.] Dowben's group has successfully applied this spectroscopy to Hg, Ba, Mg, and Mn. The measurements have shown that the nonmetal to metal transition of a thin film does not follow what is generally expected theoretically (according to the so-called Mott-Hubbard model). There are also examples in which the expected perturbations of the nonmetal to metal transition from the surrounding media are either small or cannot be observed. This is important because it is known that such transitions can occur for thin films even when these are located on metallic substrates.

The new experimental results Dowben's group has obtained have allowed the field to progress. They have laid to rest some controversial questions that have troubled the research community for 25 years. They have also shown to theoreticians some new directions for research. Practical applications are also not out of the question eventually. This work certainly has relevance to the development of new semiconductor devices, which are the basis for integrated circuits and computer chips. Finally, this work relates to questions that have already resulted in two Nobel prizes: the 1977 prize to Nevil Mott and P.W. Anderson and the 1981 prize to K. M. Siegbahn.

Dowben Honored (continued from page 1)

The Society conducts twelve conferences per year, with twelve to fifteen speakers at each conference. Speakers and participants do not apply for admission, but are invited. Dowben received an e-mail in August 1996 asking him to participate, and his invitation arrived by mail in December. Lecturing in front of the Royal Society was a homecoming of sorts for Dowben. He went to high school in Europe and earned his Ph.D. in physics from Cambridge University. While there, he hired Stephen Hawking's secretary to type his dissertation....

Dowben characterized his talk as a "lecture plus interrogation." The Royal Society's conferences are structured differently from American conferences; more time is allowed between lectures for questions and discussion. Also the scope of the conference is more narrowly focused. The audience knows what to expect and they come prepared. "They're only going to invite people they want to grill," said Dowben. "It wasn't too bad, though. I learned an awful lot. It was good fun."

Dowben was selected for his groundbreaking work examining the insulating qualities of metals. Normally, metals are good conductors of electricity, while non-metals like wood, plastic and glass are not. Dowben has shown that, under certain circumstances, metals may also act as insulators. This supports the idea that the surface of many metals may not be metal at all, which in turn raises important questions about magnetism: Why, for instance, is a magnet's surface sometimes more magnetic than the magnet itself?

These are fundamental questions in quantum mechanics," says Dowben. "They are not, however, new. The problem dates to 1931, but it's been in the doldrums for many years. The Society was interested because we've put a new twist on it—we introduced a new theoretical framework in which to look at it." While Dowben's work does not yet suggest practical applications, the issues he raises are closely related to the development of semiconductors, the basic component of computer chips and integrated circuits.

–Andy Nelson

Reprinted from the Summer 1997 issue of Columns, *the College of Arts and Sciences Alumni Newsletter*

Jorgensen Golf Book Remains in News

Ted Jorgensen's book *The Physics of Golf* continues to draw attention as the source of meaningful information on the golf swing. There have been somewhere between 10 and 15 reviews of the book since its publication. Recent reviews, in such diverse sources as the English Guardian Weekly and the Washington Post, attest to the universality of the acceptance of Ted's ideas. In the Guardian, for example, Alan Rusbridger is reviewing another, somewhat philosophical, golf book by John Updike and begins by saying his "...favourite book on golf is one entitled *The Physics of Golf*, in which a professor at a Midwest university in America attempts to help amateur hackers improve their game by reference to the basic laws of aerodynamics, kinetics and torque."


Donal J. Burns

The article in the Post by Curt Suplee attempts to discuss the mystery of Tiger Woods' distance. (At the Masters in Augusta he averaged 323 yards off the tee.) Ted is quoted as saying that Tiger's magnificent swing is "...about as good as physics can let you do." Elsewhere in the article Ted estimates that the head speed of the driver is in the vicinity of 125 miles per hour and requires a power input of approximately 2 horsepower, requiring about 32 pounds of lean muscle - approximately 20% of Tiger's total weight. So one is forced to conclude that the muscles of the arms, shoulders, legs, thighs and back must be used to approach such head speeds. For comparison, good golfers attain a speed in the lower 90's and exceptional amateurs can break the century barrier.

These citations to Ted's work continue to emphasize the worth of the ideas in the book. The book was originally published by AIP Press, but during the latter part of 1996 the Press was trying to discontinue its book publishing business. In May of 1997 it was announced that Springer-Verlag had agreed to publish and distribute AIP Press books world wide. Ted was asked to send copies of all book reviews he had concerning his book and any other interesting materials to Springer. Soon he was told that the existing edition of *Physics of Golf* would be translated into Korean, joining the already existing version in Japanese. Further, his book was being considered for publication in a possible second edition.

Springer soon decided to move forward with firm plans to work up a second edition of the book. They now want the manuscript of a second edition in their hands by February 1998. The second edition will largely follow what was in the first edition, but it will have several important additions.

Ted originally had a chapter in his manuscript explaining in non-mathematical terms the elements of translation and rotational motion for those golfers needing a review of Newtonian dynamics. This chapter was deemed unnecessary by the AIP editors and was deleted by them. However, the book has proven very popular with lay readers who are not well versed in even elementary physics concepts. Several readers actually contacted Ted and asked for such guidance. One individual came to Lincoln from quite some distance for a short course spanning some 11 hours. As a result, the deleted chapter will now appear in the second edition.

There will also be a new chapter on how to assure that you never miss short putts. A substantial addition to one chapter will involve a discussion of how the effective loft of a club is influenced by the way the golfer swings the club. This topic has become of particular interest since the development of the numerous Big Bertha-like clubs, in which a lower loft (as small as 6 or 7 degrees) is necessary for many golfers. Ted remarks that he knows of no one having looked at this general problem before. For him there is no mystery as to why one golfer can get a ball air-borne and another using the same club cannot get the ball up at all. He recalls that Jack Nicklaus wrote that the characteristics of his driver were determined by trial and error.

Ted has been basking in the correspondence he has received. He tells of a few examples: "Your book has put them (other books) to shame"; "My favorite book"; "Your book is a breath of fresh air"; "An impressive research accomplishment"; "Thank you for a wonderful book"; "A gift to the Golf Teaching Professionals of the world."

A lot of attention has been given to the chapter on matching of swing weights of clubs. In part, this is because of the emergence of graphite shafts that are quite stiff, but with much smaller masses than could be attained with even the lightest of steel shafts. The problem again is one of having the readers apply the mathematical concepts inherent to producing clubs that are matched in all three moments - mass, mass distribution and inertia about an axis in the club grip. Ted tells me he spends much time trying to educate enquiring golfers of the concepts involved.

One of the most interesting contacts has been with a professional golfer, whose activities on the course are seriously limited by back trouble. This pro is working to enlighten golfers of the world to the "mountain of hype" which "bombards" them both in golf instruction and in advertising. He is publishing a series of small pamphlets (check the site at www.golfprimer.com) which he hopes will help with this matter. He says that in the professional golf qualifying school he came across a world-renowned golf instructor who did not know the difference between velocity and acceleration. The Golf Primer pro approached Ted to help him so that nothing he writes in his pamphlets and newsletter is scientifically incorrect. Ted agreed to do this in return for any kind words about *The Physics of Golf* he may wish to include in his writing.

Ted and yours truly still enjoy exchanging thoughts about golf. Our colleagues must tire of observing the two of us in the corner of a cocktail party knocking over things with demonstrations of the back swing, wrist cock and the search for a local manifestation of the perfect swing. Our brief lesson many years ago still stands out in my memory

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Brief Notes

- **Department Makes the *Farmer's Almanac*!** The Old Farmer's Almanac, Southern Edition (1998), gives directions to locations where one may find scions of Newton's apple tree growing in the U.S. The article, entitled "How You, Too, Can Watch an Apple Fall from Sir Isaac Newton's Tree" (on p. 234), lists 5 U.S. institutions having a scion, including N.I.S.T.-Gaithersburg, M.I.T., and UNL. The story of the Department's scion was reported in the Fall 1991 issue of *Spectrum*. In brief, a retired Lincoln physician, Ed Lyman, and a retired professor of horticulture, Joseph Young, through their own curiosity concerning what species was the tree of the Newton legend, put UNL in contact with Professor Richard Keesing, a physicist at York University in England, who was an expert on the subject. Keesing had identified the very tree and provided UNL with a cutting or scion, which was grafted onto local root stock and planted south of Behlen Lab. (Of course, it was necessary for Young to meet the requirements of the USDA for importing the scion, quarantining it, etc.) The tree "is of the ancient cultivar, Flower of Kent" according to the plaque in front of it. No apples have appeared yet, but we're hopeful they will soon. A fierce early storm last October which destroyed many trees in Lincoln luckily spared our link to Newton.
- **Fuller Elected APS Fellow.** Just as we were going to press with this issue, we learned that Professor Robert G. Fuller has been elected by the Council of the American Physical Society (APS) to Fellowship in the Society. Fuller was nominated by the APS Forum on Education. Election to Fellowship in the APS is limited to a maximum of 0.5% of the APS membership each year and is recognition by peers of outstanding contributions to physics. Fuller is cited "for his development of video and computer materials for the teaching of physics and for his leadership in introducing technology into the teaching of physics." *APS News* will publish the list of newly elected Fellows in its March 1998 issue.
- **Leung Honored Abroad and at Home.** Professor of Astronomy Kam-Ching Leung was appointed a Guest Professor at the Beijing Astronomical Observatory of the Chinese Academy of Sciences. He and D.Q. Zhou of Beijing University are continuing their research on both contact and detached binary star systems. Leung presented an invited paper on this work at the Pacific Rim Conference on Stellar Astrophysics in Hong Kong last summer. Leung, a member of the organizing committee for this meeting, also delivered the plenary closing remarks. Closer to home, Leung's well-known expertise and interest in Oriental art has led to his being appointed to the Nebraska Arts Council by Nebraska Governor Ben Nelson.
- **Rudd Scores Successes with Both New and Old Technologies.** Emeritus Professor of Physics M. Eugene Rudd's recent model for electron-impact total ionization cross sections of atoms and molecules is now on the Web:
  http://physics.nist.gov/PhysRefData/Ionization/Xsection.html
  This model, developed with Yong-Ki Kim of N.I.S.T.-Gaithersburg, combines a modified form of the Mott cross section with the Bethe cross section for high incident energies. The model is not a fitting formula, nor does it contain any adjustable parameters. Instead the model uses ab initio constants obtained from the ground state wave function of the target or, in the case of ionization thresholds, from experiment. The so-called Binary-Encounter-Bethe (BEB) model (cf. Phys. Rev. A **50**, 3954 (1994)) has been found to be very effective in reproducing known ionization cross sections from threshold to several keV (to within $\pm$ 10%) for most of more than 50 atom, molecule, and radical targets tested so far. A good summary of the model's uses is presented on the N.I.S.T. Web page cited above, which allows users to obtain the model's predictions directly through the Internet.

  Rudd's well-known expertise with antique optical instruments has recently brought him honors. At last September's meeting in Pasadena of the Antique Telescope Society, Rudd was elected to a two year term as President. The Society, which was founded in 1990, has about 175 members from a dozen countries who are interested in early telescopes and the history of astronomy. The Society's activities include the publication of the *ATS Journal*, published quarterly; creation of a list of extant early telescopes and all information concerning them; providing assistance with restoration of early telescopes; reprinting of historically important documents related to early telescope makers; and providing talks to astronomy clubs.
- **Samson to Publish New Edition of VUV Spectroscopy Book.** Emeritus Professor of Physics James A. R. Samson's book on *Techniques of Vacuum Ultraviolet Spectroscopy* has long been the standard reference in its field. However, there have been so many new technologies that have been recently developed for this wavelength region that a guide was needed. Samson teamed up with David Ederer of Tulane University to edit a volume on *Vacuum Ultraviolet Spectrosocopy*, which draws on the expertise of a number of researchers to present in a single volume all details of sources, optical components, optical systems, detectors, and vacuum techniques, as well as a discussion of modern applications to lithography, spectromicroscopy, etc. The 600 page volume will be published by Academic Press as part of the series on *Methods of Experimental Physics*. Publication is set for March 1998.
- **Weymouth Reappointed by Indiana U.** Emeritus Professor of Physics John W. Weymouth was recently reappointed to the position of Research Archaeologist in the Glenn A. Black Laboratory of Archaeology by the University of Indiana in Bloomington. Weymouth continues his long-standing work using physical methods such as magnetometry to explore archaeological sites. Among the sites on which he has worked in 1997 are Fort Clatsop, Oregon, a Lewis and Clark site; Fort Remon, Montana, an early fur trading post: and an Anasazi Indian site near Cortez, Colorado.

A Vassar Girl Does Physics In The Mid-West: One Student's View of the UNL Research Experiences for Undergraduates Program.

"The night after I decided to participate in the REU at the University of Nebraska, Lincoln, some friends of mine and I were sitting around in my room trying to figure out where Nebraska is. There were four Vassar girls in one room, and not one of us knew. This was quite daunting, since I was about to spend the summer there and would have to come back and say, "I spent my summer in Nebraska," and everyone would say, 'Nebraska? Where is that again?'"

This is how Vassar senior Alexis Wynne described her decision to accept one of the eighteen summer research positions in the NSF-funded Research Experiences for Undergraduates (REU) in Nanostructured Materials program in the newsletter of the APS Forum on Education. At the beginning of June, Alexis packed up her bags and headed to the wilds of Nebraska to become part of the second class of summer REU students UNL has hosted.

"So, I went to Nebraska, and it was flat and hot and people often listened to Garth Brooks, but I had a fabulous summer."

Not everyone had to consult Rand McNally to find Nebraska. REU students come from a broad variety of backgrounds –small schools, large schools, male, female, and from all regions of the country. UNL's program is interdisciplinary, accepting students in physics, chemistry and engineering, as well as future K-12 science educators.

A faculty research mentor guides each student's work over the summer. Participation in the program is a challenge, as the short duration of the program (10 weeks) means that students must learn quickly if they are to make a significant research contribution. Students are encouraged to take the initiative in their research, with the assistance of numerous resources.

"I had my own project to work on, which gave me an opportunity to challenge myself and apply what I had learned in my courses. I worked on an experiment whose purpose was to understand the "chiral dissymmetry of the terrestrial biosphere." Or, in English, we were attempting to understand why biotic molecules (e.g., sugars, DNA) are chirally asymmetric or "one-handed". The goal of the experiment was to produce a beam of spin-polarized electrons and look for spin-dependent scattering in a vapor of chirally asymmetric molecules. I worked mostly on the front-end optics of the experiment, trying to produce a beam of laser light that would change its polarization without changing its intensity. I had taken a course in optics at Vassar, and it was fascinating to see practical applications of all the equations and theory I had studied."

Early exposure to research is cited as a critical factor in retaining undergraduate students, especially those from underrepresented groups. Research experience allows students to see the applications of the physics they have learned in the classroom. Some REU students become co-authors on published papers, or present their results at regional or national conferences. Amy Bayer, a student from the University of Pittsburgh, won the American Society for Metals' 1996 International Student paper presentation based on work completed during her summer REU experience at UNL.

The UNL REU program extends beyond the laboratory, providing students with formal and informal opportunities to develop professional skills. Seminars on topics such as finding the right graduate school and advisor, interviewing for positions in industry, giving scientific talks, writing scientific papers, and writing a first résumé or curriculum vitae provide the students with valuable information. Informal discussions with graduate students and professors help students evaluate their future academic paths to ensure that the skills necessary for their desired careers are developed while in school.

"I had the opportunity to do things that aren't available at Vassar. I worked in a big lab with a graduate student and learned what life as a physics grad student is really like. The laboratory environment was exciting and challenging. I met other undergraduates from around the country who had similar interests. This is quite different from Vassar, where most students study humanities, and, as soon as you say the word "electron", their eyes glaze over. And I learned a ton of physics and made some great friends."

The UNL REU in Nanostructured Materials program is sponsored by the Division of Materials Research at the National Science Foundation and directed by Professors **Diandra Leslie-Pelecky** and **Stephen Ducharme**. More information about the UNL program – including application materials – can be found at: http://www.unl.edu/physics/REU/reu.html.

"REU is a wonderful program because it gives students like me the opportunity to do research at a large university, meet people with similar interests, think seriously about graduate school, and make some money. I encourage students, especially those at small, four-year colleges, to do the same. It really is a great opportunity."

Alexis Wynne's article was published in the spring 1996 edition of the American Physical Society's *Forum on Education* newsletter.

Hilborn Presents 1997 Ruckman Lecture


Robert C. Hilborn

Robert C. Hilborn, Professor of Physics at Amherst and current Past President of the American Association of Physics Teachers, presented this year's Ruckman Lecture on October 2nd on "National Science Education Standards and Undergraduate Physics Education Reform." As is customary, Lincoln- and Omaha-area high school physics teachers were invited to attend the lecture and then join the Department's faculty for dinner and discussion afterward. Support for this annual event is provided by an endowment established with funds provided by alumnus **Jerry E. Ruckman** (B.S. 1962).

Hilborn began by explaining how in the late 1980's various organizations developed plans for science education reform, including the National Governors' Association, the National Educational Goals Panel, the American Association for the Advancement of Science, and the National Science Teachers Association. With the aim of fostering a scientifically literate society, in 1991 the National Research Council began the task of coordinating these efforts and developing a set of national science education standards, which were finally approved in final form in November 1995. Standards were enunciated in six areas: science teaching, professional development, assessment, content, educational systems, and educational programs. Key elements of these standards included content specifications for grades K-4, 5-8, and 9-12, an emphasis on active learning, support for teachers to make decisions on what is taught, and a recommendation that students and teachers form "learning communities." The content standards emphasized unifying concepts, a view of science as a process of inquiry, and inclusion of aspects of technology as well as social perspectives. Among issues currently being discussed regarding these standards is that there is little focus on traditional science disciplines, the standards are very broad, and there is little attention to the practicalities of everyday teaching. The NSTA, AAAS, and AAPT in particular want to make more specific content recommendations.

Hilborn then discussed undergraduate physics instruction, beginning by discussing some current statistics: 25% of high school students take physics; 70-75% of high school graduates enroll in some form of higher education; 350,000 students nationwide take a college or university physics course each year, but only 3% of those who take a calculus-based introductory course enroll in higher level courses; the current number of physics majors (4,136 in 1996) is the lowest in decades (there were 6,000 majors in 1971). Research in physics education has shown that "interactive engagement" is far more effective than traditional lectures at fostering learning, and, Hilborn emphasized (paraphrasing Harvard's Eric Mazur), "telling is not teaching" and "listening is not learning." He noted additional goals of those who aim to "re-engineer" the introductory college/university physics courses, namely, to ensure that instruction is "a bridge and not a barrier" to learning and that students should be shown how physics can be "a broad gateway to all of science."

Hilborn's lecture led to much lively discussion at dinner between area high school physics teachers and Department faculty. Among topics discussed were ways in which the Department could assist teachers heighten the interest of their students in physics. Suggestions from the teachers included having faculty come to high schools to give guest lectures, providing tours of Department research labs to both high school teachers and students, and informing teachers of what faculty find are the essentials students must know to do well in college physics courses.

UNL Hosts Project Kaleidoscope Conference on Physics Education

The UNL Department of Physics and Astronomy hosted Project Kaleidoscope's "Revitalizing Physics: What Works and What Needs to Be Done" workshop during September 26th – 28th, 1997. Project Kaleidoscope (PKAL) is a national consortium of science educators supporting the idea that science should be accessible to all students. The consortium's fundamental premise is:


Robert Fuller Lecturing at PKAL

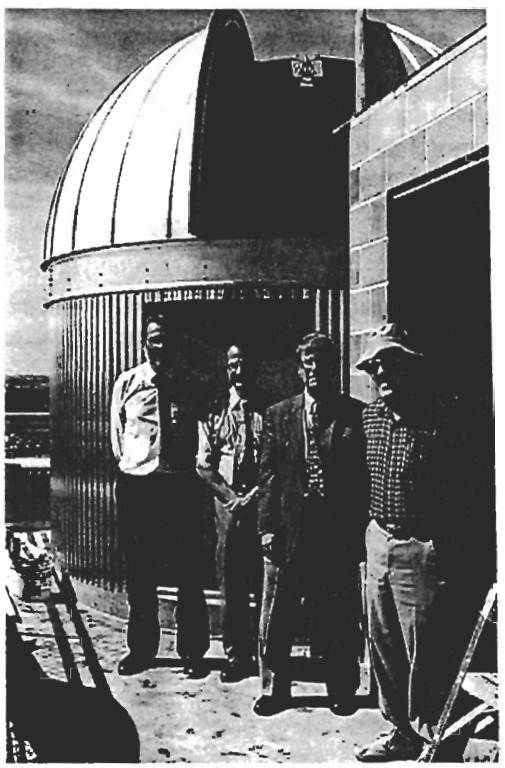
"To spark and sustain curricular renewal at the local level, faculty need to be actively involved in the same kind of intellectual community that characterizes the research community – an intellectual community that focuses on improving the learning environment for students".

About 90 physics faculty and administrators from colleges and universities across the country heard plenary talks on topics ranging from physics pedagogy to increasing the number of physics majors. Small group discussions allowed participants to explore the ideas presented in the plenary sessions. The conference organizers were Joe Priest (Miami University) and Jim Stith (The Ohio State University). Speakers included Joe Pifer, who discussed the program that tripled the number of physics majors at Rutgers University, and

(continued on page 15)

New Observatory Attracts Attention

The new Undergraduate Teaching Observatory on the roof of the new parking structure across from Memorial Stadium saw what astronomers call "first light" just before Thanksgiving. We reported on the ups and downs of this five-year project in last year's *Spectrum*, so we won't repeat ourselves this year (last year's story, the latest news, and more pictures can be found on the Department's web site: (http://www.unl.edu:80/physics/). Even before the telescope was operational, the new observatory was attracting considerable media attention because of its prominent location. Full length articles on the observatory have appeared in the *Lincoln Journal Star*, *The Scarlet*, and the program for one of the home football games (you know you've made the big time in Nebraska when you make the football program!). Channel 7 also ran a TV news special report on the new observatory.



Martin Gaskell, Anthony Starace, Roger Kirby, and Donald Taylor (left to right) stand in front of the new observatory during the final stages of its construction.

The media attention came as something of a surprise to **Martin Gaskell** and **Don Taylor**, who had worked closely together on the project since 1992. "I'm very pleased with the telescope and the observatory," said Gaskell. "This facility is exactly what I envisioned when I proposed building the observatory. The telescope is really easy for students to use. I'm excited by what students are going to be able to do." "The observatory *has* got a nice ambience," said Taylor. The only slight problem with the new telescope is some vibration of the parking structure (an expected problem). Some modifications might be made to the mounting to reduce this.

Viewings through the telescope began straight away. As this issue of *Spectrum* goes to press, a formal opening ceremony is being planned. A new astrophysics lab course using the observatory is being offered in Spring 1998. Nights are already being scheduled for viewing through the telescope by our Descriptive Astronomy students and we also hope to soon start having a regular public viewing night each month.

Many of the people who helped to bring this new observatory into existence have already been mentioned in the previous *Spectrum* articles about it. We would like to add our thanks to some people who were not mentioned before who have also played key roles, especially in the final stages. These include Dick O'Hearn of Facilities Management, Steve Lucas of Sampson Construction, **Patty Christen**, our Department's business manager, and Les Marquart of the Chemistry Department's instrument shop.

A Physics Homecoming: UNL to Host the 1998 Summer Meeting of the American Association of Physics Teachers

The Physics and Astronomy Department at the University of Nebraska has been selected to host the Summer Meeting of the American Association of Physics Teachers during August 3rd – 8th, 1998. The national conference will bring approximately 1200 physics teachers to the UNL campus to participate in workshops, contributed paper sessions and informal discussions about current developments in physics education and research. Previous meetings have been hosted by institutions such as the University of Denver, the University of Maryland, Gonzaga University and Notre Dame University.

We would like to make this occasion a homecoming for all alumni and friends of the Department by extending a special invitation for you to join us at this meeting. In addition to the meeting activities, we will provide some special gatherings at which you can meet informally with classmates and professors.

AAPT meetings feature a mix of activities from the formal (papers and workshops) to the informal (picnics and cracker barrel sessions). Participants include physicists at all levels from elementary- and middle-school teachers to faculty at research-intensive universities. Workshops range from tutorials on the latest developments in physics education research or on utilizing the web for teaching to bringing the physics of toys into elementary schools. The summer meeting is a family meeting, with special activities planned for spouses and families.

Registration information can be found at the AAPT web site at http://www.aapt.org. Additional information on special events for UNL alumni will be available on the Physics & Astronomy Department's web page at http://www.unl.edu/physics.

Stargazer returns to Nebraska to teach

Kent Reinhard

Kent Reinhard (BS 1985) is a lifelong stargazer. As a farm boy growing up near Broken Bow, Reinhard learned to admire what he saw in the dark heavens. "I saw the night sky all the time, and watched the moon come up," he said. "It was just fascinating, and I said, 'That's what I want to do.'" The boyhood interest led him to build his own telescope as a teenager, then go on to study astrophysics in college and graduate school. Ultimately, Reinhard's career led him to manage an East Coast university observatory and work on two scientific instruments now circling Earth. Today, Reinhard, 36, is back home imparting his love of science and astronomy to high school and college students in Lincoln. "I'd lived in Nebraska," the Lincoln Northeast High School teacher said. "I knew what it had to offer." He smiles as he says that, thinking back to racing boats on the Chesapeake Bay: "I miss the sailing."

Reinhard is a University of Nebraska-Lincoln graduate who got his master's degree from the University of New Hampshire. He wrote his master's thesis on some of the computer programming he helped create. This programming guided the Compton Gamma Ray Observatory, launched by NASA in 1992. Gamma rays are extremely high-energy photons generated by an intense interaction of matter, Reinhard explained. The observatory searches for them because their presence may indicate a black hole, for example, or some tremendous event, such as an explosion in space. "It's just a huge effort to put one of those things together," Reinhard said. "It was something I'd always liked to do." For him, it's simple: It's great fun. The space shuttle lifted the completed observatory into orbit. "That was the only thing that could launch it because it weighed 17 tons," he said. Eventually the observatory will fall back to earth as its orbit deteriorates, probably in a couple of years. The space shuttle could be used to push it back up, but there are no plans for that, Reinhard said. "In a sense, it's almost outdated now," he said.

Reinhard went to Baltimore to the Space Telescope Science Institute at John Hopkins University, where he built the "operational command programs" for the Hubble Space Telescope, deployed by the space shuttle in 1990. The telescope is controlled by its computer program. That means somebody has to write the software to tell it what to do, when to turn things on and off, when to turn around and so on. The instructions are written on the ground, then NASA feeds them to the telescope. Reinhard well remembers the hoopla in the news media about the Hubble's flawed mirror, which wasn't discovered until after it was up. It annoyed him... "It was frustrating ... because the media harped on how terrible it was and yet it was the best telescope ever built, even with the flaw," Reinhard said. "It saw almost perfectly fine." Astronauts replaced some equipment on the telescope during a 1993 mission and Reinhard helped write new instructions to "bug check" the system after compensating for the flaw. Then he decided it was time to move on.

"I really enjoyed teaching," Reinhard said, but he was not attracted to the "publish or perish" university atmosphere. "I liked teaching for the sake of teaching." These days Reinhard is busy teaching astronomy at UNL and preparing a new astronomy course for next semester at Northeast. He also will be teaching astronomy at Nebraska Wesleyan University next semester. He has taught at Pius X High School as well. "It's the most popular hobby in the world," Reinhard said of astronomy. "I think (people are) fascinated by what's being discovered out there." He admitted it also is an opportunity to sneak a dose of geology, physics, chemistry and other sciences into unsuspecting students. "What I try to do is just show them what I'm enthused about," Reinhard said of his astronomy classes. "Most people these days have no idea what's up there".... Reinhard's more earthly pursuits include bee keeping and amateur photography, including photographing what he sees through the telescope. He also makes his own mead from the honey he collects from his bees. Like a parent asked to rate his children, Reinhard can't say which he enjoyed more: working on the observatory or working on the telescope. Meanwhile, he and a group of colleagues keep a hand in the intense competition for time on the Hubble telescope. Sometimes they get it, sometimes they don't. "We're using the instrumentation on board to look at the formation of the solar systems around other stars," he said. "It is (fun). That's why I keep doing it."

–Ann Harrell
Reprinted from the Lincoln Journal-Star, *26 December 1996.*

Jorgensen Book (continued from page 6)

as a moment of epiphany when Ted emphasized pulling on the club with the left hand. At one time, I thought it utterly impossible to break 80. Ted caddied me through that hurdle. This year with the help of a new driver and a couple of small adjustments to the setup, I broke 80 on five occasions. I even finished the year with two consecutive scores of 77. Fortunately a combination of work and weather has prevented me from going out again.

Now a second generation of Burns golfers (Thomas – 19 and Alexi – 16) are starting to breathe down our golf necks. As a result of watching their development and many frustrations, Ted and I are into discussing what is really meant by wrist cock, something that is misunderstood by many beginners. Who knows what the future holds?

–Donal J. Burns

Krauter Speaks at Recognition Luncheon


Byron L. Krauter

Byron L. Krauter (B.S. 1976 Physics/Math) returned to campus to speak at the May 8th, 1997 Recognition Luncheon for Department graduates. Krauter is a Senior Engineer with IBM, working in the Microelectronics Division in Austin, Texas. Krauter spoke to graduates on "VLSI and Microprocessor Design in the 1990's."

Krauter told the audience that he remembers how difficult homework assignments in his physics classes were, but that by his junior year he had a buddy, Chris Greene (B.S. 1976), with whom to discuss assignments and suggested this as an effective strategy to improve learning. He reminisced that the "most fun" class was Ed Pearlstein's lab course, which taught him to look at data critically. Pearlstein was also very demanding and had a high standard for lab reports, which was excellent preparation for the real world. Krauter still remembers vividly many of the lecture demonstrations shown in his physics courses. He showed the audience a slide rule and said that with that device, as compared to electronic calculators, students were never tempted to write down answers with 10 digits of accuracy when they knew they could at best get about two digits correctly.

Following graduation, Krauter enrolled in the electrical engineering program at UNL and upon receiving the M.S. degree joined IBM's semiconductor facility in Essex Junction, Vermont, where he worked in a technology development group. Krauter found work there to be very interdisciplinary, with his group having individuals with expertise in physics, chemistry, math, and engineering. In 1985 he transferred to IBM's Austin facility "to get out of the frozen North." There he joined a chip design group which created all the the early RS6000 chips as well as the first PowerPC chips. In 1989 he enrolled in the electrical engineering program at the University of Texas and received his Ph.D. in 1995. He still works for IBM in Austin.

In his talk, Krauter explained the facts of life for computer companies in general and for chip design in particular. He noted that Intel makes more profit on one chip than Compaq makes on one computer and this is why IBM spends so much effort on chip development. He likened his job to that of Sisyphus: if one is successful in creating a new, higher-performance chip design, one is rewarded by having to do it over again (with higher performance goals). The design cycle takes about two to three years. One must constantly keep in touch with customer needs, the market environment, competitors' activities, available technology, and the cost and effort required. There are three basic architectures: CISC (complex instruction set computing), RISC (reduced instruction set computing), and hydrid forms (CISC on the outside, RISC on the inside). One can boost performance by the microarchitecture, such as breaking jobs into smaller tasks, doing tasks in parallel, using the principle that data which has recently been accessed is likely to be accessed again soon, etc. Current problems include power dissipation in chips and the need for careful bookkeeping (at one million transistors per chip, integration is an important task, and his group is already thinking about tens of billions of transistors per chip). Overcoming problems such as these will require huge financial investments.

* * * *

DuBois and Pinkerton Named APS Fellows

The American Physical Society (APS) each year selects fewer than 0.5% of its membership to become Fellows of the APS. Fellows are nominated by each APS Division, forum, and topical group. This year we learned of two UNL alumni who joined this select group.

Robert D. DuBois (BS 1970, MS 1972, PhD 1975) was honored at the 1997 DAMOP meeting in Washington, D.C. He was cited "for contributions to heavy-particle collision physics, especially the innovative use of coincidence techniques to elucidate the influence of projectile electrons on impact ionization and separate target and projectile ionization." DuBois recently moved from the Batelle Pacific Northwest Laboratory to join the physics faculty at the University of Missouri-Rolla.

Frederick Pinkerton (BS 1976) was among the first group of fellows elected by the new Forum on Industrial and Applied Physics (FIAP). He has been a research scientist at General Motors Corp. for 15 years. As reported in the June 1997 issue of *The Industrial Physicist*, "he was a key member of a small group at GM assigned ...[to find] a permanent-magnet material with the characteristics of samarium cobalt that contained neither samarium nor cobalt, both of which are expensive and in short supply. The team discovered rapidly solidified neodymium-iron-boron magnet materials ....[had the desired properties]. GM then invested in a production facility for permanent magnets in Anderson, Indiana." However, as related by Albert Sievers of Cornell, one of Fred's mentors, "initially the large-scale process did not work, and Fred went to Indiana to find out why." A key discovery "was his proposal and testing to show that they had an unacceptable level of oxygen in the reaction chamber. The engineers who were doing the scaling did not appreciate that 100 ppm oxygen together with hot rare-earth metals was enough to change everything. With much ingenuity on Fred's part, the problems were solved and the magnets successfully produced....it really does take an experimental physicist of unusual talent to enter a factory, with its completely different scale, and figure out why things were not working the way they should."

We Heard From...

Adrian, Brian, (Ph.D. 1997) Has taken a tenure-track position at Bethany College, in Lindsborg, KS. The training Brian received at UNL was critical to being offered this position, as Brian is the only physics faculty member at Bethany and needs to be able to teach a wide variety of physics courses. Brian had a wide range of experiences, including the area of multimedia and classroom teaching, in his Ph.D. program at UNL with Professor R. Fuller, that he feels prepared him well for this position.

Aylesworth, Kevin D. (M.S. 1986, Ph.D. 1989) Has taken the position of Assistant to the Director of Education of the American Physical Society, One Physics Ellipse, College Park, MD 10740-3844. Was featured in the April 29th, 1997 issue of *The Wall Street Journal* (p. 31) in an article entitled, "Landing a Job in the Sciences Takes Some Creativity."

Backus, Scott (B.S. 1990) Physics Department, University of California, Berkeley, CA 94720. Is a co-author of what is becoming a famous paper on "Quantum Oscillations Between Two Weakly Coupled Reservoirs of Superfluid ^{3}He," which appeared in the 31 July 1997 issue of *Nature* (p. 449), and which was reported upon in the October 1997 issue of *Physics Today* (p. 17). Is obtaining his Ph.D. with Professor Richard Packard and will take a postdoctoral position at Los Alamos National Lab.

Baily, Kevin (B.S. 1989) Argonne National Lab, 9700 South Cass Ave, PHY/203, Argonne, IL 60439-4843. Kevin is a member of the technical staff in the Physics Division at Argonne. (Kevin_Baily@ANL.GOV)

Bao, Minqi (M.S. 1992, Ph.D. 1995) 61 Churchill Avenue, North York, Ontario, Canada M2N 1Y8. Has taken a position with Platform Computing Corp., a software firm, in Toronto. (minqi@physics1.unl.edu)

Barrett, William A. (B.S. 1952, M.S. 1953) 2797 Lena Drive, San Jose, CA 95124. Is an assistant professor at San Jose State University.

Brakhage, Jane Elizabeth (Vendetti) (B.S. 1990) P.O. Box 50, Burlington Junction, MO 64428-0050. Is a pastor in the local United Methodist Church. "I received my M.Div. degree on May 24, 1997. I am now serving my first full-time appointment in Northwest Missouri. Between my husband and me, we have 5 churches and keep very busy. One of my previous parishioners surprised me with a gift subscription to *Sky & Telescope*."

Calabrese, Dominic (M.S. 1988, Ph.D. 1993) c/o Pasco Scientific, 10101 Foothills Blvd., Roseville, CA 95678-9011 (calabres@pasco.com). Has taken a position with Pasco Scientific as a Technical Support Representative. Says Pasco is hiring at all degree levels.

Chen, Jian (Former postdoc) 705 Boulder Dr., #C3, Richmond, VA 23225, (jchencvc@aol.com.). "I kind of feel guilty because I haven't contacted the department for a long time. During my first job as a Technical Support Engineer with CVC, I traveled 90%, dealt with lots of customers, opened my eyes and enjoyed for a while. I got married in October 1995. My wife then got a job with DuPont immediately afterwards, but started on September 1996 after her graduation. So I took a different job (Test and Integration Team Leader, a night shift supervisor) with CVC to station in Rochester in last November. To get close to my wife I worked hard trying to find a decent job here in the Richmond area. Finally the Dupont management here took good care of me and hired me recently. My title is Research Engineer. My first assignment is to work on part of the process control using sophiticated computer control system (Distributed Control System). After a few years, as other people do at Dupont, I will probably find another area that I think I can contribute the most. These days I am taking the training. Safety is a big things at Dupont. I need two week's training on that. Today we had a tour on the production line. It is amazing that a simple process takes so much equipment and control. Guess my life will be settled down at least for a while. My wife and I started looking for a house here. Please say hi for me to the Nebraska folks there. I had a great time in Nebraska. I will keep in touch."

Chung, Yang-Soo (M.S. 1986, Ph.D. 1993) Yu-Sung-Gu, Uh-Eun-Dong, Hanbit Apt. 110-1006, Zip 305-333, Daejon City, South Korea. (chung@nsphys.chungnam.ac.kr) Has taken a position as an Assistant Professor in the Physics Department at Chungnam National University, where he is building an apparatus to measure electron-hydrogen atom excitation cross sections.

Crooks, Geoffrey B. (B.S. 1965, M.S. 1967, Ph.D. 1972) 19926 Big Timber Dr., Humble, TX 77345. Is president of Spectrum Chromatography.

Eddy, Steve (B.S. 1978) 12014 Amblewood Drive, Stafford, TX 77477. Is quality department manager for Schlumberger Well Services. "It's nice to see and read about the 'old' faces and neat to see the addition of some new ones. The eyes of S.L.O.P. (Student Learning Opportunities in Physics) are upon ye!"

Dumpert, Dwight (B.S. 1984) 4525 NE 25th Place, Portland, OR 97211 (ddumpert@flir.com). "I have always enjoyed reading the Spectrum newsletter. I have been

disappointed to see so few words from my contemporaries, but then after a second I realized that I was probably the poorest example since I have never provided an update! So here it goes.....I am now entering my eighth year at FLIR System, Inc. in Portland, Oregon. The company produces radiometric thermal infrared imaging systems, stabilized broadcast cameras (Sky Cams), military night vision systems and machine vision software. I have enjoyed helping this company grow from last place in the market to the number one producer of infrared imaging systems in the world. I am currently Manager of International Sales for our radiometric imaging systems, and as such I have enjoyed traveling from Europe through South East Asia and South America. Like many of us who have been active in industry since our graduation, I have experienced the excitement of revolutionary developments in technology. These changes, coupled with what I have learned about growing a business from a small shop to a world-class organization has been tremendously exciting. Although my current role is largely non-technical, there is no question in my mind that the experiences and knowledge gained during my years in Behlen Hall prepared me well for the real world. It is clear that I learned a great many things from those who taught me: from the detailed optical derivations of Dr. Duane Jaecks, and the experimental guidance of Dr. Roger Kirby, to the importance of the big picture, including tea time, as presented by Dr. J.A.R. Samson. Would love to hear from any of my classmates!"

Gao, Bo (M.S.1986, Ph.D. 1989) 7153 Finchley Ct., Toledo, OH 43617 (bgao@physics.utoledo.edu). Presented an invited talk on "Quantum Defect Theory of Atomic Collisions and Molecular Vibrational Spectra," at the JILA Workshop on Collisions of Cold, Trapped Atoms in Boulder, 10–12 November 1997.

He, Zhong-Xiang (Former postdoctoral research associate) 25 Tamarack St., Essex Junction, VT 05452. Is a process engineer in plasma etching for IBM Microelectronics Division.

Homan, Dean (B.S. 1991) 285 Rosemont Garden R, Lexington, KY 40503. Earned Ph.D. degree in experimental AMO physics at the University of Kentucky with Keith MacAdam. Received postdoctoral position offers from University of California-Berkeley, SUNY-Stony Brook, University of Virginia and Rice University. Will join Randy Hulet's group at Rice working on achieving Bose-Einstein condensation of a Fermion system using sympathetic cooling techniques. Has his own web page: www.pa.uky.edu/~homan/homan.html.

Itoh, Akio (Former postdoctoral research associate), Kyoto University, Yoshida, Kyoto 606-01, Japan (Itoh@nucleng.kyoto-u.ac.jp). Is a faculty member in the Department of Nuclear Engineering at Kyoto University. He and his wife attended in 1997, ICPEAC meeting in Vienna and ISIAC meeting in Budapest, where they met atomic physics faculty from UNL.

Liu, Chihray (M.S. 1985, Ph.D. 1988) Is an Assistant Professor in the Department of Radiation Oncology at the University of Florida. (liucr@bolus.health.ufl.edu)

MacLay, James E. (B.S. 1959) P.O. Box 14939, Albuquerque, NM 87191.

Malhotra, Sudhir (M.S. 1992, Ph.D. 1996) c/o HMT Technology Corp., 1055 Page Ave., Fremont, CA 94538. Is a member of the technical staff at HMT Technology Corp.,

Marquard, Paul (M.S. 1986) 1624 Begonia, Casper, WY 82604. Is an instructor at Casper College. Could you please publish email addresses." (marquard@acad.cc.whecn.edu)

McAvoy, Tara (M.S. 1997) 1134 Olive Street, Santa Barbara, CA 93101, (Tjmcavoy@aol.com.). Has taken a position at Applied Magnetics in Santa Barbara, CA.

Meyer, Kurt (B.S. 1988) 234A Penn St., El Segundo, CA 90245. Following MS degree in Astronautics from George Washington University in Virginia (at NASA-Langly), enrolled in the doctoral program in aerospace engineering at the University of Colorado. However he switched to the physics department, where he recently obtained his Ph.D. (1997) in theoretical atomic physics with Professor Chris H. Greene (B.S. 1976). Following his graduation he moved to Los Angeles to take a position with the Aerospace Corporation where he is working on mission design (i.e., orbital mechanics) in support of military space projects.

Poffenbarger, Brett A. (B.S. 1993) 3591 Rue University Apt. 7, Montreal, Quebec, Canada H3A ZB1. Is a grad student in medical physics at McGill University.

Runge, Alan (M.S. 1994, Ph.D. 1997, UNL Teachers College in Administration, Curriculum and Instruction), Assistant Professor of Information Technology in Management, Concordia University, 275 Syndicate, St. Paul, MN 5104. "I successfully defended my dissertation on Monday. The last editing touches are going in tonight and I will deliver it to the library tomorrow. I accepted a faculty position starting immediately. Dissertation title: 'Impact of Maple on the Design, Instruction, and Performance in an Undergraduate Physics Mathematical Methods Course.' This will be quite a change for me in many ways. I will likely leave in a day or so, but will be back for graduation ceremonies. Best wishes to you, and thank you for all you help and support during my years here."

Sarris, Apostolos (M.S. 1990, Ph.D. 1992) Institute of Mediteranean Studies, Melissinou and Nik. Foka 130,

Rethymnon 74100, Greece (asarris@ret.forthnet.gr). Has joined the Laboratory of Geophysical-Satellite, Remote Sensing, and Archaeo Environmental Department at the Institute of Mediteranean Studies in Rethymnon, Greece.

Shahabi, Siamak (M.S. 1977, Ph.D. 1983) 5331 Brody Drive, Suite 201, Madison, WI 53705. Owns his own publishing company, Advanced Medical Publishing, which publishes the proceedings of the annual meeting of the American Association of Physicists in Medicine. Also does consulting work in medical physics. Is enthusiastic about all things Brazilian, is studying Portuguese, and takes an annual vacation in Brazil.

Shan, Zhengsheng (M.S. 1985, Ph.D. 1990) 651 Woodview Terrace, Fremont, CA 94539. Has taken a position with HMT Technology Corp.

Shen, Jian X. (M.S. 1992, Ph.D. 1994) 10799 Brunswick Road, Apt. 203, Bloomington, MN 55438-1858. Is now with Seagate in Minneapolis. His daughter, now 3, is speaking a combination of Chinese, English and Spanish (as a consequence of her day care school).

Snodgrass, Thomas, (B.S. 1991) 525 S. Randall Ave., Madison, WI 53715. Is a graduate research assistant in Electrical Engineering at the University of Wisconsin-Madison.

Sullivan, George A. (Ph.D. 1964) 4204 Kota Avenue, Harrisburg, PA 17110-9599. Is a statistical analyst for the State of Pennsylvania. Plans to retire in December 1997.

Tonder, Steven (M.S. 1992) 1795 29th Ave., NW, New Brighton, MN 55112. Is a computer help desk specialist for Medtronic, Inc. (an implantable medical device manufacturer). "What does someone with a Master's Degree in Physics do for a living? I found one answer to that question to be 'Work at a Help Desk.' As a graduate student at UNL, I found working as a teaching assistant to be more appealing than performing laboratory research. With a personality such as this, working on a corporate 'Help Desk' is the right job for me. I enjoy applying technical knowledge and troubleshooting skills to computer problems encountered in the workplace. The days pass quickly, there is no end to things to learn, and callers regularly provide positive feedback. I worked for two computer consulting companies before taking a year-long Help Desk job supporting a computerized database used to track nation-wide computer-repair requests, parts, orders, and billing. Last year, I left that position to join Medtronic's Pacing (computer) Help Desk. There, I assist employees at a pacemaker manufacturing company to effectively use their computers in the work of bringing the latest pacing technology to market quickly. I wish to thank the encouraging Physics & Mathematics faculty for my two years at UNL and send greetings from Minnesota."

Welipitiya, Dulip (Ph.D. 1997) 403 Elwood Beach Dr., Goleta, CA 93117. Has taken a research staff position at Applied Magnetics in Santa Barbara, CA.

Zhang, Weijia (Ph.D. 1996) (wjzhang@asu.edu) Has been learning and working on the Zen and art of modeling methodology for physics teaching as a postdoctoral fellow in the Physics Department of Arizona State University. His paper, "Nobel prize winners in physics from 1901 to 1990: simple statistics for physics teachers," has been accepted for publication in the British journal, *Physics Education*. He has written a Jeopardy computer game to enhance the learning of physics teaching. His present work in progress is the Anti-Plug-And-Chug-Examinations (APACHE) project

Project Kaleidoscope (continued from page 9)

Mark Bernius, a senior research physicist at Dow Chemical, who explored the skills physics bachelor's-level students need to be successful in industry. **Robert C. Hilborn** (Amherst College, currently on sabbatical at UNL) gave an overview of likely future developments in physics education.

A highlight of PKAL workshops is the emphasis on participants' experiencing new pedagogical techniques, as opposed to only hearing about them in a talk. Ken and Pat Heller (University of Minnesota) presented a workshop on cooperative group problem solving. Nick Giordano (Purdue University) showed how to use computational physics to introduce new topics into the physics curriculum. Marc Schneider (Grinnell College) involved participants in a lab-based lecture-free general physics course and the team of Steve Dunbar, **Vicki Plano Clark**, **Christopher J. Moore** and **Robert Fuller** highlighted the UNL group's contributions to using multimedia to enhance learning.

A plenary session called "Highlighting the Host Institution" featured three faculty members highlighting their involvement with education and outreach activities. Robert Fuller discussed his current project on computer-intensive learning. **Steve Ducharme** provided an overview of his NSF-funded lasers and optics laboratory course. **Dan Claes** described the Cosmic Ray Outreach Program (CROP), a program that he and **Greg Snow** designed to involve high school students and teachers across Nebraska in research. Conference attendees also had an opportunity to tour UNL research facilities.

The response from participants – who ranged from two-year college instructors to physicists at research-intensive institutions – was overwhelmingly positive. The UNL Department of Physics and Astronomy is pleased to have been chosen to host this workshop and thanks the Project Kaleidoscope organizers and participants for making it such a success.

Acknowledgements

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1996—31 October 1997. 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!

Terry L. Anderson (MS 1971, PhD 1975)
Minqi Bao (MS 1992, PhD 1995)
William A Barrett (BS 1952, MS 1953)
Louis J. Caplan (MS 1964, PhD 1975)
Geoffrey B. Crooks (PhD 1972)
Paul O. Davey (PhD 1964)
Robert D. Dubois (BS 1970, MS 1972, PhD 1975)
Stephan Eddy (BS 1978)
John W. Flocken (MS 1964, PhD 1979)
FMC Corporation
Thomas E. Furtak (BS 1971)
Maxwell Halderson (BSEE 1934, MS 1936)
Bert H. Hartzell (BA 1953)
Maurice R. Hawthorne (BS 1964)
The Jensen Co., Inc.
David W. Keifer (BS 1968)
Byron L. Krauter (BS 1976, MS 1978)
Wayne Lang (PhD 1964 Physics/Math)
James E. Maclay (BS 1959)
Paul Marquard (MS 1986)
Phillips Petroleum Foundation
Rebecca Richards-Kortum (BS 1985)
Jerry Ruckman (BS 1962)
M. Eugene Rudd (PhD 1962)
James J. Schmidt (BS 1956, MS 1957)
David J.Sellmyer
Anthony Starace
Maurice H. Witten (MA 1960)

No Known Address:

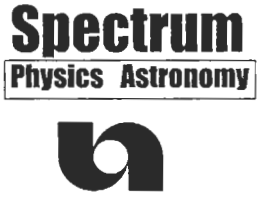
Please let us know any information you may have on these "missing alumni."

Robert K. Cacak (B.S. 1965, M.S. 1967, Ph.D. 1970)
Edward J. Carter (B.S. 1988)
Augustine C. Chen (M.S. 1957)
Shuhong Chen (M.S. 1988)
Robert L. Cunningham (B.S. 1965, M.S. 1969, Ph.D. 1971)
Richard V. Denton (B.S. 1965)
James A. Eder (M.S. 1966)
Neil Goldman (M.S. 1964)
Eric S. Green (B.S. 1994, Physics/Math)
Steve T. Gunther (B.S. 1992)
Vincent D. Harmon (B.S. 1988)
Gerald J. Henderson (B.S. 1965, M.S. 1967)
Leroy M. Hutzenbiler (B.S. 1963)
Bradley W. Jacobsen (B.S. 1990, Physics/Math)
Kayla L. Kadlec (B.S. 1989)
William C. Keller (B.S. 1981)
Jack L. Koenig (Ph.D. 1960, Physics/Chemistry)
Chulan Kwon (M.S. 1983)
Sharon L. Lackey (M.S. 1974)
Arthur C. Lindberg (M.S. 1951, Math/Physics)
Arthur D. May (B.S. 1954, Geology/Physics)
Daniel J. Miller (B.S. 1979)
Dennis W. Mueller (B.S.1975, Ph.D. 1982)
Venkataramanan Natarajan (M.S. 1981)
Labros E. Pilalis (B.S. 1978)
Potter, Christopher T. (B.S. 1992, B.A. 1993)
Tony C. Robak (B.A. 1989)
David E. Rodgers (B.S. 1971)
Akhavi H. Sadate (M.S. 1980)
Michael R. Schetterer (M.S. 1993)
Frank Schneider (M.S. 1967, Ph.D. 1971)
David P. Sheetz (Ph.D. 1952, Chemistry/Physics)
Donald C. Stafford (B.S. 1996)
Robert E. Stepp, III (B.A. 1970)
Victor C. Sutcliffe, Jr. (Ph.D. 1977)
John Taube (B.S. 1966)
James A. Thomassen (B.S. 1969)
Bruce C. Waggoner (B.S. 1985, Physics/Astronomy)
Paul J. White (B.S. 1993)
Lei Xing (M.S. 1987)
Albert O. Yeye-Odu (B.A. 1975, Physics/Math)
Todd A. Yilk (B.A. 1991, Physics/Math)
Zhang, Yuxin (B.S. 1990)

Physics and Astronomy on the Web

The Department 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 complete and 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
Dan Claes,
crd@unlinfo.unl.edu
Bernard Doudin,
bdoudin@unlinfo.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@unlinfo.unl.edu
John R. Hardy,
jhardy@unlinfo.unl.edu
Robert J. Hardy,
rhardy@unlinfo.unl.edu
Duane H. Jaecks,
djaecks@unlinfo.unl.edu
Sitaram S. Jaswal,
sjaswal@unlinfo.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
Dave Magwire,
dmagwire@unlinfo.unl.edu
Marilyn McDowell,
mmcdowel@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
Donald Taylor,
dtaylor@unlinfo.unl.edu
John Weymouth,
weymouth@unlinfo.unl.edu
Beth Wilhelm,
eaw@unlinfo2.unl.edu
Beverly Wisehart,
physmail@unllib.unl.edu


Spectrum
Physics Astronomy

The Record

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

No. 18 Fall 1997

Roger D. Kirby, Editor

1996-97 DEGREE RECIPIENTS

Bachelor of Science

Justin S. Anderson (May 1997) Is an MBA student at UNL

Christopher D. Benson (May 1997) Is working at The Brass Buckle, Lincoln, NE

Matthew M. Berggren (May 1997)Is in USAF pilot training at Sheppard Air Force Base, Wichita Falls, TX

Brent A. Peterson (May 1997) Is a restaurant manager at BW3, Lincoln, NE

Jeremy A. Vetter (May 1997) Is a Rhodes Scholar, Oxford University

Master of Science

Scott A. Atkins (August 1996) Is a Ph.D. student at North Dakota State University

Martin Jen-Chi Hu (December 1996) Is a Ph.D. student at UNL under the supervision of Professor G. Snow

Angela S. Jensvold (August 1996) Is in the graduate program in Biomedical Engineering at USC

Takashi Oe (August 1996) Is a Ph.D. student at UNL under the supervision of Professor C. Edward Jones

Zhenhua Sun (May 1997) Is a Ph.D. student at UNL under the supervision of Professor C.N. Wang

Robyn S. Wilde (August 1996) Is a Ph.D. student at UNL under the supervision of Professor I. Fabrikant

Yuanguang Xu (May 1997) Is a Ph.D. student at UNL under the supervision of Professor I. Fabrikant

Chuanxing Zhu (August 1996) Is a Ph.D. student at UNL under the supervision of Professor S. Ducharme

Doctor of Philosophy

Imaddin A. Al-Omari (August 1996) Is an Assistant Professor of Physics, Jordan University of Science & Technology

Sudhir S. Malhotra (August 1996) Is at HMT Corp., Fremont, CA

Kurt W. Wierman (August 1996) Is at Applied Magnetics Corp., Goleta, CA

Weijia Zhang (August 1996) Is a research associate in the Physics Department, Arizona State University

HONORS

1996-97 Fellowships

Ioan-Bogdan Borca	Avery Fellowship
Martin Jen-Chi Hu	University of Nebraska Foundation Fellowship
Chien-nan Liu	Maude Hammond Fling Fellowship
Lisa M. Wiese	Hazel V. Emley Fellowship
	Rhoden Fellowship
	Kate Field Fellowship

1996-97 Scholarships

Brooks A. Hitt	Henry H. Marvin Memorial Scholarship
Christina M. Lund	Joel Stebbins Fund Scholarship
	Physics and Astronomy Scholarship
Jared R. Males	U.S. Harkson Scholarship
Robert R. Martin	U.S. Harkson Scholarship
Jeremy A. Vetter	Henry H. Marvin Memorial Scholarship
	U.S. Harkson Scholarship
	Rhodes Scholarship for 1997
Stephen M. Whalen	John E. Almy Scholarship
	Barry F. Goldwater Scholarship

Outstanding Graduate Research Assistant Award
Imaddin A. Al-Omari

Sigma Xi Outstanding Graduate Student Award
Dulip A. Welipitiya

1997 Distinguished Teaching Assistant Awards
Brian W. Adrian **Cyrus Hall** **Tara J. McAvoy**
Stephanie Snedden **Robyn S. Wilde**

Multi-disciplinary Research Award, College of Arts & Sciences and The Institute of Agriculture & Natural Resources
Peter A. Dowben

Outstanding Research and Creativity Award
David J. Sellmyer

Fellow of the American Assn. for the Advancement of Science
Anthony F. Starace

1996-97 Society of Physics Students Officers
Chauncey A. Barney, President
Jennifer L. Webster, Secy/Treas

Faculty Professional Activities

In addition to service on Department, College and University-wide committees, for 1996-97 a number of the faculty are active in local, national and international professional activities, as follows:

C.L. Bettis: PIRA Professional Concerns Representative

P.A. Dowben: Adv. Brd. - Ctr. for Advanced Microstructure & Devices; Co-Organizer, 1998 Heraeus Stiftung Meeting

S. P. Ducharme: Co-Chair, Conference on Organic Photorefractive Materials & Xerographic Photoreceptors

R. G. Fuller: Advisory Board, Edgerton Educational Center

T. J. Gay: Executive Committee, APS Division of AMO Physics; Co-Chair, DAMOP Subcommittee on APS Centennial Mtg.

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

D. H. Jaecks: Member, Users Executive Committee Advanced Light Source

R. D. Kirby: Co-Chair, Steering Committee for 1997 AAPT/ APS Department Chairs Conference

D. Leslie-Pelecky: Program Vice-Chair, APS Forum on Education; Newsletter Editor, APS Forum on Education; Chairperson, AAPT Committee for Professional Concerns

Kam-Ching Leung: Chair, AAS Chrétien International Research Award Committee; Editorial Advisory Board, *Chinese Astronomy & Astrophysics* (Pergamon Press: Oxford); Editorial Board, IAU Info. Bulletin on Variable Stars; United Nations Working Grp. on Astronomical Facilities in the Pacific Rim; Chair, Planning Comm. for Pacific Rim Conf. of Binary Star Res.; Distinguished Professor, Chinese Academy of Sciences, Shaanxi Astronomical Observatory; Guest Prof., Peking University, China.

E. G. Schmidt: Coordinator, Archives of Unpublished Observations of Variable Stars of the International Astronomical Union

D. J. Sellmyer: International Organizing Committee, Magneto-Optical Recording Symposium; Advisory Committee, MMM-Intermag Conference, 1994 - 97; Technical Council, National Storage Industry Consortium; Exec. Comm., APS Group on Magnetism & Its Applications; Member, Nebraska State EPSCoR Committee; Member, Governor's Science &Technol. Planning Comm.

G.R. Snow: Chair, Education and Outreach Subcommittee, Executive Committee, Fermi National Accelerator Laboratory; Chair, Speakers Bureau, Fermilab DZERO Experiment; Co-convenor, QCD Analysis Group, Fermilab DZERO Experiment; Editorial Board, CERN CMS Experiment *Bulletin;* Proposal Review Panel, NSF Teacher Enhancement Program

A. F. Starace: Associate Editor, *Reviews of Modern* Physics; Editorial Board, *Physical Review A*; Member, Task Force to Review *Physical Review A*; Member, APS Committee on Investments; Co-Organizer, Harvard-Smithsonian Institute for Theoretical Atomic & Molecular Physics,Workshop on Resonances & Fragmentation of Three-Body Systems

1997-98 Visiting Staff Members

Visiting Professors this year are **Sam Cipolla** (Ph.D. 1969, Purdue), **Robert Hilborn** (Ph.D. 1971, Harvard), and **George Hadjipanayis** (Ph.D. 1979, Manitoba, Canada).

C. Martin Gaskell (Ph.D. 1981, California-Santa Cruz) continues as a Research Associate Professor this year.

Research Assistant Professors this year are **J. Ping Liu** (Ph.D. 1995, U. of Amsterdam), working with Professor Sellmyer, and **Renat Sabiryanov** (Ph.D. 1993, Institute of Chemistry of Solids, Ekaterinburg, Russia), working with Professor Jaswal.

Visiting Assistant Professors this year are **Shireen Adenwalla** (Ph.D. 1989, Northwestern), **Juan Martinez** (Ph.D. 1994, Illinois), and **Rochelle Ondracek** (Ph.D. 1994, Johns Hopkins Univ.).

Research Associates during the 1997-98 academic year are **Alexander Boune** (Ph.D. 1992, Moscow Institute of Crystallography), working with Professor Ducharme, **Herman Batelaan** (Ph.D. 1991, U. Utrecht, Holland) working with Professor Gay, **Peter T. Cox** (Ph.D. 1980, Michigan) working with Professor Claes, **Elaine Kirkpatrick** (Ph.D. 1997, Carnegie Mellon), working with Professor Leslie-Pelecky, **Ruolin Li** (Ph.D. 1995, University of Mainz), working with Professor John Hardy, **Toshiyuki Matsui** (Ph.D. 1995, U. Osaka Prefecture, Japan), working with Professor Kirby, **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, **Vicki Plano-Clark** (M.S. 1993, Michigan State), working with Professor Fuller, **Wayne Stolte** (Ph.D. 1994, Nevada-Reno), working with Professor Samson, and **Orhan Yenen** (Ph.D. 1986, Nebraska), working with Professor Jaecks.

1996 Fall Semester Colloquia

September 5
Dr. Stephen Platt, University of Nebraska
"Anisotropy in the Cosmic Microwave Background: Results From Python III"

September 12
Dr. John Moreland, National Institute of Standards & Technology
"Recent Advances in Magnetic Force Microscopy"

September 19
Professor Stephen Ducharme, University of Nebraska
"Physics of Lasers and Modern Optics: A Laboratory Course for Science and Engineering Majors"

October 3
Professor Harold Metcalf, SUNY-Stony Brook
"Quantum Effects in Laser Cooling"

October 10
Dr. John Womersley, Fermi National Accelerator Laboratory
"Physics at the Large Hadron Collider at CERN"

October 17
Connie Willis, Nebula- and Hugo-Award-Winning Science Fiction Author, *The Jerry E. Ruckman Lecture:*
"Science Fiction and Physics"

October 24
Professor Joachim Burgdörfer, University of Tennessee and Oak Ridge National Laboratory
"Quantum Transport Through Semiconductor Microstructures"

October 31
Professor Herbert Hopster, University of California-Irvine
"Spin-Polarized Electron Spectroscopy of Magnetic Surfaces and Ultrathin Films"

November 7
Dr. Priscilla Frisch, University of Chicago
"Interstellar Matter and the Journey of the Sun"

November 14
Professor Timothy J Gay, University of Nebraska
"Scattering of Chiral Electrons by Chiral Molecules"

November 21
Professor Peter A. Dowben, University of Nebraska
"Is Magnetism at Surfaces Different?"

December 5
Professor Boris Ya. Zeldovich, University of Central Florida
"Spit-Orbit Interaction of the Photon: Theory and Experiment on Classical Electrodynamics of Wave Propagation in Optical Fibers"

1997 Spring Semester Colloquia

January 16
Professor Subriyo Bandyopadhyay, University of Nebraska
"Quantum Computing and Quantum Cryptography"

January 23
Professor Robert G. Fuller, University of Nebraska
"Paperless Physics Pedagogy: Promises and Problems"

1997 SPRING SEMESTER COLLOQUIA (cont'd)

January 30
Professor Marjorie Langell, University of Nebraska
"Electron Energy Loss Spectroscopy of Transition Metal Oxide Surfaces"

February 13
Professor Gary J. Ferland, University of Kentucky
"The Gas Close to the Supermassive Black Holes in Quasars"

February 20
Professor David H. Dunlap, University of New Mexico
"Recent Advances in the Understanding of Charge Transport in Organic Materials"

March 6
Dr. C.-H. Chen, Lucent Technologies-Bell Laboratories
"Stars and Stripes in Manganese Oxide"

March 13
Professor Robert Greenler, University of Wisconsin-Milwaukee
"Sunlight, Ice Crytals, and Sky Archaeology"

March 20
Professor William C. Stwalley, University of Connecticut
"Revealing the Darkest and Outermost Secrets of Molecules with Laser Spectroscopy"

March 24
Dr. Herman Batelaan, University of Nebraska
"Spin Polarized Electron Beams: Were Bohr and Pauli Wrong?"

March 25
Dr. Bernard Doudin, École Polytechnique Fédérale de Lausanne
"Spin Transport in Structured Nanowires"

April 1
Dr. Deborah Jin, JILA/University of Colorado
"Bose-Einstein Condensation in a Dilute Atomic Gas"

April 3
Dr. John Kitching, National Institute of Standards & Technology
"Amplitude-Squeezed Light from Diode Lasers"

April 7
Dr. Zhenyong Zhang, Los Alamos National Laboratory
"Application of Magnetic Resonance Force Microscopy in Material Science"

April 9
Dr. Andreas Berger, University of California-San Diego
"Ferromagnetism in Ultrathin Films"

April 10
Professor Alexander Dalgarno, Harvard University
"Supernova 1987a"

April 17
Dr. Dongqi Li, Argonne National Laboratory
"Magnetic Quantum Well States: The Concept and Implications for Magnetic Multilayers"

April 21
Professor Henry Thacker, University of Virginia
"Hadron Structure on the Lattice"

New Research Grants and Contracts

during the period 1 November 1996 —31 October 1997 the following new and renewal grants and contracts were received by our faculty

Principal Investigator	Title (Source of Funds)	Amount ($Thousands)
Burrow	Temporary Anions and Dissociative Attachment: Probes of Intra- and Intermolecular Interactions (NSF)	122.9
Dowben	Fabrication and Characterization of Micron Scale Ferromagnetic Features (DOE)	105.9
Dowben	Electronic, Magnetic & Structural Properties of Surfaces of Perovskites (UT)	25.0
Dowben/Robertson	Size and Shape Effects in Submicron Magnetic Memory and Logic (DOD/ONR)	164.1
Dowben/Langell	Decomposition Pathways of Metallocenes on Surfaces (ACS)	25.0
Ducharme	Ferroelectricity in Langmuir-Blodgett Polymer Films (NSF)	83.5
Fabrikant	Atomic Processes Involving Negative Ions (NSF)	60.0
Fuller	Research & Development Using Hypermedia for Knowing Physics (NSF)	112.5
Fuller	Enhancing High School Physics Teaching with CD-ROMs: An Institute for People Who Intend to Teach Physics (CCPE)	37.0
Fuller/Plano-Clark	Integrating Multimedia-Based Life-Science Applications into College Physics Laboratories (NSF)	62.5
Gay	Polarized Electron Physics (NSF)	185.0
J. Hardy	Studies on the Microwave Optics of Ionic Molecular Solids (ARO)	7.0
Jaecks	Experimental Study of Collective Motion, Charge Distributions and Bound-Free Electron Correlations in Unusual States of Ar^+: Correlation Studies of Three Massive Coulomb-Interacting Particles(NSF)	192.0
Jaswal	Ab-Initio Study of the Finite-Temperature Properties of Novel Magnetic Materials (NSF)	147.0
Leslie-Pelecky/ Ducharme	Summer Research Experience for Undergraduates in Nanostructured Materials Research (NSF)	60.0
Liou	The Acquisition of a Scanning Probe Microscope (DOE/MISCON)	43.0
Liou	Fabrication of Magnetic Force Microscopy Tips (DI)	3.5
Samson	Interaction of Radiation with Planetary Gases (NASA)	30.0
Sellmyer	Materials Research on Nanostructured and Complex Systems (NSF/EPSCoR)	242.8
Sellmyer	Ultra High Density Recordings: Optical Recording Component (NSIC)	32.6
Sellmyer	Fundamental Media Limits on EHDR (NSIC)	18.0
Sellmyer/Jaswal	Fundamental Studies of Novel Permanent Magnet Materials (DOE)	75.0
Sellmyer/Kirby	Magnetism & Magneto-Optics of Novel Nanoscaled Materials (NSF)	64.5
Snow	The Cosmic Ray Observatory Project (CROP) (LTF)	7.5
Snow	Detector R&D and Projects Costs for CMS (NU)	25.0
Starace	Coherent Control of Continuum Quantum Processes (NSF)	78.0
Starace	Dynamics of Few-Body Atomic Processes (DOE)	83.0
Weymouth	Magnetometry at Fort Clatsop, NM (FCNM)	5.0
Weymouth	High Banks Archeological Center (NPS)	4.0
Weymouth	Pipestone National Monument (NPSMAC)	1.5
Weymouth	Hopeton Earthwork in Ross County, Ohio (NPS)	5.0
Weymouth	Lake Dumond Site (NPS)	5.0
Weymouth	Fort Remon (MSU)	3.6
	Total	**$2,116.4**

ACS - American Chemical Society
ARO - Army Research Office
CCPE - Coordinating Commision for Postsecondary Education
DI - Digital Instruments
DOD - Department of Defense
DOE - Department of Energy
EPSCoR - Experimental Program to Stimulate Competitive Research
FCNM - Fort Clatsop National Memorial
LTF - Layman Trust Fund
MISCON - Midwest Superconductivity Consortium
MSU - Montana State University
NASA - National Aeronautics and Space Administration
NPSMAC - National Park Service Midwest Archeological Center
NPS - National Park System
NSF - National Science Foundation
NSIC - National Storage Industry Consortium
NU - Northeastern University
ONR - Office of Naval Research
UT - University of Tennessee

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