

u SPECTRUM

A Newsletter for Alumni and Friends of the Department of Physics and Astronomy of the University of Nebraska—Lincoln

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M. Eugene Rudd, Editor

Park Appointed Chancellor of the University of Missouri-Rolla



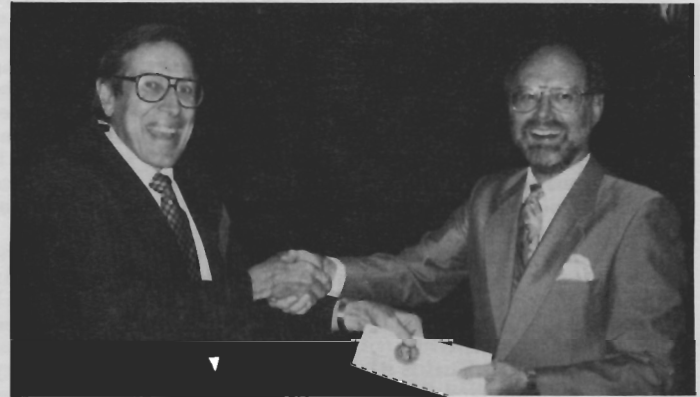
John T. Park

associate professor at New York University during the 1970-71 academic year and was chairman of the UM-Rolla Physics Department from 1977 to 1983.

At Rolla, Park developed a unique experimental system to measure energy-loss spectra of energetic ions with an unprecedented resolution. This enabled him and his associates to make measurements of various atomic collision processes which were difficult or impossible by any other method. In 1976 Park's group published the first measurement of the total cross sections for the excitation of atomic hydrogen by proton impact and in 1981 they obtained the first differential charge transfer cross sections for proton-atomic hydrogen collisions. A fellow of the American Physical Society, Park has served on numerous national and international committees and panels. He was also the recipient of the Shell Oil Company Outstanding Teacher Award at Rolla.

"John Park's appointment was recommended to me with exceptionally strong support from members of the search committee, faculty, staff and students on the Rolla campus," Russell said. "He has served Rolla long and exceedingly well as teacher, scholar and campus administrative officer. He is a person whom we know and respect and in whom we have great confidence." Prior to his appointment as chancellor, Park had also served as UM-Rolla's Vice Chancellor for Academic Affairs and in 1985-86 and 1991-92 as Interim Chancellor.

John T. Park (Ph.D. 1963) was named Chancellor of the University of Missouri-Rolla on March 20th by the University of Missouri System President George A. Russell. Park, 57, received his undergraduate degree from Nebraska Wesleyan University in 1956. In 1963, with Professor Edward Zimmerman as his thesis adviser, he received his Ph.D. in physics from the University of Nebraska. In 1964, after a postdoctoral appointment at University College in London, he went to Rolla as an assistant professor of physics. He was a visiting



Thomas D. Rossing, Past President of AAPT, presents the Millikan Medal and citation to Robert G. Fuller.

Fuller Awarded AAPT Millikan Medal

The Awards Committee of the American Association of Physics Teachers announced in the July 1992 issue of the AAPT Announcer that Professor Robert G. Fuller had been selected to receive the Robert A. Millikan Medal for 1992.

The award recognizes a teacher who has made notable and creative contributions to the teaching of physics. The Millikan Medal recipient presents a lecture at the AAPT summer meeting. A monetary award of \$4000, an inscribed silver medal, travel expenses to the meeting, and a citation are awarded annually at the AAPT Summer Meeting. Cosponsored by Prentice-Hall Publishing Company and AAPT, the award was established in 1964.

Fuller received his undergraduate degree at the University of Missouri-Rolla in 1957 and his M.S. and Ph.D. in physics at the University of Illinois. After four years at the U.S. Naval Research Laboratory where he studied conductivity and ionic transport in solids he joined the faculty at UNL in 1969. The focus of his efforts here has been on innovative educational projects. This work has brought him recognition on the national as well as the local scene. For example, he has received two Distinguished Teaching Awards at UNL; one in 1973 and another in 1986. He was elected President of AAPT for 1980 and has been the editor of their Instructional Materials Center since 1987. In 1986 he was cited by the American Association for Higher Education for his educational leadership. He received the University of Missouri-Rolla Alumni Merit Award in 1988.

Fuller presented his Millikan lecture, "Hypermedia and the Knowing of Physics—Standing Upon the Shoulders of Giants," at the AAPT summer meeting on the University of Maine campus in Orono, ME on August 13, 1992 and repeated it in a UNL Physics Department colloquium on September 3.

Moore Professorship Established



Burton Evans Moore, ca. 1898

Burton E. Moore of Charleston, South Carolina has set up an endowment fund at the University of Nebraska Foundation to be known as the "Burton Evans Moore Professorship in Physics." The Fund is named in honor of the donor's father, who was a faculty member in this Department from 1896 to 1925. The fund was established with a \$15,000 gift. Once the principal grows to \$200,000 (through reinvestment of income and additional gifts), the income of the fund will be used to provide an annual stipend to the recipient of this Professorship in addition to his or her state-funded salary. The recipient of this Professorship is to be nominated by the Dean of the College of Arts & Sciences and approved by the Chancellor of UNL, the President of the University of Nebraska, and the Board of Regents.

Burton Evans Moore was hired by Department Chairman DeWitt Bristol Brace in 1896. In his book, *Science on the Great Plains* [copies still available—see order form in this issue of *Spectrum*], Eugene Rudd notes that "Moore had received his master's degree from Cornell University and had studied at the Universities of Strassbourg and Berlin. Before coming to Nebraska he had been on the faculty of Lehigh Uni-

versity and the University of Illinois and had also done work at Göttingen, where he later received his Ph.D. degree. His research was in excitation stages in open-arc spectra. Moore published at least a dozen papers during his time at Nebraska on topics in electro-chemistry and spectroscopy and remained on the faculty until his death in 1925."

The Department is very grateful to Burton E. Moore for simultaneously honoring his distinguished father and benefitting the Department in this way. Anyone may contribute to the "Burton Evans Moore Professorship in Physics" Fund—and thereby help achieve its financial goal of \$200,000—by so designating one's gift to the NU Foundation.

Chairman's Letter



Anthony F. Starace

While I was on sabbatical during the first eight months of 1992 it seems I was asked many times by colleagues and acquaintances what it's like being Chair of this Department and simultaneously keeping active in research and teaching. Maybe they were surprised I would take a sabbatical, or rather, that I would take up the Chairmanship again on my return. Anyway, among other things, I would answer that it's like committing oneself to twice as much work as one can reasonably hope to accomplish, to managing regardless to get three quarters of it done, and feeling badly about the remaining work that one just couldn't manage. The reward comes primarily from the accomplishments and the positive changes that one has a hand in fostering. Anyway, this sabbatical did for me what it was designed to do—it allowed me much more time to think. I had time to pursue ideas and new research areas for which there is precious little time otherwise.

When I returned to Lincoln at the start of the fall semester, the newspapers were full of news about proposed mid-year budget cuts. In the national context, our University as well as our State are much better off financially than many, many other universities and states. Nevertheless, our State has not escaped the financial problems confronting the Nation. That is why it is heartening that the generosity of you, our alumni and friends, is in certain ways reducing our dependence on State funding to carry out our missions of teaching, research, and service. Burton Moore's establishment of an endowed Professorship late last year is the very first of its kind for this Department. It honors one of our distinguished former Professors. It adds to the growing number of endowment funds established to benefit the Department in various ways. Thus, as shown in *The Record* later in this newsletter, our undergraduate and graduate students benefit from a number of endowed scholarships and fellowships honoring other distinguished faculty, alumni, and friends. Certainly, the Kositzky Memorial Equipment Fund established by Mr. & Mrs. James C. Coe has done wonders for our students by enabling us to provide them with state-of-the-art equipment in our laboratories.

However, these large gifts are not the whole story. Eight years ago the Department established new endowment funds for unrestricted purposes, for visiting lecturers, and for scholarships. These were funded with a portion of the donations many of you make to us annually. As of this month these funds' total endowment is close to \$40,000. The income from these endowments is used annually to host get-togethers of our faculty with Lincoln and Omaha area high school physics teachers, to invite distinguished scientists to present colloquia and interact with our faculty and students, to recruit promising high school students interested in majoring in physics or astronomy, and for many other worthwhile purposes. Your annual donations are indeed like the proverbial acorns from which great oak trees grow given sufficient time, care, and patience. While it is always difficult to put aside a significant fraction of our annual donations for the future, especially when our needs every year seem so great, this discipline is producing for us a growing stream of permanently funded income. For this the Department and I thank you and promise to continue striving to earn your confidence in us.

It is always a pleasure to report the external recognition the Department's faculty receive. This year the Department's teaching excellence has been recognized by the presentation of the American Association of Physics Teacher's 1992 Millikan Award to Professor Robert G. Fuller and by the College of Arts and Sciences' presentation of a Distinguished Teaching Award to Professor Edward G. Schmidt. At a time when research universities throughout the U.S. are being scrutinized for how well they are carrying out their teaching mission, such awards bring added weight to the argument that good research and creative activity go hand in hand with good teaching. Fuller's award in particular recognizes his work on applying advanced technologies to developing novel teaching tools such as the interactive videodiscs which we are employing in our premedical physics courses this year. Schmidt's award makes him the 13th member of our current faculty to receive a distinguished teaching award. Furthermore, nearly all of these 13 faculty are also active researchers. While the creation of new knowledge in our laboratories often receives more publicity, you should know that its conveyance to the next generation of students is also being done in our Department and done well.

At present the Department is suffering the pains of growth. Our graduate student population is currently up to a record 63 students with a few more due to enter in January 1993. Our external research grants and contracts are at a record of \$2.8 million annually, which is more than double the \$1.3 million we had as recently as 1987-88. The number of bachelors, masters, and doctoral degrees awarded by the Department has roughly doubled in the past 10 ten years from 66 degrees during the 5-year period 1977-82 to 131 degrees during the most recent 5-year period 1987-92. Our plans to increase the number of experimental faculty in the Department are proceeding rapidly: this academic year we are advertising for experimentalists in atomic physics, condensed matter and materials physics, and in high energy physics. All of this growth, mind you, is proceeding without any increase whatsoever in the total number of faculty in the Department, which remains at 28 faculty. (Actually the number of faculty has decreased since some of our newer faculty have only partial appointments in the Department.) This growth stems in large part from the attractiveness to students of the research being carried out by our faculty as well as the much larger number of graduate research assistants and postdoctoral researchers who are being supported by our increased external grant funds.

The number one problem the Department faces is that of space: space for new faculty, students and postdoctoral researchers and space for the new laboratories in newer research areas in which we wish to educate our students. These needs are being met just one step ahead of—and in some cases, just one step behind—the arrival of our next new faculty member.

You've read in previous issues of *Spectrum* how our Library was moved from the 2nd floor of Behlen Lab to the first floor of Brace. Well, by the time you receive this issue of *Spectrum*, our Departmental offices in Behlen will also have moved to the first floor of Brace. These moves are enabling us to create four new research laboratories for our new faculty on the 2nd floor of Behlen. This Spring we plan to write proposals to renovate the attic in Brace, thereby creating 8-10 new faculty/staff/student offices and 2 new research and teaching labs. That should take care of our needs for at least a few years—we hope!

Finally, I wish to say that the faculty and staff sincerely enjoy hearing from you. We do care what happens to our graduates after graduation. That is why you'll find an information card and return envelope enclosed with this newsletter. Please use it to inform us of your activities and address changes. Please also look over the list of "missing alumni" published in this issue of *Spectrum* and help us to find any of whom we've lost track. And when your plans involve a return to Lincoln, please stop and see us. With some advance notice we can arrange a brief tour of our "new" Department. Best wishes until next year.

Sincerely

Anthony F. Starace
Professor and Chairman

Kelty Receives "Snow and Ice" Research Grant

The Department Electronics Shop is continuing its involvement with the Snow and Ice Research Group (SIRG). As a SIRG co-principal investigator, Electronics Shop Manager John Kelty was recently awarded a \$522,785 grant from NASA Earth Science and Applications Division to build and launch a probe that melts into the Greenland ice sheet. He and Electronics Technician Brian Farleigh plan to be at Summit Greenland (71° N, 37° W) in the 1993 summer season.

Kelty returned this past summer from Camp Century in North Greenland (77° N, 61° W) after surveying the existing borehole there to a depth of 1350 m, about 30 m from the bedrock bottom. A new one-meter long logging tool uses electronics designed and built in the Physics Department Electronics Shop. Related papers appear this year in the journal *Cold Regions Science and Technology*.

Donald J. Fuehring, 1929-1992



Donald J. Fuehring

Donald Fuehring, manager of the instrument shop for the Department of Physics and Astronomy since 1959, died on July 4th at the age of 62. In 1955, after attending the Nebraska Vocational Technical School in Milford, Nebraska, Fuehring started work in the shop under John Heiser, the previous foreman. After Heiser retired in 1958, Fuehring was appointed Head Instrument Maker and in 1972 his title was changed to Instrument Shop Manager. During the time he was in charge of the shop, its staff grew from two to six full-time machinists. The shop, which initially occupied two small rooms on the first floor of Brace Laboratory, expanded in 1964 into new quarters in the basement of Behlen Laboratory, and in 1973 was moved to the north wing of the first floor of Ferguson Hall.

In the early 1970s Fuehring was instrumental in bringing the shop out of the "brass age" and into the "stainless steel age." He took courses in vacuum- and heliarc-welding and taught these new skills to the other shop personnel. Visiting researchers from other laboratories never fail to be impressed with the size and capability of the shop and with the excellent workmanship of its products. Don was well known to Department faculty and to generations of graduate students who went to him to discuss their apparatus construction plans. He was invariably patient with their requests and helpful in finding solutions to their problems. There was always a pleasant, friendly atmosphere in the shop which was appreciated by all who used it.

Fuehring's survivors include his wife Evelyn, two sons, a daughter and eight grandchildren. Among the pallbearers at his funeral were current and former shop personnel Jack Loos, Loren Marks, Walter Lueken, and Les Marquart. Fuehring was a Korean War veteran.

Looking for the Optical Equivalent of the Transistor

If the next generation of computers is to rely heavily on optics as well as electronics, scientists have to come up with "the optical equivalent of the transistor," says Stephen Ducharme, assistant professor of physics and astronomy at UNL.

A likely candidate for the job is a photorefractive polymer material that Ducharme and colleagues developed while Ducharme was at IBM two and one-half years ago. The material, with a polymer base much like the epoxy that people use to repair dishware, could be an inexpensive substitute for the highly expensive, hard to produce inorganic crystals with similar properties. "What a transistor does," Ducharme said, "is take an electrical signal from one wire and use it to control another. We're looking at materials in which one optical signal controls another."

Such optical signal processing would be a giant step forward in computer, communications and other high-tech industries. Optical computers, for instance, using optical disks similar to compact disks used to store music, could potentially store more information in the same amount of space than a personal computer with a magnetic disk drive.

Ducharme, who joined the UNL faculty a year and a half ago, said the property that makes certain materials useful for that purpose is the photorefractive effect, first observed in an inorganic crystal about 25 years ago, is one in which the optical properties of a material are changed by passing a laser beam through the material. "If a material's optical properties can be altered by the very light that passes through it, then it should be possible to control the process by using one beam of light to switch or amplify another, just as a transistor controls electrical signals," Ducharme said.

At IBM, Ducharme and colleagues "took a Lego approach" to finding a material with desirable photorefractive properties, piecing together one that combined a polymer with an organic dye and another compound which IBM was already using in its copiers. The result, patented by Ducharme and his former IBM colleagues, was a material

Gell-Mann Lectures on Complexity, Sustainability



Murray Gell-Mann

Internationally renowned theoretical physicist and Nobel Laureate Murray Gell-Mann presented two well-attended public lectures in Lincoln on November 9th and 10th, 1992. His first lecture was a special Physics and Astronomy Departmental Colloquium on "Simplicity, Complexity and Complex Adaptive Systems," which was presented to a capacity audience in Brace Auditorium. The talk described the sort of real-world problems dealt with by experts from various disciplines at the Santa Fe Institute in New Mexico, where Gell-Mann resides during much of the year. He described "complexity" as related to the length of the shortest message needed to describe a system to a knowledgeable person in an agreed-upon language. Complex Adaptive Systems may be anything from a rainforest to the stock market. Such systems do not merely have records of their experience but also process this information—or rather its regularities—in highly compressed form. The goal of research on such systems is to seek out their regularities. Their special circumstances—i.e., that information which cannot be compressed—is akin to boundary conditions and must be put in separately.

Gell-Mann's second lecture was part of the E. N. Thompson Forum on World Issues. He spoke on "Toward a Sustainable World" to over 1000 listeners at the Lied Center. He discussed a host of issues necessary to move the world toward a sustainable mode. First and foremost was his opinion that broadly integrated thinking needs to be fostered. This is difficult in a world where specialization is what is rewarded. But, he suggested, the reward system could be changed to encourage more general approaches to world problems. He observed that the cost of pollution is currently zero to manufacturers and therefore is a major problem. If, however, the cost of pollution were reflected in the price of products, one wouldn't have to make moral decisions in the marketplace in order to aid the environment. Instead one could simply choose on the basis of price—what would be good for one's pocketbook would be good for the environment. Among other ideas were that population growth in poorer countries could be slowed by improved education and health care for women and children; that the developed world could provide financial assistance to the developing world in exchange for proper environmental stewardship of their land, air, and water; and that ultimately the possibly "hard-wired" biological tendency toward tribalism needs to be modified through education and cultural evolution toward a feeling that all life forms have an inter-department interest in the global environment.

Gell-Mann is the Robert A. Millikan Professor of Theoretical Physics at the California Institute of Technology. He holds a B.S. degree from Yale and a Ph.D. degree from M.I.T. which he received when only 21 years old. In 1969 he was awarded the Nobel Prize in physics for his work on the theory of elementary particles. He is known for the idea that nuclear particles are constructed of sub-nuclear particles which he named "quarks." He has also suggested a new kind of nuclear charge which he dubbed "strangeness." His present research in physics concerns the foundations of quantum theory and quantum cosmology.

Gell-Mann is a Renaissance man. He is an expert in fields far removed from physics, including linguistics and ornithology. He speaks several languages fluently. He has won several other awards, is a member of the National Academy of Sciences, a Fellow of the American Physical Society, a foreign Fellow of the Royal Society, and sits on the boards of the MacArthur Foundation, the Council on Foreign Relations, and the Santa Fe Institute. Recently he married Marcia Southwick, a noted poet and an Associate Professor in the UNL English Department.

that is easier and cheaper to produce than crystal. "The dye provides the conductivity and photorefractive properties we're interested in," Ducharme said. "The polymer is the glue that holds it together."

Ducharme continues to tinker with several "variations on a theme," looking for a photorefractive material with optimum properties for use in optical data storage, optical computing, communications and other high tech applications. Ducharme holds a three-year, \$100,000 research initiation grant from the National Science Foundation for his studies of polymer photorefractive materials.



Stephen Ducharme in his laboratory. (Photograph courtesy of the Lincoln Journal-Star Publishing Co.)

Ducharme Invention to be Used on Space Shuttle

Assistant Professor Stephen Ducharme, who joined the Department in 1991, has invented a new type of ellipsometer which is already finding use in the U.S. space program. An Ellipsometer is an instrument which measures the reflectivity of materials in order to determine their optical constants. Because Ducharme's version is compact, light, and rugged and requires no calibration, it is highly suited for remote applications in space and in other industrial situations. Misalignments of the optical elements, caused, e.g., by launch vibration, can be directly and accurately corrected in software without the need for a recalibration or adjustment.

The development took place in Ducharme's laboratory on a sub-contract from the J.A. Woollam Company under a NASA Small Business Innovation Research (SBIR) Phase I grant. John Woollam is the George Holmes Distinguished Professor of Electrical Engineering and a Professor of Physics and Astronomy. Participating in the development work were technician Hassanayn Machlab, and Woollam Co. Chief Research Engineer Blaine Johns and Woollam. Ducharme says that the entire project took approximately five months from concept to final report, but that the bulk of the work was completed in just two months.

A patent application has been filed and the Woollam Company plans to manufacture and market the device to a wide and largely untapped industrial materials processing industry. The University of Nebraska will receive royalties on the sales under a patent license agreement. Program managers at NASA were so pleased with the prototype performance that they have already scheduled the device on an upcoming space shuttle mission. The Woollam Company has submitted a much larger SBIR proposal, with approximately \$120,000 of UNL subcontracts to be shared by Ducharme and Associate Professors Paul G. Snyder and Natale J. Ianno of Electrical Engineering, to fully develop the space instrument for this mission.

Research Highlights

We present here a selection of recent research results by the Department's faculty and staff that have either been accorded rapid publication in *Physical Review Letters* (PRL) or else have been the subject of recent review articles.

In the 2 March 1992 issue of PRL, Professor Sitaram S. Jaswal reported on his calculations of the dipole-dipole interaction's contribution to the energy density of homogeneous, amorphous, and anti-ferromagnetic rare earth-transition metal (RE-TM) films. Normally, this dipolar contribution averages to zero in macroscopic samples of such materials. However, non-zero contributions become significant near the film's surface. In fact, theoretical models show that the magnitude of this dipolar contribution is usually proportional to the number of atomic layers (for materials having 3 or more layers). Jaswal's calculations showed that the dipolar interactions for anti-ferromagnetic materials are of the same order of magnitude as those for ferromagnetic materials. Furthermore, the magnitude is insufficient by itself to give rise to the observed perpendicular magnetization found in such RE-TM films. Thus other interactions are needed to explain the observations of perpendicular magnetization in these materials. Such magnetization is crucial for magneto-optic data storage devices.

In the 9 March 1992 issue of PRL, Professor M. Eugene Rudd, former post-doctoral research associate Mark Gealy, and graduate students George Kerby and Ying-Yuan Hsu reported the discovery of a large unexpected peak in their measurements of the electron spectrum resulting from ionizing collisions of 30-100 keV protons on hydrogen targets. This peak, which is observed in the backward hemisphere centered at about 31 eV, is not observed in electron impact ionization of hydrogen. This peak accounts for about 35% of the integrated cross section at an observation angle of 160°. However, its magnitude falls off rapidly with decreasing angle and accounts for only 2% of the total electron ejection cross section at a proton impact energy of 70 keV. These authors speculate that a possible explanation may be that collisions of protons with highly excited hydrogen atom targets are producing significant numbers of electrons in the backward direction. Classical trajectory Monte-Carlo calculations done by Olson's group at Rolla find no evidence of a backward peak in collisions with ground state hydrogen atoms, but find some backward peak enhancement for H(2s) targets, albeit at energies lower than observed experimentally.

In the April 1992 issue of *Reviews of Modern Physics*, Professor M. E. Rudd and collaborators at Argonne National Laboratory and at the University of Missouri-Rolla reviewed all known data on the energy distribution of electrons ejected during collisions of protons with atoms and molecules. The two experimental methods used to obtain the data are reviewed and possible sources of error pointed out. Theoretical treatments are also reviewed and several methods of checking their consistency are discussed. Semi empirical models are used to fit available data to obtain recommended values of differential cross sections for ten target gases.

In the book *High-Temperature Superconductivity* edited by J. Ashkenazi et al. (Plenum, New York, 1991), alumnus John W. Flocken (M.S. 1964, Ph.D. 1969) of the University of Nebraska-Omaha, Professor John R. Hardy, and postdoctoral research associate Hsiao-Ming Lu present a review of the role of anharmonic lattice motion in enhancing the superconducting transition temperature in high T_c systems. The authors stress, in particular, the role of double-well potentials and discuss recent experimental evidence for such mechanisms. They note that in recent years "there has accumulated a body of serious evidence that indicates with increasing strength that lattice-related Bardeen-Cooper-Shrieffer (BCS) mechanisms were too hastily dismissed."

Note from Wayne and Phyllis Lang

A newsy note came in January from Wayne W. Lang (Ph.D. 1964). He and his wife Phyllis are at the University of North Carolina at Asheville, where he is the chairman of an 8-person Computer Science Department and she is the director of the Honors Program. Her work with that program helped UNCA attain 15th place in the ranking of universities in the southern region by *U.S. News and World Report*. This ranking, Wayne says, brought them twice as many applications for positions as in the previous year.

Wayne's department recently received a \$45,000 NSF grant which will give them a new UNIX lab with 13 color Dec 5000/25 work stations. He teaches a lot of physics in his VLSI design course and is also

teaching a course on computer graphics and X-windows on their statewide network. Wayne says to tell anyone who asks that "a Ph.D. [graduate] in physics from UNL can lead a great life." He also says hello to his thesis adviser Ted Jorgensen, and to former classmates Bruce Anspaugh, Chet Sutter, Eugene Rudd, John Park, Chuck Skov, and Jim Bunch. "We remember those days with you all with great affection."

Wayne's brother, Dr. Charles Lang, a physics teacher at Omaha Westside High School, has been a collaborator with Professor Robert Fuller on several educational projects.

Arons Presents "Some Unpalatable Truths"



Arnold B. Arons

New York, 1990), 342pp, \$39.95, which has been reviewed in the December 1990 issue of *Physics Today*.

Arons began his lecture by stating his oft-voiced opinion that instructors need to back off on the volume and pace of coverage of introductory physics and pursue instead a more Socratic dialogue with the students which he believes will lead to deeper understanding. He stated that students often agree to bad teaching provided they're given bad exams. Instead he stressed that exams should test concepts. He then presented a number of "Unpalatable Truths": That "there exist no verbal explanations and no demonstrations so effective and so lucid as to convey understanding . . . to every passive listener"—rather one must "engage the minds of the learners in active thinking and reasoning"; that "mastery of concepts . . . does not become more rapid with increasing age of the learner," i.e., college-level students do not have an easier time than high school students learning the same material; that "when students make errors and you conjecture what they are thinking (without having asked questions and listened to what they actually say), you will be wrong in your conjectures almost every time."

Arons concluded by suggesting that to cut back on volume of material it helps to have a story line that brings students back again and again to the concepts needed as preparation for succeeding courses. Universities are supposed to teach people to learn by themselves. Therefore universities—and physics departments in particular—need to have the courage to leave some gaps which the students can fill themselves.

Arons was born in Lincoln in 1916. He received his Ph.D. from Harvard in 1943, whereupon he taught at both Stevens Institute of Technology and Amherst, where he became Professor of Physics in 1968. That same year he took a Professorship at the University of Washington, where he has been Emeritus Professor since 1982. His research has spanned the fields of explosive phenomena, oceanography, and cognitive development. He was awarded a Guggenheim Fellowship in 1957, and received the Oersted Medal of the American Association of Physics Teachers (AAPT) in 1972. He was the President of the AAPT in 1967. Robert Fuller and his staff helped Arons locate the address of his birthplace in Lincoln and took him there for a visit.

Following Arons's lecture, Department faculty met with Lincoln and Omaha area high school physics teachers over dinner at the Nebraska Union. Professor Robert Fuller and Visiting Assistant Professor Evelyn Tuska Patterson gave a presentation on "Using Interactive Video to Teach Physics." Patterson demonstrated how interactive videos such as Fuller's *Physics Cinema Classics* are being used in our premedical physics courses. Students in these courses are given assignments which they carry out using interactive video discs in our Physics Learning Center in Brace Lab. Assignments involve taking data based on events shown in the films and making predictions and drawing conclusions based on these data.

Pizza Boxes Hold Food for Thought

Whether people who open boxes being sent across the nation and around the world are disappointed or elated depends on what they hunger for—food or knowledge. The boxes are printed with the name of a popular pizza restaurant in Lincoln, but the "classic" inside is not a medium-sized pizza but a videodisc set produced at the University of Nebraska-Lincoln under the direction of Robert Fuller, professor of physics and astronomy.

Fuller produced "Physics: Cinema Classics" as a special project for the American Association of Physics Teachers (AAPT), which provided funds for the project. That funding was insufficient to cover the cost of producing the videodisc. No matter, for UNL will not only recover production costs, but stands to make about \$200,000 profit on the initial sale of the videodisc. Fuller obtained an agreement with his backers for the project allowing the University to collect the profits from the first sale of the videodiscs, which were advertised earlier this year in special brochures in the official publications of the AAPT. "I set the price at \$399 per set, and hoped we would sell 250 copies," Fuller said. "Instead we received orders for 1,200 copies, from every state in the union, six provinces in Canada, and 60 other countries."

The videodisc library is a collection of the best moments from hundreds of physics films, most produced since 1950. Fuller, director of the AAPT Instructional Materials Center at UNL, produced the six-sided videodisc package with a grant from the U.S. Department of Education.

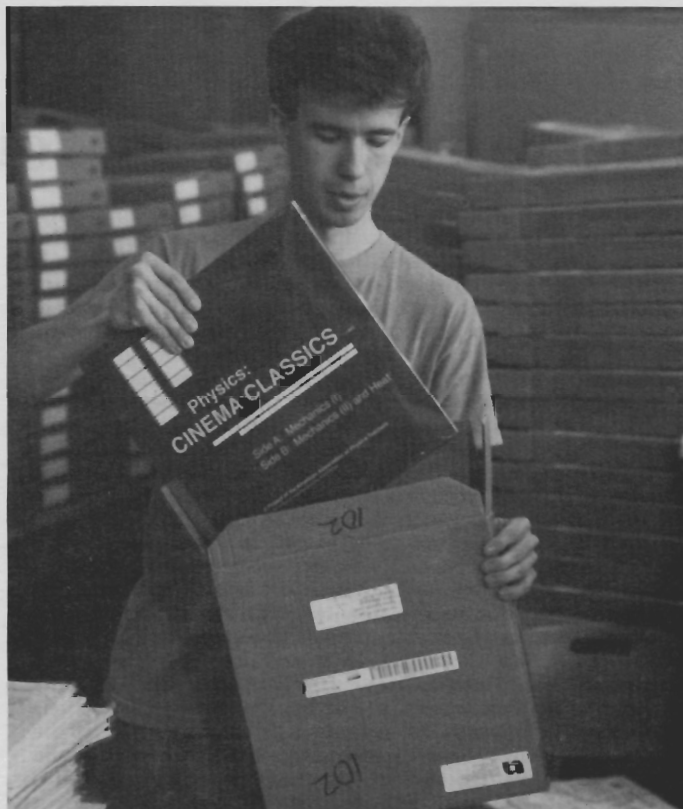
Fuller and his staff, including Dr. Charles Lang, a physics teacher at Omaha Westside High School, previewed more than 1,000 hours of film to choose material for editing and incorporating into new segments, often with new narration and sound track. The videodisc pre-production work was done by a Nebraska Educational Television Videodisc Design/Production team.

The library of physics classics will enable teachers to illustrate any one of hundreds of physics principles with an instantly accessible selection from the library, which has built-in opportunities for class discussion and also allows teachers to develop their own computer-interactive programs.

The pizza boxes were purchased from DaVinci's Restaurants, after Fuller noted that the pizza maker's medium pizza box was just the right size to hold the videodisc set. "I'd made inquiries about having the boxes made up special for mailing the videodisc. It would have cost \$1.25 per box. DaVinci's agreed to sell them for 25 cents each." The videodiscs arrived at Ferguson Hall on May 13 and were packed in the boxes and mailed by a team assembled by Marilyn McDowell,

the project associate, by the end of the week. "I'd love to see the expression on the face of a purchaser in Italy when he opens up his 'Italian Masterpiece' pizza box and finds a videodisc inside," Fuller said.

(This article was written by Robert Sheldon and appeared originally in *The Scarlet*, a publication of the UNL Division of News and Information.)



Christopher Babb helping insert 1,200 videodiscs into pizza boxes for shipping. The boxes were assembled inside out, so the DaVinci logo was inside the package. (Photo by Mark Sumner)

Schmidt Receives Distinguished Teaching Award



Edward G. Schmidt

In an award ceremony held in April, Professor **Edward G. Schmidt**, a member of the astronomy staff since 1974, received a College of Arts and Sciences Award for Distinguished Teaching. Schmidt received his B.S. degree at the University of Chicago and his Ph.D. at Australian National University in 1970. His main research specialty has been observational research on Cepheid variable stars. Schmidt was cited for his many contributions to teaching, which have spanned all levels of instruction from grade school to the Ph.D. level.

In his teaching of descriptive astronomy to large classes, he is noted for his patient, laid-back style and straightforward method of presentation. He believes that learning astronomy and not the instructor's personality should be the major factor in the classroom. At the same time, he is highly energetic and innovative in his approach and uses techniques that enhance the learning process even though they may require extra time and effort on the instructor's part. Outside the classroom he has contributed to teaching by establishing the Minnich Astronomy Resource Center, which serves students in various astronomy courses.

Besides running an informal seminar for astronomy majors, he has been very successful in giving them extensive hands-on research experience using the 0.76-meter telescope and its CCD camera at the Behlen Observatory. As a result, many graduates have been well enough prepared that they have obtained positions working on NASA's astronomical satellite programs. Education of the general public has also been one of Schmidt's concerns. He has organized and participated in over 50 open houses at Behlen Observatory and has also served as a volunteer at Lincoln's Hyde Observatory. For several years he managed the Physics Department's Saturday Science course for 5th and 6th graders and has also taught a course for local area science teachers.

DuBois Speaks at 1992 Recognition Luncheon



Robert D. DuBois

Robert D. DuBois (B.S. 1970, M.S. 1972, Ph.D. 1975) was the speaker at the May 7th Department recognition luncheon. This event has been held each spring in recent years to recognize the students who have received bachelors, masters, and doctoral degrees during the past year, and to honor students and faculty members who have received fellowships, scholarships and other awards or honors.

The speaker this year had done his doctoral research under Professor **Eugene Rudd** on the subject of differential cross sections for elastic scattering and secondary electron production from electron impact on argon and nitrogen. The title of his talk at the luncheon was "Where Do I Go From Here? A Physicist's Journey Through Space, Time, and Atomic Collisions." In his talk DuBois described his unusually broad range of experiences as a post-doc in several laboratories, as a senior scientist, his present position at Pacific Northwest Laboratories in Richland, Washington, and as a visiting Fulbright Scholar in Frankfurt, Germany. His other positions were at the Joint Institute for Laboratory Astrophysics in Boulder, Colorado, the University of Aarhus in Denmark, the Hahn-Meitner Institute in Berlin, Germany, at Kansas State University, and at the University of Frankfurt, Germany.

DuBois noted that one often finds oneself doing research which is quite different from one's thesis topic. With Gordon Dunn, e.g., he studied electron-ion recombination; with Bent Fastrup he worked on spectroscopy of low-Z atoms and inner-shell alignment. He investigated inner-shell ionization by fast, highly charged ions with Nikolaus Stolterfoht, electron capture and transfer ionization with Lew Cocke, and dissociation of molecules and double ionization with Horst Schmidt-Böcking. Besides describing several of these projects, he told about the various places he had worked and emphasized the fun he had had, both inside and outside the laboratory.



Aylesworth Founds Young Scientists Network

Choose the correct statement: "There is a current shortage of physicists in this country which will become worse as the aging population of academic physicists retires over the next few years." Or, "There is a scarcity of jobs for PhD level physicists and many are in temporary postdoctoral positions with low salaries and no job security." Depending on whom you speak to, you can get quite different perspectives on the issue of jobs for our graduating physicists. One of our graduates, Dr. **Kevin Aylesworth** (Ph.D. 1989), has been one of the major spokesmen for young PhD graduates looking for positions. Several of his letters have been published in *Physics Today* calling attention to the fact that at the same time that the National Science Foundation is predicting an impending shortage of 625,000 scientists in this country, large numbers of young physicists are either out of work or are unable to find anything but temporary employment as postdocs. In some cases the postdoctoral jobs have gone on for as long as seven years.

While a postdoc at the Naval Research Laboratory in Washington, Aylesworth founded an informal organization called the "Young Scientists Network," an electronic mail network which now includes several hundred physicists. His call for attention to the problem has resulted in articles in the *New York Times* in March and in *Science* in May and September. Aylesworth updates his network each week with news of job tips, new funding sources, and updates on government actions affecting scientific research. He regards it as an attempt to get the physics establishment to honestly confront its graduate education and employment problems. The network has also provided a much-needed forum for frustrated scientists who see little chance of finding a career in their chosen field and who wish to discuss their situation with others in similar straits. Aylesworth also hopes to unite the members of the network into a political force.

Some factors cited as contributing to the drying up of the job market are the recession, the postponement of retirement by senior scientists, the funneling of science funds into the construction of large experimental facilities, the increasing number of physicists emigrating from the former Soviet Union, and the trend away from pure research at industrial laboratories.

Challenging the gloomy prospects for physicists is Nobel Laureate Leon M. Lederman who is currently president of the American Association for the Advancement of Science. "The opportunities for scientists in general are tremendous," he said. "A physicist may not always find opportunity in his original narrow research specialty, but only 2 or 3 percent of physicists are actually unemployed. The need for scientists to contribute to the defense of the environment is growing, and physicists will also star in the quest for alternative energy sources and many other social needs. There's no question that the nation will need more physicists."

Part of the answer to the job problem, some say, is the utilization of physicists in areas that, while not closely related to physics, can use their quantitative, problem-solving abilities in other ways. Alan Chynoweth, head of research at Bellcore, says that what is needed is flexibility. "Some physicists have moved enthusiastically into new areas," he says, "the big ones being software, systems, and services. There's no shortage of really interesting work to be done if people are willing to be flexible. There is a need for people who can solve problems in data handling, video compressions, and speech technology—things of immediate use to the company." Aylesworth has evidently heeded that advice and has recently taken a job working on issues in science and public policy with the law firm of Lawrence Tribe in Cambridge, MA.

Staff Activities

Professor Duane H. Jaecks has been reappointed by the National Research Council as the chairman of the selection committee for National Science Foundation graduate research fellowships. This is his eighth year as a member of the committee and his fifth year as chairman.

Visiting Assistant Professor Evelyn Tuska Patterson and Research Associates Michelle Mason and Laurie Gottsche presented a talk entitled "CD ROM Technology" to a computer science class at Nebraska Wesleyan University on October 20. The presentation gave the audience an overview of CD ROM, discussed present trends, and described a CD ROM for physics educators called "Physics Infomall." Physics Infomall is an NSF-sponsored project under the direction of Professor Robert Fuller.

Professor M. Eugene Rudd gave one of the four addresses at the inaugural meeting of the Antique Telescope Society held in October at the U.S. Naval Observatory in Washington, D.C. The title of his talk was "The Long and the Short of It: Telescopes of the Seventeenth Century." In it, he described the enormously long refracting telescopes of the period, which reached lengths of several hundred feet, and contrasted them with the tiny first reflecting telescope of Isaac Newton, which was less than one foot in length.

Professor Edward G. Schmidt has taken a two-year leave of absence to assume duties as Program Director for Stellar Astronomy at the National Science Foundation in Washington, D.C. His replacement for this period is Visiting Assistant Professor C. Martin Gaskell, who received his B.S. in astrophysics from Edinburgh University in Scotland and his M.S. and Ph.D. from the University of California at Santa Cruz. He has held similar positions at Ohio State University, the State University of New York at Stony Brook, the University of Michigan, and the University of Oklahoma.

Professor and Chairman Anthony F. Starace was on sabbatical from January through August at the Joint Institute for Laboratory Astrophysics (JILA) in Boulder, Colorado. During this time he also visited many universities and laboratories in the Paris area and in three cities in Germany (Kaiserslautern, Freiburg, and Berlin). He says his sabbatical was "too short." Nevertheless he submitted 5 articles for publication, gave 10 colloquia, seminars and invited talks, and chaired an APS Task Force which is reviewing *Reviews of Modern Physics*. He's most proud, however, of having worked his way to the top of the JILA squash ladder after seven months of effort, even though he only held the position for two weeks. As might have been expected, he says he's also improved his skiing.

During the summers of 1991 and 1992 Emeritus Professor John Weymouth directed a magnetometer survey of the site of Fort Ellis, which was built in 1867 on the Bozeman Trail near Bozeman, Montana. The fort was abandoned by the Army in 1886 and used by the Montana Militia until about 1920 when the buildings were razed. The survey identified a number of anomalies which are now undergoing archaeological excavation. In October Weymouth conducted a survey in Rice County, Kansas of a purported site of a serpent intaglio, which is possibly a religious effigy dug by prehistoric plains Indians.

Department Offices to be Moved

Because of continued budget problems in the State of Nebraska and at the University, it does not seem likely that a new building can be constructed very soon to solve the space problems in the Department. Therefore, we are doing our best to utilize the present space most efficiently by remodelling and rearranging functions. With the recent and planned increase in the number of experimental faculty, additional research laboratory space is needed. It was decided that space in Behlen Laboratory presently used for the Department office could be better utilized as laboratories than rooms in the older Brace Laboratory since the newer building has the needed services more readily available.

Therefore, after an extensive remodelling project costing about \$110,000, we are now in the process of moving the main Department office, the offices of the chairman and his secretary, and also the office machines and the mail boxes from the second floor of Behlen Laboratory to rooms on the south side of the first floor of Brace Lab. A new classroom is also being readied in that area. Then, to accommodate the junior-senior laboratory which formerly occupied that space, two large rooms in the northeast corner of the third floor of Brace Lab were partitioned and remodelled. This rearrangement consolidates all of the Department administration, including the recently remodelled business office and conference room, in Brace Laboratory and puts the main office close to the east main door. The third floor location of the junior-senior laboratories removes them from the high traffic area and provides much more pleasant, well lighted rooms. Venetian blinds in some of the laboratories have replaced the old torn shades while black-out shades in another room allow complete darkening for optics experiments. A separate room for experiments with radioactive sources has also been provided.

The move into the teaching laboratories took place in September and October and the transfer of the offices is scheduled for December 1. Then the vacated space on the second floor of Behlen will be made into research laboratories and faculty offices.

The Department building committee, whose members are Professors David Duquette, Edgar Pearlstein, and Eugene Rudd and Business Manager Allen Specht, have been heavily involved in planning and overseeing the project, but the main impetus for the move came from Department Chairman Anthony Starace, who not only had the original idea, but was successful in obtaining University funding for it.

While this rearrangement gains us some valuable laboratory and office space, we are still badly in need of more space for the addition of an experimental elementary particles group planned for later in the 1990s. Another project, currently under consideration, would involve remodelling much of the space in the attic of Brace Laboratory into laboratories and offices. The realization of this idea would also allow us to move some of our faculty members out of Ferguson Hall, thus solving a severe shortage of office space in the Computer Science Department as well.

If the attic renovation project gets done, our immediate space needs will be met. Further growth, however, will require new construction. However, at this point a new building seems to be only a dream. But in the meantime we are pleased to be able to make needed improvements and try to meet the growing needs as best we can.

No Known Address:

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

Malvyn P. Bailey (M.S. 1962)
Wendell G. Bradley (M.S. 1961, Ph.D. 1970)
Harvey E. Clark (B.S. 1968)
Robin L. Collins (B.A. 1979)
James M. Costello (M.S. 1963, Ph.D. 1967)
Duane A. Courter (M.S. 1960)
Jonathan B. Crooks (Ph.D. 1974)
Stephen L. Cunningham (M.S. 1969, Ph.D. 1971)
Richard V. Denton (B.S. 1965)
Clarence M. DeYoung (B.S. 1958)
James A. Eder (M.S. 1966)
Burrel O. French (B.S. 1961)
Jimmie D. Gordon (B.S. 1960)
George W. Graft (B.S. 1963)
Gerald J. Henderson (B.S. 1965, M.S. 1967)
Mehdi Homayoonfar (M.S. 1971, Ph.D. 1971)
Charles R. Hummer (B.S. 1971, Ph.D. 1983)

King-Chung A. Ip (B.S. 1980)
William C. Keller (B.S. 1981)
Ki Tae Kim (M.S. 1967)
Roy B. Kreigh (A.B. 1949, M.A. 1950 Math/Physics)
Chulon Kwon (M.S. 1983)
Sharon L. Lackey (M.S. 1974)
Mei Lin Lin (M.S. 1962)
Daniel J. Miller (B.S. 1979)
Edward E. Moreland (M.A. 1954)
Albert C. Mueller (Ph.D. 1943 Chemistry/Physics)
Venkataramanan Natarajan (M.S. 1981)
William H. Odell (B.S. 1965)
Winfred P. Pikelis (B.S. 1980)
Labros E. Pilalis (B.A. 1978)
James D. Reiersen (B.S. 1963)
Frank P. Ross (B.A. 1958)
Leroy G. Schulz (M.S. 1941)
James A. Thomassen (B.S. 1969)
Ter-hsin Tsai (Ph.D. 1978)
Robert A. Worsing (M.A. 1949 Math/Physics)
Albert O. Yeye-odu (B.A. 1975)

We Heard From . . .

Ackerman, Charles B. (M.A. 1950, Ph.D. 1954) 6720 E. Bluebird Lane, Paradise Valley, AZ 85253. Retired from Motorola in 1985 after 32 years. "The missing telescope objective lens was in a crate in the basement of Brace Lab in 1953. Say 'Hi' to Ted Jorgensen. Keep up the good work! Times are tough. I appreciate the annual newsletter."

Chu, Shi-Chung (Ph.D. 1989) Transcript International IMC, 1440 Buckingham Drive, Lincoln, NE 68506.

Day, Michael A. (Ph.D. 1983) Department of Physics, Lebanon Valley College, Annville, PA 17003. Left Thiel College in Greenville, Pennsylvania and went to Lebanon Valley College in Annville, Pennsylvania as an Associate Professor in 1987. Was awarded tenure in 1989. In 1990 he received a Whitaker Foundation Grant of the Research Corporation for his research, which he continues to do in collaboration with Professor Robert J. Hardy.

De, Bhola Nath (Ph.D. 1990) Materials Research Corporation, Headquarters Magneto-Optics Division, Rt. 303, Orangeburg, NY 10962. Is a Project Scientist at the Materials Research Corporation in Orangeburg.

Du, Ning-Yi (Former Postdoctoral Research Associate) 2414 John R. Road, Apt. 206, Troy, MI 48083. Is beginning a Medical Physics Postdoctoral appointment at William Beaumont Hospital in Royal Oak, MI.

DuBois, Robert D. B.S. 1970, M.S. 1972, Ph.D. 1975) 7721 West 13th, Kennewick, WA 99337. Is a senior scientist at Battelle Memorial Institute, Pacific Northwest Labs. "My compliments on the articles in the SPECTRUM. I especially enjoyed reading about 'Newton's Apple Tree.' It's also nice to hear about the latest research activities and awards. Keep up the good work."

Edalati, M. Taghi (Former Research Associate). Has returned to the Physics Department at Ferdowsi University in Mas-had, Iran.

Gao, Bo (M.S. 1986, Ph.D. 1989) 2414 John R. Road, Apt. 206, Troy, MI 48083. Is beginning a Medical Physics Postdoctoral appointment at William Beaumont Hospital in Royal Oak, MI.

Gayton, Charles F. (B.S. EE 1950) 1313 Sheppard Drive, Fullerton, CA 92631. Retired from CBS - News.

Helwig, Russell D. (M.S. 1964) W8615 Glacial Drive, Whitewater, WI 53190. Is an Associate Professor in the Department of Physics at The University of Wisconsin-Whitewater.

Homan, Dean M. (B.S. 1991) 305 Lindenhurst Drive, Apt. 1049, Lexington, KY 40509. Is a Graduate Teaching Assistant in the Department of Physics at the University of Kentucky.

Kim, Ho-Il (Visiting Research Associate). Has been appointed the Director of Sobaeksan Astronomical Observatory, Dae-jeon 305-348, Korea.

Lee, Yong-Sam (Visiting Research Associate). Has been appointed the Chairman of the Department of Astronomy and Space Science at Chungbuk National University, Cheong ju 360-763, Korea.

Lewis, Michael K. (B.S. 1992). Is a graduate fellow in physics at the University of Michigan-Ann Arbor. If you think your graduate school program was tough, consider what Michael recently wrote home: He took a physics exam that started at 6:00 pm and he left at 5:00 am — and he was one of the first to leave!

Liu, Chih-Ray (M.S. 1985, Ph.D. 1988) 8360 Kings Trail Cove, Cordova, TN 38018. Recently joined the faculty of the Department of Radiation Oncology of the University of Tennessee Medical Group in Memphis.

Nha, Id-Seong (Visiting Professor). Returned to Yonsei University, Seoul 120-749, Korea after spending several months of his sabbatical leave at the University of Nebraska-Lincoln.

Sarris, Apostolos (M.S. 1990, Ph.D. 1992) 4 Lerou Street, Kip-seli, Athens, Greece 11364.

Scoggin, Kenwood D. (B.A. 1990) 2307 Prairie View East, Ames, IA 50010. Is working at the National Soil Tilt Laboratory.

Smith, Andrew Nowell (A.B. 1947) Star Route, Box 33, Eldridge, MO 65463-9602. Is a self-employed Engineering Physicist. "Collapse of the USSR has not halted the Navy's program of expanding and upgrading its ELF/VLF/LF long haul radio communications systems. I am still doing some of the required design, development, modification and testing of the antenna systems as an independent consultant, 13 years after retiring from direct employment at Naval Ocean Systems Center in San Diego."

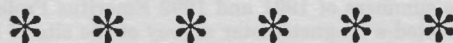
Sutcliffe, Victor C. (Ph.D. 1977) 16061 Custer Trail, McKinney, TX 75070. Is a member of the Technical Staff at Texas Instruments. "I enjoy reading about the Department. Thanks."

Tonder, Steve, 221 Satellite Lane NE, Apt. 3, Fridley, MN 55432.

Weimer, Robert K. 7773 Asterella Court, Springfield, VA 22152. Executive Officer in the U.S. Navy.

Wooten, John W. (Ph.D. 1972) 106 Crestview Lane, Oak Ridge, TN 37830. Coordinator for Educational Technology at the Oak Ridge National Laboratory. "I'm having fun setting up educational wide-area networks for schools in the Oak Ridge area. Contact me at woo@ornl.gov."

Yang, Jing, x/o Yang, Jin-Chun, Yunnan Research Institute of Chemical Industry, Kunming, 650041, People's Republic of China.



Order Your Own Newton's Apple Tree!

Two readers of last year's *Spectrum* article on Newton's apple tree have already placed their orders. You, too, can be the first in your neighborhood to possess this link to the origins of Newtonian physics! As we reported last year, a number of trees are being propagated by UNL's Horticulture Department. These all originate from scions taken from what is believed to be the original Newton's apple tree at his family's former estate at Woolsthorpe Manor in England. Professor Richard Keesing, a professor of physics at York University, has written a lengthy (and as yet unpublished) article regarding his researches into locating the original Newton's apple tree. We will be pleased to send copies to interested persons. Please include with your request a check for \$5.00 payable to "UNL Dept of Physics & Astronomy" to cover our photocopy and postage costs.

How does one obtain a tree? The cost including shipping will be approximately \$50 for a 3-foot tall tree. To reserve a tree, one should contact Professor W. A. Gustafson, Jr., 122 Mussehl Hall, The University of Nebraska, P.O. Box 880714, Lincoln, NE 68588-0714, Tel. 402-472-3674. The optimum time for shipment depends on the frost dates for Lincoln and for the recipient's location. The best time is likely to be in the Spring. Gustafson can advise one of the best time to transplant.

Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1991 – 31 October 1992. 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 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 (M.S. 1971, Ph.D. 1975)
Kevin D. Aylesworth (M.S. 1986, Ph.D. 1989)
Thomas H. Bedwell (Ph.D. 1966 Secondary Education/
Physics)
Bell Communications Research, Inc.
Russell W. Brace
Louis J. Caplan (M.S. 1964, Ph.D. 1975)
CBS Inc.
Mr. and Mrs. James C. Coe
Charles J. Cook (M.A. 1950, Ph.D. 1953)
Daniel E. Dunn (B.S. 1984 Engineering Physics)
Cathy L. Engelhardt (M.S. 1983, Ph.D. 1987)
Michael A. Engelhardt (M.S. 1983, Ph.D. 1988)

John W. Flocken (M.S. 1964, Ph.D. 1969)
Robert G. Fuller
C. Fred Gayton
Bert H. Hartzell (A.B. 1939 Math/Physics)
Alan J. Heeger (B.S. 1957)
Howard L. Heinisch (M.S. 1968, Ph.D. 1972)
David J. Holcomb (B.S. 1970, M.S. 1971)
Hughes Aircraft Corp.
IBM Corp.
Carol K. Ikeda (Ph.D. 1945 Chemistry/Physics)
Robert Katz
George W. Kerby (B.S. 1985, M.S. 1988)
John E. Lahiff (B.S. 1964)
William J. Lannan (M.A. 1956)
Alvin L. Lugn (M.A. 1950)
Robert L. Maher (M.S. 1975, Ph.D. 1980)
Ronald W. Mayle (M.S. 1979)
Materials Research Corp.
Charles B. Minnich (B.Sc. EE 1937)
Burton E. Moore
Mr. & Mrs. Joseph L. Parker (Ph.D. 1940 Chemistry/
Physics)
Rebecca R. Richards-Kortum (B.S. 1985)
Jerry E. Ruckman (B.S. 1962)
M. Eugene Rudd (Ph.D. 1962)
James J. Schmidt (B.S. 1956, M.S. 1957)
Donald P. Schneider (B.S. 1976)
David J. Sellmyer
Xue Ying Shi (M.S. 1987)
Andrew N. Smith (A.B. 1947 Physics/Math)
Stanley J. Sramek
Anthony F. Starace
Kenneth L. Stricklett (M.S. 1981, Ph.D. 1987)
Terry J. Teays (Ph.D. 1986)
Texaco Philanthropic Foundation, Inc.
United Technologies
Bruce C. Waggoner (B.S. 1984)
Westinghouse Educational Foundation
William R. Welton (M.S. 1965)
Kwong Mow Yoo (M.S. 1984)



**Obtain your copy
of the history of the
Department using the
order form on the
reverse of this page!**

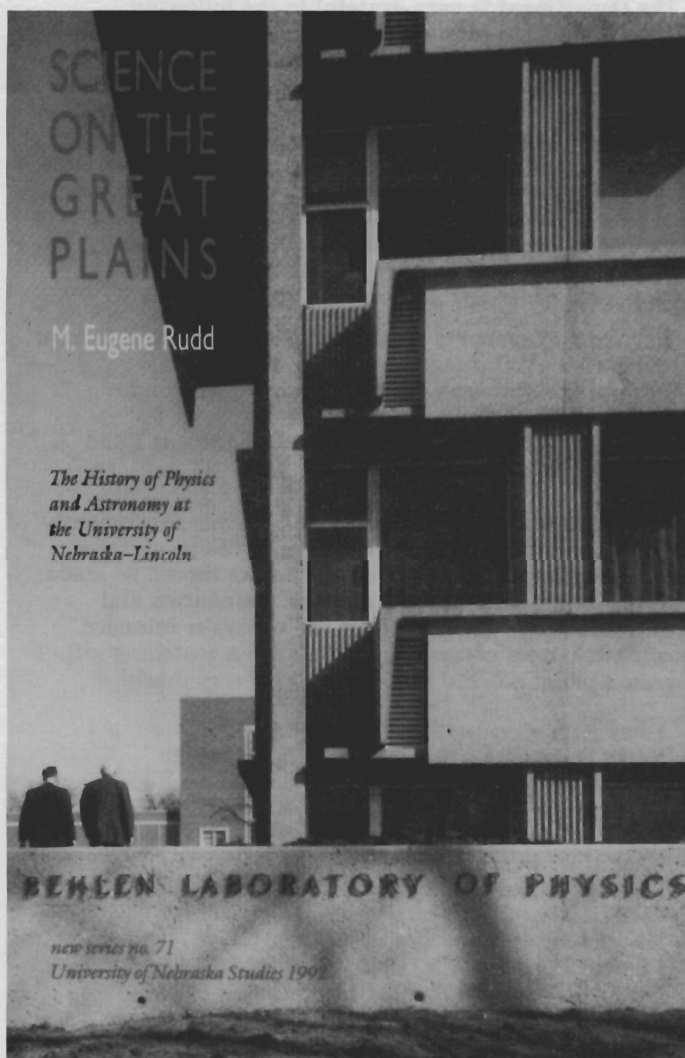
Department History Book Available

The book *Science on the Great Plains: The History of Physics and Astronomy at the University of Nebraska-Lincoln* by M. Eugene Rudd was published last summer as No. 71 of the Nebraska Studies series. This 168-page illustrated book describes the early teaching of physics and astronomy when the University of Nebraska had only four professors, the beginning of the research program in physics by DeWitt Bristol Brace, the founding of the two separate departments (Physics and Astronomy) under Brace and Goodwin Swezey, the decline of these departments during the wars and the Great Depression, their rapid growth in the 1960s, and their eventual union and further growth in the 1970s and 1980s.

In addition, there is available a supplement which lists the professors and staff, all graduate degrees granted, and a list of publications from the Department up to 1950.

To order your copy, use the form below. Make your check payable to the University of Nebraska Foundation and send it with the form to:

Patricia J. Christen, Accounting Clerk,
Department of Physics and Astronomy
Brace Laboratory 116
University of Nebraska
P.O. Box 880111
Lincoln, NE 68588-0111.



Order Form

Please send me:

_____ copies of "Science on the Great Plains" at \$25 per copy.

_____ copies of the Supplement (no extra charge if ordered with the book)

Amount enclosed \$ _____

Name

Address

THE RECORD

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

No. 8 Fall 1992

Anthony F. Starace, Editor

1991-92 DEGREE RECIPIENTS

Bachelor of Arts

- Scott P. Amthor (December 1991). Is a Pilot with the Nebraska National Guard and Charter Pilot for Capitol Aviation.
Keith A. Hays (May 1992). Is an Ensign/student aviator in the U.S. Navy, stationed in San Diego, California.

Bachelor of Science

- Dean M. Homan (August 1991). Is enrolled in the graduate program in physics at the University of Kentucky.
Brian E. Jones (August 1991). Is enrolled in the graduate program in physics at UNL.
Brian E. Yueill (December 1991). Is an officer in the U.S. Navy, stationed in Orlando, Florida.
John R. Chab (May 1992, Astronomy). Is job hunting.
David L. Johnson (May 1992). Following a three-month tour of Turkey and Eastern Europe, joined the Hudson Bay Company in Lincoln, which is a telephone fund-raising outfit. However, he plans to apply to several graduate programs in physics for Fall 1993 admission.
Scott B. Laffoon (May 1992). Is working at a resort in Cook City, Montana, near Yellowstone.
Michael K. Lewis (With Highest Distinction, May 1992). Is enrolled in the graduate program in physics at the University of Michigan in Ann Arbor. Is one of the five (out of 40) first year graduate students who were awarded Graduate Fellowships.
Christopher T. Potter (With Highest Distinction, May 1992). Is enrolled in the graduate program in physics at the University of Minnesota.
Scott H. Sinkular (With Distinction, May 1992). Is enrolled in the graduate program in physics at the University of Kansas.

Master of Science

- Fatt Foong (August 1991). Is engaged in doctoral research with Professor Sy-Hwang Liou.
Shauket N. Goderya (December 1991). Is engaged in doctoral research with Professor Edward G. Schmidt.
Jian X. Shen (May 1992). Is engaged in doctoral research with Professor Roger Kirby.
Kurt W. Wierman (May 1992). Is engaged in doctoral research with Professor Roger Kirby.
Kayvan Aftafooni (May 1992). Is enrolled in the graduate program in physics at UNL.

HONORS

1991-92 Fellows

- | | |
|-----------------------|--|
| Kenneth W. McLaughlin | Bukey Memorial Fellowship |
| Brian W. Moudry | Franklin E. & Orinda M. Johnson Fellowship |
| Rui Qi | Maud Hammond Fling Fellowship |
| Dexin Wang | Bukey Memorial Fellowship |
| Jing Yang | Avery Fellowship |

1991-92 Scholarships

- | | |
|----------------------|--------------------------------------|
| Conrad D. Engel | Joel Stebbins Fund Scholarship |
| Eric S. Green | Henry H. Marvin Memorial Scholarship |
| David L. Johnson | Joel Stebbins Fund Scholarship |
| Michael K. Lewis | John E. Almy Scholarship |
| Daniel A. Meyer | Henry H. Marvin Memorial Scholarship |
| Deseray J. Petersen | Ed Hirsch Scholarship |
| Matthew E. Ramspott | Henry H. Marvin Memorial Scholarship |
| Samuel P. Rankin | Physics & Astronomy Scholarship |
| Keith N. Sutton | Ed Hirsch Scholarship |
| Coby C. Young | Henry H. Marvin Memorial Scholarship |
| Matthew J. Zimmerman | Joel Stebbins Fund Scholarship |

1992 Distinguished Teaching Assistant Awards

- | | |
|-----------------|--------|
| Sudhir Malhotra | Bao Vu |
|-----------------|--------|

1992 College of Arts and Sciences Distinguished Teaching Award

- Edward G. Schmidt

1992 Recognition Award for Contributions to Students

- | | |
|---------------------|--------------|
| Robert G. Fuller | Roger Kirby |
| Marilyn T. McDowell | Norman Simon |

1992 Honorary Degree, "Doctor of Science, honoris causa" Concordia College, Moorhead, Minnesota

- M. Eugene Rudd

1991-92 Society of Physics Students Officers

- | | |
|---------------------------|--------------------------------|
| Eric Green, President | Darwin Reiswig, Vice President |
| Jackie Francis, Secretary | David Bentz, Treasurer |

Faculty Professional Activities

In addition to service on Departmental, College and University-wide committees, for 1992-93 a number of the faculty are active in local, national, and international professional activities, as follows:

Clifford L. Bettis: Board of Directors, Lincoln Children's Museum; Physics Instructional Resource Association.

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

Ilya I. Fabrikant: APS Reviewer, Physics Programs in the former Soviet Union.

Robert G. Fuller: Author, "Ask the Medium" column, *AAPT Announcer*; Editor, *AAPT Instructional Materials Center*; Member, AAPT Publications Committee; Co-Principal Investigator, Science Supplement of Statewide Nebraska Systemic Initiative; Steering Committee, Physics Academic Software.

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

Duane H. Jaacks: Consultant, Edgerton Museum Project, Plainsman Museum, Aurora, NE; NSF Graduate Fellowship Committee (Chairman), National Academy of Sciences; Local Program Committee, VI International Conference on the Physics of Highly Charged Ions, Kansas State University, September 28-October 2, 1992.

Roger D. Kirby: Consultant to Colorado State University.

Kam-Ching Leung: Chrétien Research Grants Committee of the AAS (Chairman); Distinguished Professor, Shaanxi Observatory, Academia Sinica, China; Editorial Board,

Chinese Astronomy and Astrophysics (Pergamon Press); Pacific Rim Colloquium on New Directions in Binary Star Research (Co-Editor).

Sy-Hwang Liou: Editor, *Applied Physics Communications*.

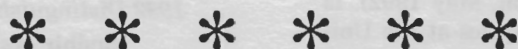
M. Eugene Rudd: Organizational Committee, Conference on the Application of Accelerators in Research and Industry; Report Committee (Chairman), International Commission on Radiation Units and Measurements; Special Collaborator, Report on Atomic Data for Radiotherapy, International Atomic Energy Agency.

James A. R. Samson: X-Ray and Ultraviolet Techniques Committee, Optical Society of America; 1992 William F. Meggers Award Committee, Optical Society of America.

Leo Sartori: Nominating Committee (Chairman), APS Forum on Physics and Society.

David J. Sellmyer: Program Committee, International Conference on Magnetism, 1993; International Organizing and Program Committees, Magneto-Optical Recording Conference, Tucson, 1992; Program Committee, Magnetism and Magnetic Materials Conference; Statewide NSF/EP-SCOR Steering Committee; National Storage Industry Consortium Technical Council.

Anthony F. Starace: Advisory Board, Institute for Theoretical Atomic and Molecular Physics, Harvard-Smithsonian Center for Astrophysics; APS Task Force to Review *Reviews of Modern Physics* (Chairman); Editorial Board, *Physical Review A*; General Committee, International Conference on the Physics of Electronic and Atomic Collisions.



1992-93 Visiting Staff Members

Visiting Associate Professor this Fall is **C. Martin Gaskell** (Ph.D. 1981, California-Santa Cruz) from the University of Oklahoma.

Visiting Assistant Professors this year are physics education researcher **Charles R. Lang** (Ph.D. 1975, Kansas State); **Charles B. Robbins** (Ph.D. 1969, Illinois); physics education researcher **Evelyn B. Tuska Patterson** (Ph.D. 1990, Delaware); and **Yong Zhang** (M.S. 1983, Tsinghua, Beijing) on sabbatical from Huaqiao University, Quanzhou, Fujian, P.R.C.

Research Assistant Professors this year are theoretical condensed matter physicist **Hsiao-Ming Lu** (Ph.D. 1988, Arizona State), working with Professor J. Hardy; theoretical atomic physicist **Cheng Pan** (Ph.D. 1988, Virginia), working with Professor Starace; and experimental condensed matter physicist **Zhengsheng Shan** (Ph.D. 1990, Nebraska), working with Professor Sellmyer.

In our Department as Postdoctoral Research Associates this

year are experimental condensed matter physicist **David Billesbach** (Ph.D. 1987, Nebraska), working with Professors J. Hardy and Ullman; experimental atomic physicist **Zong-Xiang He** (Ph.D. 1990, Hawaii), working with Professor Samson; astrophysicist **Shashi Kanbur** (Ph.D. 1989, London), working with Professor Simon; **Adilgiry Kusov** (Ph.D. 1977, A.F. Ioffe Physical-Technical Institute, Leningrad, USSR), working with Professor Sellmyer; experimental condensed matter physicist **Brian Patterson** (Ph.D. 1991, Delaware), working with Professor Sellmyer; theoretical atomic physicist **Qiaoling Wang** (Ph.D. 1991, Louisiana State), working with Professor Starace; and experimental atomic physicist **Orhan Yenen** (Ph.D. 1986, Nebraska), working with Professor Jaacks.

Research Associates this year are **Lauri K. Gottsche** (M.A. 1988, Nebraska); **Joseph D. Maciarz** (M.A. 1990, Nebraska); **Michelle J. Mason** (B.A. 1989, Nebraska); and **Hsiwen Yung** (M.S. 1985, N. Cheng Kung Univ.).

1991 Fall Semester Colloquia

- September 5: Professor Karl M. Unruh, University of Delaware
"Melting and Freezing in Restricted Geometries"
- September 12: Professor Anthony F. Starace, University of Nebraska-Lincoln
"Uncovering Fundamental Physics with Lasers and Negative Ions"
- September 19: Professor Howard C. Bryant, The University of New Mexico
"Relativistic Atomic Physics"
- September 26: Dr. Gary L. Eesley, General Motors Research Laboratories
"Ultrafast Optical Studies of Metals"
- October 3: Professor Sumner Starrfield, Arizona State University
"Stellar Explosions from a Novae Point of View"
- October 17: *The Jerry E. Ruckman Lecture*: Dr. H. Gordon Berry, Argonne National Laboratory
"The Chicago Academy for Mathematics and Science Teachers"
- October 24: *The Montgomery Lecture*: Norman F. Ramsey, Nobel Laureate (1989) and Higgins Professor of Physics, Harvard University
"Fundamental Symmetries"
- November 7: Professor Eugene M. Chudnovsky, The City University of New York
"Quantum Tunneling of Magnetization in Solids"
- November 14: Dr. Olle Eriksson, Los Alamos National Laboratory
"Ground State Properties of Crystalline Materials Obtained from First Principles"
- November 21: Dr. Randall B. Shirts, Brigham Young University
"Nonlinear Dynamics of Molecular Vibration: Semiclassical Quantization of Quasiperiodic and Chaotic Motion"
- December 5: Professor Sitaram S. Jaswal, University of Nebraska-Lincoln
"How to Make a Good Permanent Magnet"
- December 12: Dr. Marvin L. De Jong, College of the Ozarks
"Thoughts on Teaching Calculus-based Physics"

1992 Spring Semester Colloquia

- January 23: Professor Gordon A. Gallup, University of Nebraska-Lincoln
"Carbon C₁, C₆₀ or Buckyball, C_n"
- January 30: Professor Douglas K. Finnemore, Iowa State University
"Does BCS Theory Apply to High T_c Superconductors?"
- February 6: Professor Evelyn B. Tuska, University of Nebraska-Lincoln
"Solar Modulation of Cosmic Ray Electrons"
- February 13: Professor Edward G. Schmidt, University of Nebraska-Lincoln
"Faint Variable Stars: Searching for the Odd and Interesting"
- February 20: Professor Paul D. Burrow, University of Nebraska-Lincoln
"Float Like a Butterfly, Sting Like a Bee: Low Energy Electron Interactions with Molecules"
- February 27: Professor R. Kent Honeycutt, Indiana University
"The Remarkably Varied Variations of Cataclysmic Variable Stars"
- March 5: Professor James E. Brau, University of Oregon
"The GEM Project at the SSC: A Probe Into the Fabric of the Universe"
- March 12: Professor James L. Erskine, University of Texas
"Thin Film Magnetism "
- April 2: Professor Jeremy Bernstein, Stevens Institute of Technology
"What Little I Know About Bose-Einstein Condensation"
- April 9: Professor Kenneth Laws, Dickinson College
"The Physics of Dance"
- April 16: Professor Peter Carruthers, University of Arizona
"Counts and Correlations of Photons, of Galaxies, and of Hadrons"
- April 23: Professor Stuart R. Hameroff, University of Arizona
"The Role of the Cytoskeleton in Information Storage and Transmission"

1991 Faculty Publications

ASTRONOMY AND ASTROPHYSICS

- K.C. Leung, "Massive Contact Binary Systems," in *Wolf-Rayet and Interrelations with Other Massive Stars in Galaxies*, Edited by K.A. van der Heucht and B. Hidayat (Kluwer, Dordrecht 1991), pp. 207-212.
- K.C. Leung, "Energy and Mass Transfer for Contact Systems," in *Transactions of the International Astronomical Union, Reports on Astronomy 20A*, Edited by D. McNally (Kluwer, Dordrecht, 1991), pp. 498-499.
- E.G. Schmidt, "Cepheids" in *Transactions of the International Astronomical Union, Reports on Astronomy 21A*, Edited by D. McNally (Kluwer, Dordrecht, 1991), pp. 254-257.
- E.G. Schmidt, "The Behlen Observatory Variable Star Survey: First Results," *Astronomical Journal* 102, 1776 (1991).
- E.G. Schmidt, "A Note on the Cepheid Luminosity Scale," *Observatory Magazine* 111, 178 (1991).
- N.R. Simon and A.N. Cox, "The RRd Masses Revisited," *Astrophysical Journal* 376, 717 (1991).

- J.A.R. Samson, Y. Chung, and E.M. Lee, "Excited Ionic and Neutral Fragments Produced by Dissociation of the N_2^{+*} H Band," *Journal of Chemical Physics* 95, 717 (1991).
- H. Hamdy, Z.S. He, and J.A.R. Samson, "Precision Photoabsorption Cross Section Measurements of SO_2 from 147 to 1017 Å," *Journal of Physics B* 24, 4803 (1991).
- C.R. Liu, N.Y. Du, and A.F. Starace, "One- and Two-Photon Detachment of H^- with Excitation of $H(n=2)$," *Physical Review A* 43, 5891 (1991).
- C. Pan and A.F. Starace, "Angular Distribution of Electrons Following Two-Photon Ionization of the Ar Atom and Two-Photon Detachment of the F^- Ion," *Physical Review* 44, 324 (1991).
- C. Pan and A.F. Starace, "Target Dependence of Angular Distributions for Near-Threshold ($e,2e$) Processes," *Physical Review Letters* 67, 185 (1991).
- A.F. Starace, "Long-Range Dipole Field Effects on H^- Detachment Processes Above the $H(n=2)$ Threshold, in *Atomic and Molecular Physics: Third U.S.-Mexico Symposium*, Edited by C. Cisneros, T. Morgan and I. Alvarez (World Scientific, Singapore, 1991), pp. 359-378.



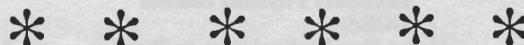
ATOMIC, MOLECULAR AND OPTICAL PHYSICS

- P.D. Burrow, "Electron Scattering from Laser-excited SF_6 ," *Journal of Physics B* 24, L149 (1991).
- I.I. Fabrikant, "Near-Threshold Photodetachment of H^- in Parallel and Crossed Electric and Magnetic Fields," *Physical Review* 43, 258 (1991).
- I.I. Fabrikant, "Quasiclassical R-Matrix Theory of Inelastic Processes in Collisions of Electrons with HC_1 Molecules," *Physical Review A* 43, 3478 (1991).
- I.I. Fabrikant, "A Model Describing Inelastic Processes in Low-Energy Electron Collisions with Methyl Chloride," *Journal of Physics B* 24, 2213 (1991).
- I.I. Fabrikant, S.A. Kalin and A.K. Kazansky, "Inelastic Processes in $e-HCl$ Collisions in the Energy Range Including the Dissociation Threshold," *Journal of Chemical Physics* 95, 4966 (1991).
- V.M. Borodin, I.I. Fabrikant and A.K. Kazansky, "Collisional Broadening of Rydberg States by Alkali Perturbors," *Physical Review A* 44, 5725 (1991).
- D.H. Jaecks, O. Yenen, D. Calabrese, and L. Wiese, " H^+-H^- Coincidence Studies Resulting from the Dissociation of Excited, Fast-Moving H_3^+ ," in *Atomic and Molecular Physics: Third U.S.-Mexico Symposium*, Edited by C. Cisneros, T. Morgan, and I. Alvarez (World Scientific, Singapore, 1991), pp. 49-57.
- O. Yenen, B.W. Moudry, D.H. Jaecks, W.W. Tan, and M.E. Rudd, "Two- and Three-Electron Processes in H_3^+ Collisions," *Nuclear Instruments and Methods in Physics Research B* 56/57, 268 (1991).
- Wen-qin Cheng and M.E. Rudd, "Recoil Ions from Near-Zero-Impact-Parameter H^+-Xe Collisions in the Range 20-70 KeV," *Physical Review A* 43, 5130 (1991).
- M.E. Rudd, "Secondary Electrons from Charged Particle Collisions with Atoms and Molecules," *Nuclear Instruments and Methods in Physics Research B* 56/57, 162 (1991).
- M.E. Rudd, "Differential and Total Cross Sections for Ionization of Helium and Hydrogen by Electrons," *Physical Review A* 44, 1644 (1991).
- R.R. Meier, J.A.R. Samson, Y. Chung, E.M. Lee and Z.S. He, "Production of N^{+*} from $N_2 + h\nu$ EUV Emission Yields from Laboratory and Dayglow Data," *Planetary and Space Science* 39, 1197 (1991).
- J.A.R. Samson, L. Yin, G.N. Haddad, G.C. Angel, "Recent Progress on the Measurement of Absolute Atomic Photoionization Cross Sections," *Journal de Physique-Colloque*, C1, 99 (1991).

CONDENSED MATTER PHYSICS

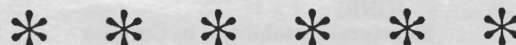
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- S. Ducharme, R.J. Twieg, J.C. Scott, and W.E. Moerner, "Observation of the Photorefractive Effect in a Polymer," *Physical Review Letters* 66, 1846 (1991).
- S. Ducharme, J.C. Scott, R.J. Twieg, and W.E. Moerner, "Ducharme et al. Reply," *Physical Review Letters* 67, 2590 (1991). Reply to "Comment on 'Observation of the Photorefractive Effect in a Polymer,'" D.D.C. Bradley and O.M. Gelsen, *Physical Review Letters* 67, 2589 (1991).
- D.M. Burland, S. Ducharme, W.E. Moerner, J.C. Scott, and C.A. Walsh, "Observation and Study of the Photorefractive Effect in Doped Nonlinear Polymers," in *Photorefractive Materials, Effects, and Devices Topical Meeting, Technical Digest Series V. 14*, p. 2 (Optical Society of America, Washington, 1991).
- W.E. Moerner, C.A. Walsh, J.C. Scott, S. Ducharme, D.M. Burland, G.C. Bjorklund, and R.J. Twieg, "Photorefractivity in Doped Nonlinear Organic Polymers," in *Nonlinear Optical Properties of Organic Materials IV*, V. 1560, p. 278 (SPIE, Bellingham, 1991).
- G.C. Bjorklund, S. Ducharme, W. Fleming, D. Jungbauer, W.E. Moerner, J.D. Swalen, R. Twieg, G. Wilson, and D. Yoon, "Applications of Organic Second Order Nonlinear Materials," in *Symposiums on New Materials for Nonlinear Optics: Chemical Perspectives*, Edited by Seth R. Marder, John E. Sohn, and Galen D. Stucky, ACS Proceedings V. 455, p. 216 (American Chemical Society, Washington, 1991).
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- H.M. Liu and J.R. Hardy, "First-Principles Study of Phase Transitions in KNO_3 ," *Physical Review B* 44, 7215 (1991).
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- Y.X. Zhang, S.H. Liou, R.J. DeAngelis, K.W. Lee, C.P. Reed, and A. Nazareth, "The Process-Controlled Magnetic Properties in Nanostructured Fe/Ag Composite Films," *Journal of Applied Physics* 69, 5273 (1991).
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- L.Y. Chen, P. He, S. Nafis, W.A. McGahan, J.A. Woollam, and D.J. Sellmyer, "Magneto-Optic and Optical Characterization of Tb/Co Compositionally Modulated Amorphous Films," *Journal of Applied Physics* 69, 5989 (1991).
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- D. Wang and D.J. Sellmyer, "Magnetic and Structural Properties of Co/Cr Multilayers with in-Plane Anisotropy," *Journal of Applied Physics* 70, 6053 (1991).
- S. Nafis, J.A. Woollam, Z.S. Shan, and D.J. Sellmyer, "Temperature and Thickness Dependence of Coercivity and Magnetization of Co/Cu and Co/Si Multilayers," *Journal of Applied Physics* 70, 6050 (1991).
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- D.J. Sellmyer and Z.S. Shan, "Magnetism of Nanostructured Rare-Earth Multilayers," in *Science and Technology of Nanostructured Magnetic Materials* (NATO Advanced Study Institute), Edited by G.C. Hadjipanayis and G.A. Prinz (Plenum, NY, 1991), p. 151.



NONLINEAR DYNAMICS

- P. Finkler, C.E. Jones and G.A. Sowell, "Construction of a Quasiconserved Quantity in the Henon-Heiles Problem using a Single Set of Variables," *Physical Review A* 44, 925 (1991).



TRACK PHYSICS

- R. Katz, "A Track Physics Model of Radiation Action," *Radiation Physics and Chemistry* 37, 125-129 (1991).
- R. Katz, "On the Normalized Yield (events/rad/Dalton) of Biological Molecules Irradiated with Energetic Heavy Ions," *Radiation Physics and Chemistry* 37, 372-374 (1991).
- R. Katz and S. Wesely, "Cross Sections for Single and Double Strand Breaks in SV-40 Virus in EO Buffer after Heavy Ion Irradiation: Experiment and Theory," *Radiation and Environmental Biophysics* 30, 81-85 (1991).
- R. Katz and F.A. Cucinotta, "RBE vs. Dose for Low Doses of High Let Radiations," *Health Physics* 5, 717-718 (1991).
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New Research Grants and Contracts

During the period 1 November 1991-31 October 1992 the following new and renewal grants and contracts were received by our faculty:

Principal Investigator	Title (Source of Funds)	Amount (\$ Thousands)	Principal Investigator	Title (Source of Funds)	Amount (\$ Thousands)
P.D. Burrow	Electron Scattering Studies of Temporary Anion Formation in Hydrocarbons (NSF)	\$ 77.0	J.A.R. Samson	Ultraviolet and X-ray Bombardment of Planetary Atmospheres (NSF)	\$ 80.0
S. Ducharme	Real Time Space Materials Degradation Monitor Using Ellipsometers (WC)	\$ 15.5	J.A.R. Samson	A Rare Gas Optics-Free Absolute Photon Flux and Energy Analyzer (USC)	\$ 57.6
S. Ducharme	Experimental Studies of Photorefractive Polymers (NSF)	\$ 11.5	E.G. Schmidt	Survey of Poorly Studied Variable Stars (NSF)	\$ 54.5
D.W. Duquette	Laser Photoionization Studies of Excited Atomic States (NSF)	\$ 49.1	D.J. Sellmyer	Magnetism and Magneto-Optics of Artificially Structured Materials (NSF)	\$ 65.0
I.I. Fabrikant	Atomic Processes Involving Negative Ions (NSF)	\$ 45.6	D.J. Sellmyer	Fundamental Studies of Strongly Magnetic Rare Earth-Transition Metal Alloys (DOE)	\$ 60.0
R.G. Fuller	Bridges, Bicycles, and Traffic: Thematic Physical Science Lessons (NSF)	\$ 41.6	D.J. Sellmyer	Development of New Permanent-Magnet Materials for Energy-Related Applications (NEO)	\$124.2
R.G. Fuller	Transforming Physics Content Using New Technologies (NSF)	\$113.0	N.R. Simon	A Test of New Radiative Opacities and Their Incorporation into Improved Cepheid Pulsation Models (NASA)	\$136.9
R.G. Fuller	Every Physics Teacher's CD-ROM Toolkit (NSF)	\$468.5	A.F. Starace	Dynamics of Photon-Atom and Electron-Atom Interactions (NSF)	\$ 54.0
R.G. Fuller	National Interactive Media Project for Secondary Physical Science (DOEd)	\$ 95.5	A.F. Starace	Dynamics of Collision Processes (DOE)	\$ 69.0
R.G. Fuller	Using New Technologies to Teach Physics (NSF)	\$ 99.0	J.W. Weymouth	Magnetic Survey—Lewis and Clark Lower Portage Camp Site (WHR)	\$ 7.0
R.G. Fuller	Transforming Physics Laboratories Using New Technology (IU)	\$ 29.9	J.W. Weymouth	St. Catherine's Island Survey (AMNH)	\$ 5.0
R.G. Fuller	Creating CD-ROMs for Science Education (NSF)	\$ 52.5	J.W. Weymouth	Quarry Creek Survey (UK)	\$ 1.5
R.G. Fuller	Undergraduate Education Initiative (HH)	\$ 15.0	J.W. Weymouth	Kennard House Magnetic Survey (NSHS)	\$ 1.0
J.R. Hardy	Studies of Ionic Molecular Solids (ARO)	\$100.0	J.W. Weymouth	Ft. Ellis Magnetic Survey (MSU)	\$ 1.4
J.R. Hardy	First Principles Theoretical Studies of Ferroelectric Lattice Instabilities (ONR)	\$ 58.0	J.W. Weymouth	North Central Kansas Survey (DI)	\$ 3.5
J.R. Hardy	Structural Instabilities in Complex Ionic Solids (ARO-EPSCOR)	\$149.8	TOTAL: \$2,792.2		
D.H. Jaecks	Correlation Studies of Three Massive, Coulomb-Interacting Particles (NSF)	\$170.2	* * * * *		
S.S. Jaswal	Electronic and Magnetic Properties of Quasicrystalline and Amorphous Alloys (NSF)	\$ 15.0			
R. Katz	Theory of Biological Effectiveness (DOE)	\$ 48.0			
R. Katz	Theoretical Evaluation of the Radiation Hazards from Cosmic Rays within Space Vehicles (NASA)	\$ 30.0			
R.D. Kirby	Magneto-Optical Properties of Novel Artificially Structured Multilayers and Intermetallic Compounds (RC)	\$ 20.0			
K.C. Leung	A U.S.-Korea Seminar on Binary Star Astronomy (NSF)	\$ 34.0			
S.H. Liou	Superconductivity (NASA)	\$ 25.0			
S.H. Liou	Magnetron Sputtering of High Critical Current Ti-Ba-Cu-O Films for Use in Electric Power Systems (NEO)	\$ 68.2			
M.E. Rudd	Ionization Processes in Atomic Collisions (NSF)	\$102.5			
J.A.R. Samson	Interaction of Radiation with Planetary Gases (NASA)	\$ 51.5			
J.A.R. Samson	Photoionization Studies of Atoms (NSF)	\$ 85.0			

AMNH—American Museum of Natural History
 ARO—U.S. Army Research Office
 DI—U.S. Department of the Interior
 DOE—U.S. Department of Energy
 DOEd—U.S. Department of Education
 EPSCOR—Experimental Program to Stimulate Competitive Research
 HH—Howard Hughes Medical Institute
 IU—Indiana University
 MSU—Montana State University
 NASA—National Aeronautics and Space Administration
 NSF—National Science Foundation
 NEO—Nebraska Energy Office
 NSHS—Nebraska State Historical Society
 ONR—Office of Naval Research
 RC—Research Corporation
 UK—University of Kansas
 USC—Subcontract—University of Southern California
 WC—Woollam Company
 WHR—Western History Research