

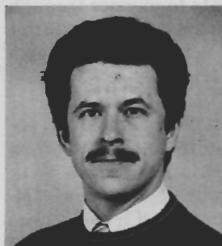
U SPECTRUM

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

No. 12 Fall 1991

M. Eugene Rudd, Editor

Ducharme Joins Department



Stephen P. Ducharme

In accordance with Departmental goals to increase the number of experimental faculty in general and to strengthen the condensed matter physics group in particular, a fifth experimental condensed matter physicist, Assistant Professor Stephen P. Ducharme, was hired last January. His appointment is two-thirds in the Department and one-third in the UN Center for Materials Research and Analysis (CMRA). Set-up funds for his new laboratory for studies of nonlinear optical polymeric and crystalline materials will exceed \$220K, funded mostly by the Nebraska Research Initiative through

the CMRA.

Ducharme received his B.S. degree in physics from the University of Lowell (Massachusetts) in 1981. His M.S. (1982) and Ph.D. (1986) degrees were received from the University of Southern California, where his thesis on "Photorefraction in $BaTiO_3$ " was supervised by J. Feinberg. From 1986-88, Ducharme was a postdoctoral research associate at the University of Utah studying microwave and radio frequency absorption in perovskite superconductors and photodarkening in chalcogenide glasses. He then took a Visiting Scientist position during 1988-90 at IBM Almaden Research Center, where he worked on the development of organic photorefractive, electro-optic and nonlinear optical materials. At UNL Ducharme's plans include the development, improvement, and investigation of polymer photorefractive materials as possible replacements for currently available inorganic photorefractive crystals. [See also *Research Highlights* on page 4.]

Scion from Newton's Apple Tree Planted at UNL

William Stukeley wrote about his friend, Isaac Newton, "... the notion of gravitation came into his mind. It was occasion'd by the fall of an apple as he sat in a contemplative mood." Newton himself wrote about his time at home in Woolsthorpe, England during the plague of 1665-66, "I began to think of gravity extending to the orb of the moon, and from Kepler's rule I deduced that the forces which kept the planets in their orbs must be reciprocally as the squares of their distances from the centers about which they revolve: and thereby compared the force requisite to keep the moon in her orb with the force of gravity at the surface of the earth." These are the sources of the famous legend in which Newton formulated the law of gravitation after watching an apple fall from his tree.

The very tree in Newton's farmyard which presumably played such an important role in the Newtonian Revolution now has an "offspring" just south of Behlen Laboratory. It all started some years ago when Edward Lyman, a retired physician in Lincoln, read a biography of Newton and wondered what variety of apple tree was involved in this momentous discovery. He and his friend Joseph Young, a retired UNL horticulture professor, were able to make contact with Dr. Richard Keesing, a physicist at York University in England who had made a study of Newton and had carefully researched the apple tree story. In his investigation of the story, Keesing had contacted a descendant of Edmund Turnor, the one who had purchased the Woolsthorpe estate shortly after Newton's death. The estate had remained in the Turnor family until recently. From early engravings of the estate obtained from the Turnor family, Keesing was able to identify an apple tree, still flourishing at Woolsthorpe, which closely resembled the one there at the time of Newton.

A graft of the tree had been made around 1800 and from that a cutting was made and transported to Lincoln a few years ago. After the required quarantine period, it was ready to be planted in its permanent spot south of Behlen Laboratory. This was done at a ceremony on April 4, 1991, attended by Professor Keesing and several University dignitaries. A plaque was placed by the tree which reads:

In 1991 this scion from Sir Isaac Newton's famous apple tree at his birthplace in Woolsthorpe Manor, Lincolnshire, England, was presented to the University by Dr. Richard G.W. Keesing of the Physics Department of the University of York, England. This tree is of the ancient cultivar, Flower of Kent.

Following the planting, a program was held in Brace Auditorium during which the horticulturists described how the tree came to Nebraska followed by a fascinating lecture presented by Keesing entitled "The Story of Isaac Newton's Apple Tree." In the evening he gave another lecture: "The Incomparable Genius of Isaac Newton."

The visit by Keesing was sponsored by the Departments of Horticulture, Physics and Astronomy, and Classics, by the Nebraska State-wide Arboretum, and by the University Research Council. Similar scions from Newton's apple tree may be purchased from the Horticulture Department. Contact A. F. Starace for details.



The planting of Newton's apple tree south of Behlen Laboratory. Left to right: Joseph Young of the Horticulture Department, Anthony Starace, Physics and Astronomy Chairman, and Richard Keesing from York University in England.

Chairman's Letter



Anthony F. Starace

Spring 1991 marked the third anniversary of the last Departmental Academic Program Review (APR) in Spring 1988. At this midpoint between the previous and the next APR review in 1994, the faculty met to review our progress on the recommendations and goals that were agreed upon in 1988. As I shall be taking a sabbatical break from "chairing" beginning in January 1992 [Vice Chair William B. Campbell will serve as Acting Chairman during my leave], such an assessment of the Department's past progress and future plans naturally comes to mind as I write this annual letter.

When I was interviewed for the Chair position in 1984 by then Chancellor Martin Massengale, I was asked why the Department didn't have as much external grant support as many physics departments in our peer institutions. I couldn't answer him then, but soon enough found four likely reasons: (1) the Department had not hired any new faculty in many years; (2) there were only 7 experimental physicists out of a total of 24 physics faculty, which is a very low ratio; (3) the Department was not associated with any research institutes or centers; and (4) due to past hiring decisions, the Department was not involved in any of the "big science" areas of physics. All of these factors affected the amount of our external funding: lack of faculty hiring limited our participation in newer and well-funded areas of physics; a low ratio of experimental to theoretical faculty meant smaller grant awards since experimental grants are generally larger than theoretical ones; lack of involvement with research institutes meant reduced possibilities for large group awards and for achieving the critical mass of researchers needed to make an impact in certain fields of research; and lack of involvement in "big science" areas meant smaller than average grant awards since big science fields have larger than average grant awards.

Over the last several years much has changed to improve the Department's research prospects. First, five new faculty, one theorist and four experimentalists have been hired. All of the experimentalists are in newer research areas not heretofore represented in the Department. Second, there are now 10 experimental faculty out of the 24 physics faculty in the Department: five in atomic, molecular, and optical physics and five in condensed matter and materials physics. Our plans call for hiring 1-3 more experimentalists in these two areas in the near future. Third, The Nebraska Research Initiative led to the establishment of the Center for Materials Research and Analysis (as well as other research centers), with which our Department's faculty has been significantly involved. Fourth, as reported elsewhere in this newsletter, the Rocky Mountain Consortium for High Energy Physics is off to a good start and will assist the Department in establishing over the next several years a group of three faculty in experimental high energy physics, the biggest of the big science areas in physics. Thus, all of the conditions are in place for the Department to assist UNL in becoming one of the top 50 research universities in the nation, which President Massengale has stated is an institutional goal. The recent naming of Nebraska as an EPSCoR state will further help to bring significantly increased grant funding to UNL and thereby to increase opportunities for training our students for the high technology jobs of the future.

This increased emphasis on newer experimental research areas has had the unfortunate side effect of making both laboratory and office space scarce commodities. These are needed for both new faculty and increased numbers of graduate students, postdocs, and visitors. Much of my attention as Chair over the past several years has been occupied seeking to garner additional laboratory space by a host of remodeling projects designed to use our currently available space more efficiently. Just this fall approval was obtained for an additional remodeling project to move the Departmental offices to the first floor of Brace so that — combined with the prior move of the Department's branch library to the first floor of Brace — in a year or two the entire second floor of Behlen lab will be devoted to new experimental research laboratories. Need for space has resulted in conversion of under-utilized darkrooms and other miscellaneous purpose rooms to needed additional office space. We still have not resolved where to locate the new experimental group in high energy physics, but several proposals are now under consideration. Also, as the currently started groups grow, space needs will grow as well. If anyone is acquainted with a donor interested in helping us add two more floors to Behlen Lab, please let me know!

Physics education has also become a very timely issue. National

concern with science education is tangibly demonstrated by the incredibly large number of research grants in physics education awarded to Professor Robert G. Fuller this past year, as discussed in one of the articles in this newsletter. Our faculty generally have been known for outstanding teaching, as evidenced by the 12 teaching award winners on our staff (including two new ones this year, as reported in this issue). In order to pass on their skills to the new generation of faculty as quickly as possible, the Department has instituted this year a new mentoring program which teams these award-winning faculty teachers with our untenured faculty. A similar mentoring program has been instituted for new graduate teaching assistants, who are being teamed with senior GTAs who have won our Department's Distinguished Graduate Teaching Assistant award. Lastly, our long experience with introducing 5th and 6th grade public school students to physics through our Saturday Science Program is proving useful as a model for similar programs in other science areas at UNL, which is trying to develop a more coordinated involvement with K-12 math and science education throughout the State.

Enclosed with this mailing is an information card and return envelope to inform us of your activities. I urge you to do so. 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. Finally, I want to thank you, our alumni and friends, once again for your continuing financial support. This has proved crucial this year in enabling us to recruit new faculty and students, in improving our teaching laboratories and demonstrations, in supporting the activities of our Society of Physics (and Astronomy) Students, and in underwriting some of the expenses of our service programs to further science education in Nebraska. Best wishes until next year.

Sincerely,

Anthony F. Starace
Professor and Chairman

Kirby Receives Distinguished Teaching Award



Roger D. Kirby

Professor Roger D. Kirby received a college-wide Distinguished Teaching Award at the UNL Convocation on April 12, 1991. The award of \$1,000 was made for his service to students, both undergraduate and graduate, and for his work with elementary school students in the Saturday Science Program. Kirby received his B.S. at Michigan in 1964 and his Ph.D. at Cornell University in 1969. His research area is experimental condensed matter physics.

Kirby was noted for being passionate about his teaching and for making improvements in each new course he is assigned. The best example of this is our Advanced Laboratory sequence, which many of our graduates claim was the most valuable course in their undergraduate career. Kirby developed a new experiment each of the six years he taught the course. Furthermore, he always left the experiments open-ended and was commonly available at all hours to spur students on. For many students, this intense interaction was exhilarating. As one physics major noted, Kirby "gave me an appreciation of the power of experimental physics."

In his large enrollment lecture classes, Kirby was cited for teaching his students with the same dedication he gives to our majors. His teaching was praised by students for "careful attention . . . to ensure that the student will learn." A German exchange student wrote that of all the teachers he knew, Kirby "did not lose the ability to see the problems students have with explanations."

In his service work, Kirby characteristically has devoted much time to teaching. Most noteworthy is his stewardship of our Saturday Science Program for 5th and 6th grade students from the Lincoln Public Schools. He has just been given an award by the LPS School Board for this work. Less publicly known, however, are numerous other "teaching" activities ranging from giving tours of his research laboratory to judging at local science fairs. Lastly one must note the five Ph.D. students whose doctoral dissertations Kirby has supervised.

Rudd Receives Distinguished Teacher-Scholar Award



M. Eugene Rudd

In April 1991 Professor M. Eugene Rudd received the Burlington-Northern Distinguished Teacher-Scholar Award. This award of \$3,000, given annually to two faculty members on the Lincoln campus, is presented on the basis of outstanding teaching in combination with exemplary scholarly achievements. Rudd received the B.A. degree from Concordia College, Moorhead, MN, the M.A. from the University of Buffalo, and the Ph.D. from Nebraska. He was on the faculty at Concordia College for eleven years before coming to Nebraska in 1965. He was acting chairman of the Department from 1970 to 1972.

The research problem Gene Rudd has investigated over the course of his career—the ejection of electrons from atoms and molecules by fast ions—is fundamentally important in areas as diverse as radiobiology (specifically, cell damage by ionizing radiation), fusion plasma modelling, and stellar astrophysics. Rudd was the first to study systematically the dependence of the probability for electron emission on the incident ion's energy and on the ejected electron's energy and angle of emission. In the 1960's and 70's, three firsts were reported in the prestigious journal, *Physical Review Letters*. In 1964 Rudd made the first experimental observation of doubly-excited atomic states produced by heavy particle impact of rare gas target atoms, in 1968 with Ted Jorgensen he made the first experimental observation of doppler

shifts of ejected spectra, and in 1970 he made his most famous "first," the observation that ejected electrons "prefer" to travel with the velocity of the incident ion (called "charge transfer to the continuum"). Over the following years and decades Rudd produced copious quantities of accurate, reliable data on these phenomena which contributed significantly to theoretical advances in understanding the basis for these phenomena. Indeed, as one of the distinguished external supporters of Rudd's award nomination noted, "The name of Eugene Rudd as an author of an experimental paper . . . has become a kind of seal of dependability." It is for this reason that Rudd is often asked to write major reviews of his field, including, most recently, a major one published in 1985 in *Reviews of Modern Physics*.

In his teaching Gene Rudd has brought to bear the same care, attention to detail, and enthusiasm for continuous improvement that he brings to research. He served three years (1978-81) on the College of Arts and Sciences' Task Force on the Liberal Arts, which instituted the current liberal education requirements for the College. He then developed both two-semester and one-semester "Liberal Arts Physics" courses, which he has taught for 10 semesters since 1980. Since no suitable texts for these courses could be purchased he developed his lecture notes into a book. In the past 5 years Rudd has developed two other new courses: a physics course on "scientific revolutions" for the UNL Honors Program and a course on "Issues in Science and Religion." These courses were very well received by UNL students. Many comment on how Rudd drew their attention to applications of Physics. They also note how he went out of his way to introduce demonstrations, historical photographs, and original scientific documents into his lectures. In their course evaluations, undergraduates have written that "his enthusiasm is contagious" and that "he encourages students to find connections between physics and life."

Fuller's Physics Education Grants Top \$2.4 Million!

This past year Professor Robert Fuller successfully attracted grant funds in the area of physics education totalling over \$2.4 million. The largest is a four-year grant for \$1,479,982 from the National Science Foundation (NSF) to make what he calls the "CD-ROM (compact disc-read only memory) Toolkit" for physics teachers. Using compact disc technology to store data, he is producing 12-cm plastic discs which hold up to 660 megabytes each, the equivalent of 100,000 pages of text. The entire contents of 10 textbooks, sets of test questions, scientific equipment catalogs, lesson plans, demonstrations, glossaries, handbooks, journal articles, and much more are recorded on discs to be made available to physics teachers.

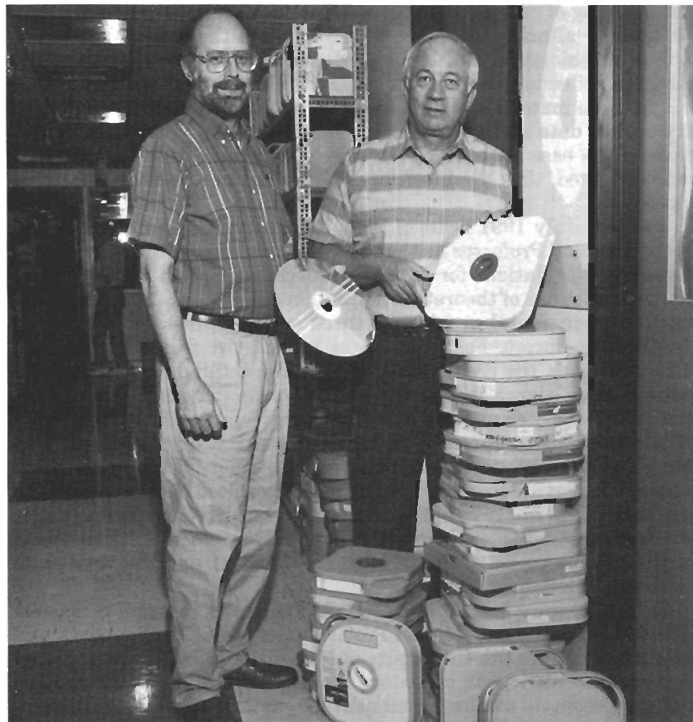
Other projects funded by NSF include "Transforming Physics Laboratories Using New Technologies" (\$36,998), "Bridges, Bicycles, and Traffic: Thematic Physical Science Lessons" (\$114,825), "Transforming Physics Content Using New Technologies: A Leadership Development Workshop" (\$112,986), and "Using New Technologies to Teach Physics" (\$98,995). An additional \$590,815 grant from the Department of Education is for "A National Interactive Media Project for Secondary Physical Science Courses." This is to operate the UNL-based Instructional Materials Center (IMC) for the American Association of Physics Teachers. Fuller is Editor of IMC.

The grants have enabled him to bring several visiting physicists with interests in educational innovation to Nebraska. These include Amarnath Kshatriya from the British Columbia Institute of Technology, Marvin L. De Jong from The School of the Ozarks, Point Lookout, MO, and Evelyn Tuska from the University of Delaware. In collaboration with Charles Lang of Omaha Westside High School, Fuller is editing a large number of physics films to put on a set of videodiscs with the title, "Physics: Cinema Classics."

Fuller's involvement in physics education has deep roots. Like the rest of the faculty, he has contributed to the education of students by teaching courses in physics since he joined the faculty in 1969. But in addition, since the early 1970s he has also been involved in educational research and in the utilization of new technologies in teaching. Among the many programs he has pioneered on this campus are the use of the Keller plan of teaching, the use of film loops, the founding of the Physics Learning Center, the development of the ADAPT (Accent on the Development of Abstract Processes of Thought) program of learning-vised in several departments on campus, the use of computers to provide personalized systems of instruction, and the use of Piagetian-based educational methods. The University of Nebraska has given him

two Distinguished Teaching Awards but recognition of his work has extended far beyond the campus as well. He has held numerous workshops on educational subjects in many places and in 1980 was elected the President of the American Association of Physics Teachers. In 1986 he was one of six faculty members in the country to be honored by the American Association of Higher Education.

Starting in the 1970s Fuller was able to attract federal grant funds to carry out many of his educational projects. During the Reagan years, however, education was not a high priority in the federal government and grant funding for such purposes dried up. Under President Bush educational projects are once again being emphasized.



Robert Fuller with Charles Lang, a physics teacher at Omaha Westside High School, viewed over 1000 hours of physics films to select segments for their three-videodisc set entitled "Physics: Cinema Classics."

Rocky Mountain Consortium for High Energy Physics Established

The University of Nebraska-Lincoln is part of a nine-university consortium established to participate in experimental high energy physics research at the Superconducting Super Collider (SSC). The other members of the consortium are the University of Arizona, the University of Colorado, the Colorado School of Mines, Colorado State University, the University of Kansas, Kansas State University, the University of Oregon, and the University of Wyoming. The consortium was awarded \$500,000 by the Texas National Research Laboratory Commission (TNRLC) this past April to get started on a ten year program of developing new experimental high energy physics at Nebraska, Colorado State, Kansas State, and Wyoming and to strengthen existing programs at Arizona, Colorado, Kansas, and Oregon. At about the same time the members chose the name Rocky Mountain Consortium for High Energy Physics (RMCHEP).

Since April the RMCHEP has hired two new faculty members, an electronics engineer, and several new postdoctoral research associates. Searches for three more new faculty members are now in progress. By the end of the ten-year period the plan is to have established 25 new

faculty positions in high energy physics in the universities of the consortium. Three of those will be here at Nebraska.

In addition, work has started on renovating the old cyclotron building at the University of Colorado to house the Boulder lab for the RMCHEP. This lab will become a regional center for research and development for SSC detectors and a center for high energy physics research done by the consortium. There will be four workshops on SSC physics held in Boulder next summer under the sponsorship of the RMCHEP, and plans are being made for a teacher enhancement program to begin in the summer of 1993.

The consortium just recently submitted its second-year budget to the TNRLC, asking for \$1,600,000. Out of that budget Nebraska is asking for money for a postdoctoral research associate to do high energy phenomenology, and money for Rod Dillon's group in the Department of Electrical Engineering to do research on diamond as a possible material for making SSC detectors. We will start hiring our high energy experimentalists in 1993.

Research Highlights

We present here a selection of recent research results by the Department's faculty and staff which have been accorded rapid publication in *Physical Review Letters* (PRL).

In the 31 December 1990 issue of PRL, Assistant Professor Sy-Hwang Liou and a group from the General Motors Research Laboratories reported on their femtosecond time-resolved measurements of the $Tl_2Ba_2Ca_2Cu_3O_{10}$ high-temperature superconductor. An ultrashort-duration (80×10^{-16} sec) light pulse was absorbed by the electrons in the superconductor. Subsequent energy relaxation between the electrons and phonons was monitored by optically probing the temperature-dependent reflectivity change as a function of time delay after the excitation pulse. The results were found to be consistent with the behavior of conventional superconductors, indicating that phonons play a significant role in this high-temperature superconductor, a fact about which in the past there has been considerable controversy.

In the 8 April 1991 issue of PRL, Assistant Professor Stephen P. Ducharme and a group from the IBM Almaden Research Center in San Jose, CA reported the first observation of the photorefractive effect in a polymer material. The photorefractive effect is the redistribution and trapping of charge in a photoconducting insulator or semiconductor, thereby altering the index of refraction of the material. A phase replica, or hologram, is thereby produced of the optical intensity distribution, allowing researchers to "write" and "read" information at will in these materials, which has practical applications for high-density optical data storage and many image-processing techniques. Because of the ease with which polymeric materials can be synthesized and fabricated, they are ideal for creating useful new photorefractive materials.

In the 8 July 1991 issue of PRL, Postdoctoral Research Associate Cheng Pan and Professor Anthony F. Starace reported electron impact ionization calculations for H and He targets. Electron impact ionization processes are of theoretical importance as a means of understanding the fundamental problem of three or more particles interacting via Coulomb forces. For final states having two free electrons, i.e., $(e,2e)$ processes, the prediction of triply differential cross sections provides a most severe test of theoretical understanding. Recent low-energy $(e,2e)$ experiments for various targets have shown the triply differential cross sections to be highly dependent on the target, even though at asymptotic separations the long-range fields in the final state are target independent. The results presented here represent the first theoretical analysis of the target effects observed experimentally, which are shown to stem primarily from short-range interaction effects on the s-wave phase shifts of both the incident and the final-state continuum electrons.

In the 29 July 1991 issue of PRL, Professors Sitaram S. Jaswal and David J. Sellmyer, Adjunct Professor George C. Hadjipanayis, and collaborators from the University of Missouri and Delaware, reported on some new rare-earth components of the form $R_2Fe_{17}N_x$ which have exciting prospects as new permanent magnetic materials. While compounds of the form R_2Fe_{17} have large magnetization values, they also have rather low ordering temperatures and demagnetizing fields. Absorption of nitrogen improves their properties greatly, as demonstrated in detail by the neutron diffraction measurements and the self-con-

sistent spin-polarized electronic-structure calculations reported in this work. $Sm_2Fe_{17}N_{2.7}$ especially has properties which make it a candidate for lightweight permanent-magnet applications in small motors, in undulators for synchrotron radiation sources, and in miniaturized integrated thin-film electro-optic devices.

Prominent Scientists Visit UNL

During 1991 a number of nationally and internationally prominent scientists in physics and astronomy visited UNL.

Professor Lincoln Wolfenstein of the Carnegie-Mellon University gave a Departmental Colloquium in March on "Massive Neutrinos and the Solar Neutrino Problem." Wolfenstein, who is a member of the National Academy of Sciences, has proposed an explanation of the observed neutrino flux from the sun.

In April the Montgomery Distinguished Lecturer was Professor Owen Gingerich, Senior Astronomer at the Smithsonian Astrophysical Observatory and Professor of Astronomy and of the History of Science at Harvard University. Gingerich, a leading authority on 16th and 17th century astronomy, presented two public lectures, "Let There Be Light: Modern Cosmogony and Biblical Creation" and "Circles of the Gods: Copernicus, Kepler, and the Ellipse." In addition, Gingerich met informally with a large group at a forum discussing the topic, "What Does Science Say to the Church?" and also with the Campus Ministries' "Theology for Lunch" group. His visit was sponsored by the Department, by the Cotner College Commission on Continuing Education and by the University Research Council. Gingerich's talk "Let There Be Light" has been printed in the book *World Treasury of Physics, Astronomy, and Mathematics* edited by Timothy Ferris, which was the Book-of-the-Month Club selection in March.

In October we had another Montgomery Lecturer, Norman Ramsey, Higgins Professor of Physics at Harvard University. Professor Ramsey's work has ranged from molecular beams to particle physics. He and his associates discovered the deuteron electric quadrupole moment and have measured many other nuclear magnetic moments. His work led to the invention of the atomic hydrogen maser. He was President of the American Physical Society in 1978-79 and Chairman of the Board of Governors of the American Institute of Physics from 1980 to 1986. Ramsey received the Davisson-Germer Prize in 1974, the National Medal of Science in 1988, and was the Nobel Laureate in Physics in 1989. His visit, supported by the University Research Council, featured his talk, "Fundamental Symmetries" in which he showed how symmetries in parity, charge, and time reversal are important guides in the development of new fundamental laws of nature. He discussed his own work on the search for the electric dipole moment of the neutron as a test of time symmetry violation.

Walter Massey, the Director of the National Science Foundation, spoke at UNL during the *Nebraska 2000: A Partnership for Education* Conference in October. His visit was arranged through the efforts of Senator Kerry's and Governor Nelson's offices and by University of Nebraska President Martin Massengale. He also spent some time with Professors David Sellmyer, John Hardy and others to discuss several initiatives such as the EPSCoR and other programs. Massey, a condensed matter physicist, described a new NSF initiative in synthesis and processing which is relevant to the work of several people here.

Staff Activities

Patty Christen, the Accounting Clerk for the Department, received the Regent's KUDOS award in recognition of the superior way in which she handles her job of keeping track of all of the Departmental expenditures, including many research grants, the total of which reached \$5 million this past year. Besides her job and being mother to five young children, she is working on a degree in accounting in the College of Business Administration.

Professors Robert G. Fuller, Kam-Ching Leung, and Norman Simon received Recognition Awards for Contributions to Students on January 25, 1991. For this award, parents of students nominate faculty members who have made a significant difference in their son's or daughter's life.

Professor Roger Kirby and Research Assistant Professor Cliff Bettis received a citation from the Lincoln Board of Education and the Lincoln Public Schools for their work in connection with the Saturday Science Program, which has enrolled 1500 5th and 6th grade students during its 18-year history.

The University of Nebraska chapter of Sigma Xi, the scientific research society, gave its *Support of Science Award* to Walter Lueken, who is an Instrument Maker III in the Department machine shop. He was cited for his unusual ability to build the complex instrumentation needed to support the Department's research programs.

Professor M. Eugene Rudd has been selected to receive an honorary Doctor of Science degree from his undergraduate alma mater, Concordia College in Moorhead, Minnesota. The degree will be conferred at the May Commencement.

The manuscript of the book, "Fundamentals of Relativity" by Professor Leo Sartori has received favorable reviews and is scheduled to be published by the University of California Press next year.

During his leave in the second semester last year, Professor Edward Schmidt worked at the Dominion Astrophysical Observatory in Victoria, British Columbia where he analyzed CCD images of stars in other galaxies in search of variable stars. He spent last summer in the Ultraviolet Measurements Group of the Space Sciences Division at the Naval Research Laboratory in Washington, D.C. analyzing ultraviolet images of star fields.

The Experimental Program to Stimulate Competitive Research (EPSCoR) was established by Congress and, through the efforts of Senator Robert Kerry, it was recently expanded to include Kansas and Nebraska. Professor David Sellmyer has been appointed to the Nebraska EPSCoR Committee. The program is funded partially through the Department of Energy and the National Science Foundation and is administered individually by the participating states, which also share in the funding. The University of Nebraska is planning to submit one or more proposals.

Professor and Chairman Anthony Starace was awarded a one-month post as Professeur Associé at the Université Pierre et Marie Curie in Paris, France. For the past two years, Starace and his research group have carried out theoretical calculations of the processes studied by the faculty at that laboratory. Starace was also selected for a Visiting Scientist Fellowship at the Joint Institute for Laboratory Astrophysics in Boulder, Colorado, where he will spend the second semester in Spring 1992.

Recently published by Van Nostrand Reinhold was *The Astronomy and Astrophysics Encyclopedia* edited by Stephen Maran which contains an article by Professor Kam-Ching Leung entitled *Contact Binary Stars*. He also presented invited papers at the General Assembly of the Symposium on Evolutionary Processes in Interacting Binary Stars held at Cordoba, Argentina. On his return from South America, he visited the Huarorani Indian settlement in the remote rainforest in eastern Ecuador. He survived the recently retired head hunters, the piranha fish, crocodiles, and tropical diseases. Leung presented a public interest talk on his adventures in Ecuador and in Indonesia to a full-house audience in Brace Auditorium in October. Leung was curator of two exhibits at the Lentz Center for Asian Culture at UNL: *The Diversities of Asian Arts and Crafts* from June through October, 1991, and *Paintings by Lu Chen and Zhou Si-Cong* from October to December, 1991. He also arranged for the visit of the two prominent Chinese painters from Beijing, China whose works were exhibited.

Photo of the Missing Swezey-Minnich Telescope Discovered

In the Fall 1985 *Spectrum* we told you the sad story of the missing Minnich lens. Back in 1905 astronomy professor G. D. Swezey set out to build a 12" refracting telescope for the University. Dr. Charles S. Minnich, a Palmer, NE physician, ground the lens and for several years Swezey and the Engineering Department worked on the construction of the telescope tube, drive mechanism, and mounting. In 1917 the Board of Regents appropriated \$25,000 to build an observatory for the telescope from plans which had been painstakingly drawn up by Swezey. But just before construction began, the appropriation was cancelled, the building was not built, and consequently the telescope was never put to use. In 1973 Commander Charles Minnich, grandson of Charles S. Minnich, contacted the Department to learn the whereabouts of the lens. A thorough search failed to turn up the lens and neither the lens nor telescope have yet been found. Blueprints of the telescope and the observatory still exist but there were no known photographs of the mighty instrument.

Last year, however, Professor Eugene Rudd was looking through some old papers found in the bottom of a box in the Department "museum" when he came upon a part of a page from a magazine which had a picture of the telescope! At the top were inscribed the words "from 'Every Week' December 27, 1915." Although not too clear, the picture shows the 12-foot high iron base, the telescope support, and the 18-foot long telescope tube with several large counterweights. The article says that Swezey worked on the construction with three generations of engineering students, giving all of his spare time from 1907 to 1915 to build the 319 separate parts in the instrument. The labor put into it was valued at \$6000—a considerable sum at that time. The telescope was to be the largest in the state and one of the largest in the Middle West. It was to be Swezey's gift to the University. Alas, it was not to be, and the immense amount of work expended on the project all went to naught; certainly a prime example of being penny wise and pound foolish.

More fortunate was the fate of the six-inch lens that Commander Minnich gave to the university in 1985. It is now the essential element in the Minnich telescope installed in 1987 outside a second story window in Ferguson Hall and used by astronomy students and faculty. We reported on its dedication in the 1988 *Spectrum*.



Professor Goodwin Swezey and the only known photograph of the original telescope which he built about 1915 to use the 12-inch lens ground by Dr. Charles S. Minnich.

Rebecca Richards Wins Presidential Young Investigator Award



Rebecca Richards

Rebecca Richards-Kortum (B.S. 1985) received a National Science Foundation Presidential Young Investigators Award (PYI) in 1990. This award was funded by the Bioengineering and Environmental Systems Section of the Biological and Critical Systems Division of the Directorate for Engineering. She is the second of our graduates to receive this high honor. Chris Greene (B.S. 1976) received a PYI award in 1984.

Rebecca earned her Ph.D. at the Massachusetts Institute of Technology in 1990 and is now Assistant Professor of Electrical and Computer Engineering at the University of Texas at Austin. Her research interests are in the applications of optical spectroscopy in biomedical engineering. In particular, she has studied the possible use of fluorescence spectroscopy in the clinical diagnosis of atherosclerosis and neoplasia. Such spectra contain information on the concentration, absorption and scattering coefficients, and fluorescence quantum yield of each tissue component. In addition to formulating and testing new models of light attenuation, she is developing methods of obtaining the information as a function of position in a sample. In her work she collaborates with scientists and clinicians at the University of Texas Medical Branch at Galveston, and engineers in the Biomedical Engineering Program at the University of Texas at Austin.

Besides her research work, she teaches a class in freshman physics for engineering students. She writes that at UNL "... your freshman physics course is orders of magnitude better than the one here. I find it extremely difficult to work with computer-graded homework and exams." She is working hard to improve the course and has tried several ideas to achieve that end. Each student is encouraged to sign a contract with the instructor spelling out what the student is expected to do and what the level of commitment of the instructor is. Over half of the students have signed the contracts. She generates interest by interspersing her lectures on physics with lectures on engineering topics and other real world applications. Some examples that she cites are talks on the clutch and synchromesh, the FAX machine, flight, woodwind instruments, the thermostat, and the refrigerator. But most important, she says, is to make herself more accessible to students.

Besides her professional activities, Rebecca and her husband are expecting their first baby in January.



An Alumnus Shares His Memories

In January we received a letter from Raymond L. Murray (M.S. 1941) who received his Ph.D. degree at the University of Tennessee. He is Professor Emeritus of Physics in the Department of Nuclear Engineering at North Carolina State University, Box 7909, Raleigh, NC 27695-7909. We quote his letter.

"I'm looking forward to getting a copy of the history of the Department. The names Almy, Marvin and Smith are familiar to me even though it has been fifty years. I majored in Physics while a student in Teachers College, with a B.S. in 1940 and received my M.S. in Physics in 1941. Earlier, I was a lecture assistant to Dr. Almy in his beginning course. He was a shy and kindly man. I recall so well his advice to me to try to be better organized. And Dr. Marvin, who read from his lecture notes while copying them on the board. We could get a beautiful set of notes every lecture without having to think at all. And Dr. Smith—who bluntly told me I was not capable of getting a Ph.D.—served as a strong stimulus for me to do just that. I would enjoy hearing from some of my classmates of that era."

Donald Schneider Honored



Donald P. Schneider

On January 13, 1992 Donald Schneider (B.S. 1976) will be featured as the leadoff speaker at the two-day meeting *Images in Science* hosted by the National Academy of Science for government and industry attendees. His talk is to be "Charge-Coupled Device Sky Survey." Two days later, he will be a special invited speaker at the American Astronomical Society meeting to be held in Atlanta, Georgia. The prize-winning book *First Light—The Search for the Edge of the Universe* by Richard Preston (New York: Atlantic Monthly Press, 1987) describes the work of the group of astronomers at the Palomar Observatory including Schneider as one of the main characters.

In the 1989 *Spectrum* we reported on the discovery by Schneider and his colleagues, Maarten Schmidt and James Gunn, of the most distant known quasar, 14 billion light years away. An article describing their discovery has now been published (*Astronomical Journal* 102, 837, 1991). The quasar, labelled PC 1247 + 3406, has a redshift of 4.897 which corresponds to an age of 9/10 of the estimated age of the universe. With Jesse Greenstein as an additional collaborator, the investigators reported in the same journal (pg. 1180) on the discovery of an astronomical object with an even greater redshift, the reddest ever seen in the infrared sky survey conducted at the California Institute of Technology's Palomar Observatory.

Last May Schneider returned to UNL to give a talk "Through a Very Large Glass, Darkly," at our annual Physics and Astronomy Recognition Luncheon. In the talk he described the Hubble Telescope and its problems.

Science on the Great Plains Set for Publication

We reported in last year's *Spectrum* that the manuscript of the book *Science on the Great Plains: The History of Physics and Astronomy at the University of Nebraska—Lincoln* had been completed. It was submitted to the Faculty Scholarly Publications Committee in May 1990. After some delay and the cutting out of most of the appendices, as requested by the committee, it was sent to two outside reviewers, whose comments came back in March 1991. While the reviews were favorable, a number of changes and additions were suggested. In June the revised manuscript went to the University of Nebraska Press for editorial work, layout, and printing and is now scheduled to come out in the spring. Elsewhere in this issue (on page 9) you will find information on how to order your copy.

One of the external reviewers wrote, "*Science on the Great Plains*" is a unique contribution to the history of science in the U.S. It is the only study of which I am aware that not only traces in detail the development of a Physics and Astronomy department in a midwestern university from its origins to the present, but also gives an insight into the remarkable scientists who created it and brought it international recognition in the early years of this century. It will be of value to all those who have an interest in the growth of science and science education in the Midwest."

In addition to the early history of physics and astronomy at the University of Nebraska, the book follows the departments through the Great Depression, the two World Wars, through the era of great growth in the 1960s and early 1970s and the period of stability and productivity of the late 1970s and 1980s, and brings the story right up to the present. The book is dedicated to the memory of DeWitt Brace, the man who founded the Department and gave it great distinction before his untimely death in 1905.

The deleted appendices contain lists of faculty and other staff members, all of the graduate degrees awarded, and a compilation of the publications from the Department up to 1950. Since we went to all the trouble of gathering that data and because we felt that many of you alumni and former faculty members would be interested in it, we plan to have those appendices reproduced separately as a supplement to the book and will make that available to you as well.

We Heard From . . .

- Agrawal, Bishan S.** (M.S. 1973 Physics/Elec. Eng., Ph.D. 1974) 85 Rockwell Circle, Marlboro, NJ 07746. Is an MTS with Bellcore. "Glad to see names of friends/teachers in *SPECTRUM*. Proud to learn of new developments undertaken in the Physics Department at UNL."
- Allen, Glenn E.** (B.S. 1989) 4314 Rowalt Drive, #301, College Park, MD 20740. Is a Graduate Teaching Assistant at the University of Maryland.
- Anania Russell M.** (M.S. 1967, Ph.D. 1974) 4530 Pierce Street, Omaha, NE 68106. Presented a talk on "Robotics and the Space Shuttle's Remote Manipulator Arm" at the 1991 Annual Meeting of the Nebraska Academy of Sciences.
- Baird, Leemon C.** (M.S. 1963) Box 807, Brandon, FL 33509. Self-employed as an Oncology Physics Consultant for Acurad Systems, Inc.
- Bardsley, Thomas E.** (B.A. 1988) 5724 Glade Street, Lincoln, NE 68506. Is a special agent for The Prudential. "Just celebrated the birth of my second daughter in November. I will be planning to travel either to lower Baja or Hawaii to observe the July 11 solar eclipse. I also plan to equip my amateur observatory near Weeping Water with a CCD imaging device this spring. I'm working on the interfacing right now!"
- Brda, William A.** (M.S. 1989) 328 So. 47, Lincoln, NE 68510.
- Brown, Robert H.** (M.S. 1942) 12420 Birch Street, Yucaipa, CA 92399-4219. "Retired."
- Burmester, William L.** (M.S. 1975, Ph.D. 1982) 4473 Pali Way, Boulder, CO 80301. Is a Principal E-O Engineer with Ball Aerospace Systems Group.
- Byrne, Eric J.** (B.S. 1983) 1224 Claflin Road #6, Manhattan, KS 66502. Is a Graduate Research Assistant in the Department of Computing and Information Science at Kansas State University. "I'm about half way through my Ph.D. work. I'm working in software engineering."
- Chung, Youngmin** (M.S. 1985, Ph.D. 1989) Kangnam-gu, Ap-gujung-dong, Sinhyundai—Apt., 102-dong, 1003-ho, Seoul, Korea.
- Chang, Shwu-Jen** (M.S. 1985) 8141 S 77th E Ave., #2038, Tulsa, OK 74133.
- De, Bhola Nath** (M.S. 1986, Ph.D. 1990) 172 S John Street, Pearl River, NY 10965. Is a Project Scientist with Materials Research Corporation (SONY). "I had a fine feeling hearing from my *alma mater*. Working with my colleagues and teachers had given me very valuable knowledge and experience that I truly enjoyed and appreciated. My hope is to expand that base and use it to solve real life problems. Keep up your good work!"
- Dunn, Dan** (B.S. Eng. Phys.) 185 Melba Street, #306, Milford, CT 06460. Is a Metrology Engineer with Hughes Danbury Optical Systems. "Am currently working on the Advanced X-ray Astrophysical Facility, an orbiting X-ray telescope NASA will launch in the late '90s."
- Engelhardt, Michael A.** (M.S. 1983, Ph.D. 1988). Department of Physics, University of Minnesota at Duluth, Duluth, MN 55812. Has accepted a tenure-track faculty position at the University of Minnesota. "I'm planning to start a research program in atomic force microscopy on a group of insulators I have already studied at the Synchrotron Radiation Center at the University of Wisconsin—Madison."
- Gayton, Charles F.** (BS EE 1950) 1313 Sheppard Drive, Fullerton, CA 92631. Is a News Cameraman with CBS News. "During the time Professor O. C. Collins had very bad eyesight due to cataracts he would hold an outside class and, staring at the ground, would point his cane precisely at the stars discussed. He knew the time and date. I found out about different times then (i.e., sidereal, solar etc.)."
- Homan, Dean M.** (B.S. 1991) 305 Lindenhurst Drive, Apt 1047, Lexington, KY 40509. Is enrolled as a graduate student at the University of Kentucky at Lexington.
- Jatzen, Eric R.** (B.S. 1988) Römer Lager B, NR 417, Am Jesuitenhof 1, 5300 Bonn 1, Germany. Is enrolled as a student at the University of Bonn.
- Kadlec, Kayla L.** (B.S. 1989) P.O. Box 10, Sunspot, NM 88849. Is enrolled as a graduate student at New Mexico State University in Las Cruces.
- Lee, Eun-Mee** (M.S. 1985, Ph.D. 1989) Kangnam-gu, Ap-gujung-dong, Sinhyundai-Apt., 102-dong, 1003-ho, Seoul, Korea.
- Macek, Joseph H.** (Former Staff) Theoretical Physics, 200 South College, University of Tennessee, Knoxville, TN 37996-1501. Is a Distinguished Professor at the University of Tennessee.
- Meyer, Kurt W.** (B.S. 1988) Colorado Center for Astrodynamic Research (CCAR) in Boulder. "Received a Master's degree in astronautics from George Washington University in August. My master's thesis involved studying the orbital lifetimes of lunar satellites. Will begin doctoral study this Fall at Boulder, CO."
- Minnich, Cmdr. Charles B.** (B.S. E.E., 1937) 5120 Monet Ave., Orlando, FL 32812-1049. Retired. "Planning to witness the 11 July 1991 total solar eclipse from Mazatlan, Mexico on shipboard. This to be followed by a visit to Mt. Palomar for a tour of the observatory and the Hale 200 in. telescope."
- Morgan, Jack F.** (Ph.D. 1943 Chemistry/Physics) Arey Lane, Box 233, South Wellfleet, MA 02663. Retired. "Enjoy Cape Cod. Keep busy with golf, garden, oystering, reading, bridge, and stamp collecting. Enjoyed many years of solving chemical problems in industry."
- Park, Chang-Hwan** (Ph.D. 1984) 7413 Tomjoe Dr., Louisville, KY 40242.
- Patterson, James D.** (Former Staff) Department of Physics and Space Sciences, 150 West University Blvd., Melbourne, FL 32901-6988. Is Professor and Head of Department.
- Perera, Harold** (M.S. 1985, Ph.D. 1990) Box 8224, Division of Radiation Oncology, Mallinckrodt Institute of Radiology, 510 S. Kings Highway, St. Louis, MO 63110. Is research associate at Washington University School of Medicine.
- Pruitt, Michelle** (Garwood) Scripps Institute of Oceanography, Mail Code 0230, Rm 416, LaJolla, CA 92093-0208. Received an NSF Fellowship and has enrolled in the Ph.D. program in physical oceanography at SIO.
- Reinhard, Kent E.** (B.S. 1985) 2253 Rogene Dr., #T-2, Baltimore, MD 21209.
- Sazama, Franklin J.** (M.S. 1962) 7820 Whiterim Terr., Potomac, MD 20854. Is a physicist with US DOE, DP-20.1/GTN, Washington, DC 20545. "Recently received M.A. in National Security Studies at Georgetown University in December 1990 and was promoted to GS-15 w/DOE nuclear weapons program."
- Weimer, Robert K.** (B.A. 1977) 7950 Crossroads Dr., Apt 202, North Charleston, SC 29418. Is an Executive Officer with the U.S. Navy.
- Yin, Lifeng** (Former Staff) Shanghai Institute of Optics and Fine Mechanics, Academia Sinica, P.O. Box 800-211, Shanghai 201800, PRC. Visited UNL in May 1991. Recently served as the General Secretary of the International Workshop on Lasers and Laser Applications held in Shanghai in November 1991.
- Yoo, Kwong Mow** (M.S. 1984) Electrical Engineering Department, City College of New York, NY 10031. Is an Assistant Professor at the City College of CUNY.
- Zhang, Yuxin** (B.S. 1990) Department of Physics, University of Michigan, Ann Arbor, MI 48109. Recently passed his Ph.D. qualifying examination.
- Zhen, Zheng** (M.S. 1985, Ph.D. 1988). Has taken a position in Medical Physics at The University of Pittsburgh.

Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1990 - 31 October 1991. These contributions have been made in support of major items of capital equipment, 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 them 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!

Bishan S. Agrawal (Ph.D. 1974)
Kevin D. Aylesworth (M.S. 1986, Ph.D. 1989)
Belcore
Thomas E. Bullock (M.S. 1979)
Louis J. Caplan (M.S. 1964, Ph.D. 1975)
CBS Inc.
Mr. & Mrs. James C. Coe
Bhola Nath De (M.S. 1986, Ph.D. 1990)
Robert D. DuBois (B.S. 1970, M.S. 1972, Ph.D. 1975)
Daniel E. Dunn (B.S. 1984 Eng. Phys.)
Thomas E. Furtak (B.S. 1971)
John S. Gallagher
Charles F. Gayton (B.S.EE 1950)
David M. Gray (B.S. 1977)
Bert H. Hartzell (A.B. 1939 Math/Physics)
Hughes Aircraft Corp.
IBM Corp.
William J. Lannan (M.A. 1956)
Joseph H. Macek
Robert L. McKenzie (B.A. 1948)
Charles B. Minnich (B.Sc.EE 1937)
Douglas B. Mitchell (B.S. 1968 Math/Physics)
Debra J. Molskness (B.S. 1988)
Burton E. Moore
Donald C. Moore (B.A. 1942)
Stuart O. Nelson (M.A. 1954)
Mr. & Mrs. Joseph L. Parker (Ph.D. 1940 Chemistry/Physics)
Rockwell International
Jerry E. Ruckman (B.S. 1962)
M. Eugene Rudd (Ph.D. 1962)
Franklin J. Szama (M.S. 1962)
James J. Schmidt (B.S. 1956, M.S. 1957)
Donald P. Schneider (B.S. 1976)
Morris W. Sergent
Anthony F. Starace
Terry J. Teays (Ph.D. 1986)
Kwong Mow Yoo (M.S. 1984)

Departmental History Book

The book "*Science on the Great Plains: The History of Physics and Astronomy at the University of Nebraska-Lincoln*" by M. Eugene Rudd is in press and will be available in the spring of 1992. A supplement is also provided which lists all faculty, most of the supporting staff, all graduate degrees awarded, and a list of the early publications from the Department.

You may order the book, together with the supplement, for the pre-publication price of \$20. After March 1, 1992 the price will be \$25. Use the order form below to reserve your copy. Please make your check payable to the University of Nebraska Foundation and send it together with this order form to:

*Patricia J. Christen, Accounting Clerk
Department of Physics and Astronomy
Behlen Laboratory 260
University of Nebraska
Lincoln, NE 68588-0111*

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Departmental History Book

The book "Science on the Great Plains: The History of Physics and Astronomy at the University of Nebraska-Lincoln" by M. Eugene Rudd is in press and will be available in the spring of 1992. A supplement is also provided which lists all faculty, most of the supporting staff, all graduate degrees awarded, and a list of the early publications from the Department.

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Department using the
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THE RECORD

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

No. 7 Fall 1991

Anthony F. Starace, Editor

1990-91 DEGREE RECIPIENTS

Bachelor of Arts

Kenwood D. Scoggin (August 1990). Is a Physical Science Technician for the United States Department of Agriculture at The Soil Tilth Laboratory in Ames, Iowa.

Theodore J. Tipton (August 1990). Is a member of the Stage Crew at the Lied Center for Performing Arts while job hunting for a scientific or technical position.

Mark L. Yarkowsky (August 1990) Is job hunting.

Todd A. Yilk (With Distinction, May 1991). Has enrolled in the graduate physics program at Yale University.

Bachelor of Science

Bao Quoc Vu (August 1990). Is enrolled in the graduate program in physics at UNL.

Yuxin Zhang (August 1990). Is enrolled in the graduate program in physics at the University of Michigan at Ann Arbor.

Jane E. Peterkin (Astronomy, December 1990). Is enrolled in the graduate program in Electrical Engineering at UNL, working with Professor John Woollam.

Ronald A. Synowicki (December 1990). Is enrolled in the graduate program in Electrical Engineering at UNL, working with Professor John Woollam.

Gerald C. Pflapsen (May 1991). Is job hunting.

Michael G. Reiser (May 1991). Is enrolled in the graduate program in Electrical Engineering at UNL.

Thomas G. Snodgrass (May 1991). Worked at Sandia National Lab in Albuquerque prior to taking up his duties as an officer in the Nebraska Air National Guard. Plans graduate study in physics upon completion of his service commitment.

David H. Wells (May 1991). Is applying to graduate schools.

Master of Science

Francis N. Caputo (Astronomy, May 1991). Has enrolled in the graduate astronomy program at the University of Colorado-Boulder.

Michael J. DiMuzio (Astronomy, May 1991). Is engaged in doctoral research with Professor Kam-Ching Leung.

Kenneth W. McLaughlin (May 1991). Is engaged in doctoral research with Professor David W. Duquette.

Rui Qi (May 1991). Is engaged in doctoral research with Professor John R. Hardy.

Dulip A. Welipitiya (May 1991). Is engaged in doctoral research with Professor Joseph P. Woods.

Doctor of Philosophy

Bhola Nath De (August 1990). Is a Project Scientist at the Materials Research Corporation in Orangeburg, N.Y.

Ding Liu (August 1990). Is a postdoctoral research associate with Professor Dennis Alexander in the UNL Center for Electro-Optics.

1990-91 HONORS

1990-91 Fellows

Kenneth W. McLaughlin	Bukey Memorial Fellowship
Brian W. Moudry	Avery Fellowship
Rui Qi	Parker Fellowship
Dulip A. Welipitiya	Avery Fellowship
Jing Yang	Avery Fellowship

1990-91 Scholarships

Gregory R. Burns	Joel Stebbins Scholarship
Anita I. Fritz	Joel Stebbins Scholarship
Eric S. Green	Ed Hirsch Scholarship and U.S. Harkson Scholarship
Dean M. Homan	U.S. Harkson Scholarship
David L. Johnson	U.S. Harkson Scholarship
Joseph B. Lammers	U.S. Harkson Scholarship
Michael K. Lewis	John E. Almy Scholarship
Jane E. Peterkin	John E. Almy Scholarship
Christopher T. Potter	Ed Hirsch Scholarship and Joel Stebbins Scholarship
Samuel P. Rankin	Henry H. Marvin Scholarship
Thomas G. Snodgrass	Henry H. Marvin Scholarship

1991 Distinguished Teaching Assistant Awards

Steven P. Tonder **Jaegwon Yoo**

1991 Burlington Northern Faculty Award for Distinguished Teaching and Scholarship

M. Eugene Rudd

1991 College of Arts and Sciences Distinguished Teaching Award

Roger D. Kirby

1991 Regents KUDOS Award

Patricia J. Christen

1991 Recognition Award for Contributions to Students

Robert G. Fuller **Kam-Ching Leung** **Norman R. Simon**
Marilyn T. McDowell

1991 Lincoln Board of Education Citation

Clifford L. Bettis **Roger D. Kirby**

1990-91 Society of Physics Students Officers

Todd A. Yilk, President **Dean M. Homan**, Vice President
Eric S. Green, Secretary **Kristine L. Warner**, Treasurer

Faculty Professional Activities

In addition to service on Departmental, College and University-wide committees, for 1991-92 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 High Energy Physics Consortium Representative.

Robert G. Fuller: Author, "Ask the Medium" column, *AAPT Announcer*; Editor, *AAPT Instructional Materials Center*; Member, AAPT Publications Committee; Steering Committee, Physics Academic Software.

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

Duane H. Jaecks: Consultant, Edgerton Museum Project, Plainsman Museum, Aurora, Nebr.; NSF Graduate Fellowship Committee (Chairman), National Academy of Sciences.

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-Ed.).

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

M. Eugene Rudd: AAAS Symposium Organizer; Consultant, Edgerton Museum Project, Plainsman Museum, Aurora, Nebr.; 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, Joint 3M/Intermag Conference, 1991 (Co-Chair); Program Committee, Magneto-Optical Recording Conference, Tucson, 1992; Program Committee, Magnetism and Magnetic Materials Conference; State of Nebraska EPSCOR Committee.

Anthony F. Starace: APS Division of Atomic, Molecular and Optical Physics (Past Chairman); APS Search Committee for the Editor of *Physical Review A1*; General Committee, International Conference on the Physics of Electronic and Atomic Collisions.



1991-92 Visiting Staff Members

On our staff as Visiting Professors this year are experimental atomic physicist **Sam J. Cipolla** (Ph.D. 1969, Purdue) from Creighton University; **Marvin De Jong** (Ph.D. 1965, R.P.I.) on sabbatical from the School of the Ozarks; and condensed matter theorist **John Flocken** (Ph.D. 1969, Nebraska) from the University of Nebraska-Omaha.

Visiting Associate Professor this Fall is **Amarnath Kshatriya** (M.Ed. 1979, British Columbia) from the British Institute of Technology, Burnaby, BC, Canada.

Visiting Assistant Professors this year are experimental condensed matter physicist **Charles B. Robbins** (Ph.D. 1969, Illinois); physics education researcher **Evelyn B. Tuska** (Ph.D. 1990, Delaware); and **Yong Zhang** (M.S. 1983, Tsinghua Univ, Beijing) on sabbatical from Huaqiao Univ., Quanzhou, Fujian, P.R.C.

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 **Youngmin Chung** (Ph.D. 1989, Nebraska), working with Professor Sampson; theoretical atomic physicist **Ning-Yi Du** (Ph.D. 1989, LSU), working with Professor Starace; experimental atomic physicist

Zhong-Xiang He (Ph.D. 1990, Hawaii), working with Professor Samson; astrophysicist **Shaski 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 atomic physicist **Eun-Mee Lee** (Ph.D. 1989, Nebraska), working with Professor Samson; theoretical condensed matter physicist **Hsiao-Ming Lu** (Ph.D. 1988, Arizona State), working with Professor J. Hardy; experimental atomic physicist **Robert Moberg** (Ph.D. 1990, Uppsala, Sweden), working with Professor Samson; experimental condensed matter physicist **Anthony S. Nazareth** (Ph.D. 1988, Kansas State), working with Professor Sellmyer; theoretical atomic physicist **Cheng Pan** (Ph.D. 1988, Virginia), working with Professor Starace; experimental condensed matter physicist **Brian Patterson** (Ph.D. 1991, Delaware), working with Professor Sellmyer; experimental condensed matter physicist **Zhengsheng Shan** (Ph.D. 1990, Nebraska), 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 Jaecks.

1990 Fall Semester Colloquia

- September 6: Dr. Refik Kortan, AT&T Bell Laboratories
"Quasicrystals: Seeing is Believing"
- September 13: Professor M. Eugene Rudd, University of Nebraska-Lincoln
"Early History of Physics and Astronomy at the University of Nebraska"
- September 20: Professor S. N. Khanna, Virginia Commonwealth University
"Magnetism in Low Dimensional Systems"
- September 27: Professor Vladimir Fridkin, Inst. of Crystallography, Academy of Sciences, USSR
"Bulk Photovoltaic Effect in Ferroelectric & Piezoelectric Materials"
- October 4: Professor Marshall Onellion, University of Wisconsin-Madison
"Photoemission Experiments in Condensed Matter Physics"
- October 11: *The Jerry E. Ruckman Lecture*: Dr. Sheila Tobias, University of Arizona
"They Are Not Dumb, They Are Just Different—Stalking the Second Tier"
- October 18: Professor Steven T. Manson, Georgia State University
"New Frontiers in the Interaction of Radiation with Matter: Opportunities Presented by High-Brightness Light Sources"
- October 25: Professor Dimitri Mihalas, University of Illinois-Urbana-Champaign
"New Radiative Opacities for Stars"
- October 26: Dr. Randall L. Headrick, AT&T Laboratories
"Two-Dimensional Systems in Semiconductors Created by Doping"
- November 8: Professor James L. Lawler, University of Wisconsin-Madison
"Optogalvanic Studies of Discharge Plasma Sheaths"
- November 12: Dr. Stephen Ducharme
"Improved Photorefractive Materials"
- November 29: Professor Eric Davies, University of Nebraska-Lincoln
"Wound Signals in Plants: Are They Electrical?"
- December 6: Professor Roger Kirby, University of Nebraska-Lincoln
"Fourier Transforms in Physical Measurements: Life in K Space"

1991 Spring Semester Colloquia

- January 17: Professor Theodore P. Jorgensen, University of Nebraska-Lincoln
"Can The Quantum Equation Be Derived From Classical Physics?"
- January 24: Professor David J. Sellmyer, University of Nebraska-Lincoln
"Magnetism and Magneto-Optics of Nano-structured Multilayers"
- February 7: Professor Dennis R. Alexander, University of Nebraska-Lincoln
"Non-Linear Laser Interactions With Aerosol Droplets"
- February 14: Professor C. L. Cocke, Kansas State University
"The Interaction of Slow Highly Charged Ions with Electrons, Atoms, and Surfaces"
- February 21: Dr. Robert B. Van Dover, AT&T Bell Laboratories
"High-Temperature Superconductors: Where Do We Stand?"
- February 28: Dr. Randall Victora, Eastman Kodak Co.
"Calculated Magnetic and Electronic Properties of Superlattice Magneto-Optic Media"
- March 7: Professor Lincoln Wolfenstein, Carnegie-Mellon University
"Massive Neutrinos and the Solar Neutrino Problem"
- March 14: Professor Walter E. Kauppila, Wayne State University
"Cross-channel Coupling Effects in Positron-Atom Scattering"
- April 4: Dr. Richard G. W. Keesing, York University, U.K.
"The Story of Isaac Newton's Apple Tree"
- April 11: Professor David J. Pegg, University of Tennessee
"Negative Ions: Fragile Quantum Systems"
- April 18: Professor Owen Gingerich, Harvard University
"Circles of the Gods: Copernicus, Kepler and the Ellipse"
- April 25: Professor Virginia Trimble, University of California-Irvine
"The Universe You Don't See: Existence and Nature of Dark Matter"
- May 9: Dr. Donald P. Schneider, Institute for Advanced Study, Princeton
"Scanning for Violence at the Edge of the Universe"

1990 Faculty Publications

ASTRONOMY AND ASTROPHYSICS

- D.Q. Zhou and K.C. Leung, "An Explanation of Light-Curve Asymmetries in Contact Binaries by Means of the Coriolis Effect," *Astrophysical Journal* 355, 271-276 (1990).
- K.C. Leung, "Types of Contact Binary Systems and Ways to Find Them," in *Active Close Binaries*, Edited by C. Ibanoglu (Dordrecht: Kluwer 1990), p. 881.
- M.T. Edalati and K.C. Leung, "A Photometric Analysis of Eclipsing Systems in NGC 188," in *Active Close Binaries*, Edited by C. Ibanoglu (Dordrecht: Kluwer 1990), p. 891.
- P.B. Etzel and K.C. Leung, "Synthesis Methods for Eclipsing-Binary Light Curves," in *Active Close Binaries*, Edited by C. Ibanoglu (Dordrecht: Kluwer 1990), p. 873.
- X.F. Liu, Z.A. Li, K.C. Leung, and H.S. Tan, "Photoelectric Solutions and Analysis for an Algol Type Binary Ci Aur ," *Acta Astrophysics Sinica* 10, 48-55 (1990).
- E.G. Schmidt, C.G. Loomis, A.T. Groebner and C.T. Potter, "The Long Period Field RR Lyrae Stars," *Astrophysical Journal* 360, 604 (1990).
- E.G. Schmidt, and B.A. Gross, "Two New Short Period Cepheids," *Publications of the Astronomical Society of the Pacific* 102, 978 (1990).
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ATOMIC, MOLECULAR AND OPTICAL PHYSICS

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- I.I. Fabrikant, "Resonance Processes in e-HCl Collisions: Comparison of the R-Matrix and The Nonlocal-Complex Potential Methods," *Comments on Atomic and Molecular Physics* 24, 37 (1990).
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- D.H. Jaecks, O. Yenen, L. Wiese, and D. Calabrese, "Production of Near-Zero-Energy Projectile-Frame Protons in $\text{H}_2^+ - \text{He}$ Collisions at 4 keV," *Phys. Rev. A* 41, 5934 (1990).
- O. Yenen, L.M. Wiese, D. Calabrese, and D.H. Jaecks, "Near-Zero Energy Proton Production Mechanisms from the Three-Body Dissociation of H_3^+ ," *Phys. Rev. A* 42, 324 (1990).
- M.E. Rudd, "Cross Sections for Production of Secondary Electrons by Charged Particles," *Radiation Protection Dosimetry* 31, 17-22 (1990).
- M.E. Rudd, "Spectra of secondary Electrons from Electron and Proton Collisions," *ICRU News*, June 1990, pp. 15-17. (International Commission on Radiation Units and Measurements: Aachen, Germany).
- J.A.R. Samson, E-M. Lee and Y. Chung, "Resonant Satellite Transitions in Argon," *Physica Scripta* 41, 850 (1990).
- J.A.R. Samson and G.C. Angel, "Double Photoionization Studies of Ne, O and N from Threshold to 280 eV," *Physical Review A* 42, 5328 (1990).
- J.A.R. Samson and G.C. Angel, "Single and Double Photoionization Cross Sections of Atomic Nitrogen from Threshold to 31 Å," *Physical Review A* 42, 1307 (1990).
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- C.D. Caldwell, M.G. Flemming, M.O. Krause, P. van der Meulen, C. Pan, and A.F. Starace, "Near 100% Production of the Excited $\text{Be}^+ 1s^2 2p$ Ion From Decay of $\text{Be} 1s 2s^2 2p$," *Physical Review A* 41, 542 (1990). (Rapid Communication)
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- C. Pan, B. Gao and A.F. Starace, "Two-Photon Ionization of the Ar Atom and Detachment of the F⁻ Ion," *Physical Review A* 41, 6271 (1990).
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CONDENSED MATTER PHYSICS

- S. Ducharme, J. Hautala, and P.C. Taylor, "Photodarkening Profiles and Kinetics in Chalcogenide Glasses," *Physical Review B* 41, 12,250 (1990).
- P. Shukla, P.M. Cotts, R.D. Miller, S. Ducharme, R. Astana, and J. Zavislan, "Nonlinear Optical Studies of Polysilanes," *Molecular Crystals and Liquid Crystals* 183, 241 (1990).
- S. Ducharme, W.P. Risk, W.E. Moerner, V.Y. Lee, R.W. Twieg, and G.C. Bjorklund, "Intracavity Frequency Doubling of a Nd:YAG Laser With an Organic Nonlinear Optical Crystal," *Applied Physics Letters* 57, 537 (1990).
- J.D. Swalen, G.C. Bjorklund, S. Ducharme, W. Fleming, S. Herminghaus, D. Jungbauer, W.E. Moerner, B.A. Smith, R. Twieg, D. Yoon, and G. Willson, "Organic Nonlinear Optical Materials and Their Device Applications for Frequency Doubling, Modulation, and Switching," in *Nonlinear Optical Properties of Organic Materials III*, Proceedings of the SPIE 1137, 2 (Society of Photo-Optical Instrumentation Engineers, Bellingham, 1990).
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- J.R. Hardy and J. Flocken, "Possible Vibronic Origin of High T_c Superconductivity: Non-Cuprate High T_c's?," *Ferroelectrics* 92, 175 (1990).
- H.M. Lu and J.R. Hardy, "First-Principle Simulations of Ionic Molecular Solids: The Phase Transition in K_2SeO_4 ," *Physical Review Letters* 64, 661 (1990).
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- C.P. Reed, Y.X. Zhang, S.H. Liou, R.J. DeAngelis, and R.J. Jacob, "Substructure-Magnetic Property Correlation in Fe/Ag Composite Thin Films," *Advances in X-ray Analysis* 34, 557 (1990).
- S.H. Liou, Z.X. Zhang, R.J. DeAngelis, "Magnetic Properties of Nanostructured Fe/Ag Composite Metal Films," *MRS Proceedings: Physical Phenomena in Granular Materials* (Edited by T.H. Geballe, Ping Sheng, and C.D. Cody) 195, 451 (1990).
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M.A. Engelhardt, S.S. Jaswal, and D.J. Sellmyer, "Dependence of Electronic Structure on Atomic Structure: Amorphous and Disordered Crystalline Cu-W Alloys," *Solid State Communications* 75, 663 (1990).

D.J. Sellmyer, Z.S. Shan, and S.S. Jaswal, "Interfacial Magnetic Anisotropy in Nanoscale Magnetic Multilayers," *Materials Science and Engineering B* 6, 137 (1990).

Z.S. Shan, D.J. Sellmyer, S.S. Jaswal, Y.J. Wang, and J.X. Shen, "Magnetism of Rare Earth-Transition Metal Nanoscale Multilayers: II. Theoretical Analysis of Magnetization and Perpendicular Magnetic Anisotropy," *Physical Review B* 42, 10446 (1990).

J.X. Shen, R.D. Kirby, and D.J. Sellmyer, "The Structure and Magneto-Optic Properties of MnAl-Based Thin Films," *Journal of Applied Physics* 67, 4929 (1990).

N. Amin, D.J. Sellmyer, D. Wang, and Shadzi, "Magnetic Properties of Longitudinally-Oriented Barium-Ferrite Particles," *Journal of Magnetism and Magnetic Materials* 87, 361 (1990).

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L.Y. Chen, W.A. McGahan, Z.S. Shan, D.J. Sellmyer, and J.A. Woolam, "Enhancement of Magneto-Optical Kerr Effects," *Journal of Applied Physics* 67, 5337 (1990).

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L.Y. Chen, W.A. McGahan, Z.S. Shan, D.J. Sellmyer, and J.A. Woolam, "Kerr Effect of Two-Medium Layered Systems," *Journal of Applied Physics* 67, 7547 (1990).

J.P. Woods and R.C. O'Handley, "Static Magnetization Orientation Under Perpendicular Surface Anisotropy," *Physical Review B* 42, 6568 (1990).

J.P. Woods and R.C. O'Handley, "Low Frequency (< 10 kHz) Surface Magnetic Energy Losses Measured with Polarized Secondary Electrons," *Journal of Applied Physics* 67, 4807 (1990).

ELEMENTARY PARTICLES AND FIELDS

P. Finkler, C.E. Jones, and G.A. Sowell, "A Possible Conserved Quantity for the Henon-Heiles Problem," *Physical Review A* 42, 1931 (1990).

INTERDISCIPLINARY PHYSICS

(a) Physics Education

R.G. Fuller, "LVs, CDs, and New Possibilities," *The Conference on Computers in Physics Instruction Proceedings*, Edited by E.F. Redish and J.S. Risley (Addison-Wesley, NY 1990), pp 523-527.

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G.B. Hept and R.G. Fuller, "The Personal Computer's Impact on Physics Education at the U.S. Air Force Academy," *The Conference on Computers in Physics Instruction Proceedings*, Edited by E.F. Redish and J.S. Risley (Addison-Wesley, NY 1990) pp 499-501.

D.M. Winch and R.G. Fuller, "Using Videodiscs Interactively with HyperCard," *The Conference on Computers in Physics Instruction Proceedings*, Edited by E.F. Redish and J.S. Risley (Addison-Wesley, NY 1990), p 535.

D.I. Dykstra, Jr and R.G. Fuller, "Wondering about Physics . . . Using Spreadsheets to Find Out," *The Conference on Computers in Physics instruction Proceedings*, Edited by E.F. Redish and J.S. Risley (Addison-Wesley, NY 1990), pp 412-413.

G.A. Sowell and R.G. Fuller, "Some Dos and Don'ts for Using Computers in Science Instruction," *Journal of College Science Teaching*, November 1990.

(b) Track Physics

R. Katz, "Cross Section," *Applied Radiation and Isotopes* 41, 563-567 (1990).

R. Katz and G. Huang, "Radiosensitivity Parameters for Cell Survival in Tradescantra and for Chromosome Aberrations in Chinese Hamster Cells," *Radiation Protection Dosimetry* 31, 261-263 (1990).



New Research Grants and Contracts

During the period 1 November 1990-31 October 1991 the following new and renewal external 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	M.E. Rudd/ D.H. Jaecks	Inelastic Processes in Atomic Collisions (NSF)	\$260.5
D.W. Duquette	Laser Photoionization Studies of Excited Atomic States (NSF)	\$ 49.1	J.A.R. Samson	A Rare Gas Optics-Free Absolute Photon Flux and Energy Analyzer (Univ. of Southern California)	\$ 57.6
I.I. Fabrikant	Atomic Processes Involving Negative Ions (NSF)	\$ 42.5	J.A.R. Samson	Interaction of Radiation with Planetary Gases (NASA)	\$ 50.5
R.G. Fuller	Bridges, Bicycles, and Traffic: Thematic Physical Science Lessons (NSF)	\$ 41.6	J.A.R. Samson	Photoionization Studies of Atoms (NSF)	\$ 85.0
R.G. Fuller	Every Physics Teacher's CD-ROM Toolkit (NSF)	\$469.0	J.A.R. Samson	Ultraviolet and X-ray Bombardment of Planetary Atmospheres (NSF)	\$ 60.0
R.G. Fuller	National Interactive Media Project for Secondary Physical Science (Department of Education)	\$ 95.5	E.G. Schmidt	Survey of Poorly Studied Variable Stars (NSF)	\$ 54.5
R.G. Fuller	Transforming Physics Content Using New Technologies (NSF)	\$ 56.5	D.J. Sellmyer	Development of New Permanent-Magnet Materials for Energy-Related Applications (Nebraska Energy Office)	\$124.2
R.G. Fuller	Transforming Physics Laboratories Using New Technologies (NSF)	\$ 29.9	D.J. Sellmyer	Fundamental Studies of Strongly Magnetic Rare Earth-Transition Metal Alloys (DOE)	\$ 60.0
R.G. Fuller	Using New Technologies to Teach Physics (NSF)	\$ 99.0	D.J. Sellmyer	Magnetism and Magneto-Optics of Artificially-Structured Materials (NSF)	\$ 55.0
J.R. Hardy	First Principles Theoretical Studies of Ferroelectric Lattice Instabilities (ONR)	\$100.0	D.J. Sellmyer	Midwest Solid State Conference	\$ 5.0
J.R. Hardy	Studies of Ionic Molecular Solids (ARO)	\$100.0	N.R. Simon	A Test of New Radiative Opacities and Their Incorporation into Improved Cepheid Pulsation Models (NASA)	\$130.3
D.H. Jaecks	Novel Techniques for Studying Fundamental Three Body Interactions (UN Foundation)	\$ 33.2	A.F. Starace	Dynamics of Collision Processes (DOE)	\$ 60.0
R. Katz	Theory of Biological Effectiveness (DOE)	\$ 48.0	A.F. Starace	Dynamics of Photon-Atom Interactions (NSF)	\$ 52.0
R.D. Kirby	Magneto-Optical Properties of Novel Artificially-Structured Multilayers & Intermetallic Compounds (Research Corp.)	\$ 20.0	A.F. Starace	XVII ICPEAC International Travel Grant (NSF)	\$ 36.8
K.C. Leung	A US-Korea Seminar on Binary Star Astronomy (NSF)	\$ 34.0	J.W. Weymouth	Magnetic Survey-L&C Lower Portage Camp Site (Western History Research)	\$ 7.0
S.H. Liou	Magnetron Sputtering of High Critical Current Ti-Ba-Cu-O Films for Use in Power Systems (Nebraska Energy Office)	\$ 68.2	J.W. Weymouth	Quarry Creek Survey (University of Kansas)	\$ 1.5
S.H. Liou	Superconductivity (NASA)	\$ 24.7	J.W. Weymouth	St. Catherine's Island Survey (American Museum of Natural History)	\$ 5.0
				TOTAL:	\$2,499.0 K