

SPECTRUM

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

No. 11 Fall 1990

M. Eugene Rudd, Editor

Nelson Inducted into National Academy of Engineering



Stuart O. Nelson

In October Stuart O. Nelson (M.A. 1954) of Athens, GA, a research agricultural engineer at the Russell Research Center of the Agricultural Research Service, U.S. Department of Agriculture, was inducted as a new member of the National Academy of Engineering during its annual meeting in Washington. Election to membership is a singular honor conferred upon distinguished engineers by their peers. Nelson was honored "for pioneering applications of dielectric properties of seeds and insects related to radio-frequency treatment and processing." The National Academy of Engineering is a private organization established in 1964. It shares in the responsibility given the National Academy of Sciences under a congressional charter granted in 1863 to advise the federal government on questions of science and technology. Nelson received both the B.S. (1950) and M.S. (1952) degrees in Agricultural Engineering and an M.A. (1954) in Physics at UNL, and his Ph.D. (1972) in Engineering at Iowa State University.

Remodeling in Brace and Behlen Laboratories Continues

Things are a'changing in the physics buildings at UNL! If you haven't been here for a few years, you might not be able to find your way around. Under the leadership of department chairman Anthony Starace, several rooms have been remodeled and reassigned, several more are in the process of being refurbished, and plans for additional work are being laid. We are attempting to implement one of the recommendations of our last departmental review committee, namely that we increase the ratio of experimentalists to theorists on the faculty. We are adding the experimental physicists but, of course, with their laboratories, they require more space than theorists do. Before asking for new buildings, we are rearranging and remodeling some of our present rooms in Brace, Behlen, and Ferguson for more efficient use of the space we do have.

The Library

In February the Physics branch library, which was on the second floor of Behlen Laboratory, was moved to newly remodeled space in the north-east corner of the ground floor of Brace Laboratory. The rooms in this area were occupied many years ago by the machine shop before Behlen Laboratory was built. More recently Professor John Weymouth had his research quarters in part of this space. This move was partly necessitated by the floor loading problem which we told you about in a previous issue of the Spectrum. As we added journals and books, the problem became more severe. Moving to a ground floor location meant that there was less concern over the weight of books so we could go to more dense packing of shelves. Part of the new library contains what is called "compact shelving." This involves rolling entire shelves back and forth to get at the book or journal that you want; a bit of a nuisance, but necessary to save space.

A new concrete floor was poured and then carpeted; a new ceiling with recessed lighting was installed. The physics and astronomy librarian, Beverly Wischert, now has her own office and the library even has its own copy machine. It would be nice to be able to say that the library is now well situated for many years to come, but an unfortunate consequence of the advance of knowledge is that books and

Greene Awarded First Rabi Prize



Chris H. Greene

Chris H. Greene (B.S. 1976) has been awarded the first I.I. Rabi Prize by the Council of the American Physical Society. The purpose of the prize is to recognize and encourage outstanding research in Atomic, Molecular, and Optical Physics. The Prize consists of an award of \$5,000 and a certificate with the following citation: "For his many contributions to atomic and molecular theory including studies of resonance vibronic processes, multiple electron excitations, photoabsorption in external fields, and threshold effects of long range forces."

Chris will receive the Prize at the April 1991 meeting of the American Physical Society in Washington, D.C., where he will present an invited talk on the work which gained him the Prize.

Chris was raised in Greenwood, NE, where his parents still reside. He majored in physics and math at UNL, was a member of Phi Beta Kappa, and was a National Merit Scholar. He was also a research assistant in Professor Donal Burns' laboratory and wrote an undergraduate thesis on his work there entitled "Alignment and Orientation in Beam-Foil Excited He." As a result of this thesis, he received the B.S. degree "with high distinction." He then did his thesis work in theoretical atomic physics with Professor Ugo Fano at the University of Chicago, where he received the Ph.D. in 1980. Following postdoctoral appointments at Stanford and the Université de Paris - Sud, he joined the faculty at Louisiana State University in Baton Rouge in 1981. While at LSU, he received an NSF Presidential Young Investigator Award and an Alfred P. Sloan Foundation Fellowship. He was promoted to full professor of physics in 1987. In 1989 he accepted a professorship at the University of Colorado-Boulder as well as an appointment in the Joint Institute for Laboratory Astrophysics there. In May 1990, Greene was named a Fellow of the American Physical Society.

journals are being published at a rapid and increasing rate and even with the compact shelving the space will be filled again in a few years.

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Part of the new Physics library showing the periodical shelves and the librarian's office.

Chairman's Letter



Anthony F. Starace

This past year has seen major changes in our physical facilities in order to accommodate our growing experimental programs. The physics and astronomy branch library now occupies newly renovated quarters in Brace. The space vacated by the library in Behlen has been divided into three modern laboratories. Furthermore, extensive renovations in Brace have been carried out to house the offices of the new Center for Materials Research and Analysis as well as to accommodate the new locations of our meeting and seminar rooms

and our business office, all of which were displaced due to the relocation of our library and the creation of our new laboratories. Plans are now being developed to create additional laboratories so that the Department can achieve its long-term goal of increasing the number of experimental faculty to 50%-60% of the total faculty from roughly 30% a few years ago. Meeting this goal will enable us to prepare our students better for science careers in the 1990's and beyond.

I am pleased to note also the national recognition recently accorded to two of our alumni. Chris H. Greene (B.S. 1976) has recently been selected as the first winner of the newly instituted I.I. Rabi prize of the American Physical Society. Stuart O. Nelson (M.S. 1954) has recently been elected a member of the National Academy of Engineering. Such high honors are very gratifying to the Department. I know I speak for all of our faculty, students, and alumni in expressing my congratulations to these two distinguished alumni.

This year I am serving as the Chairman of the Atomic, Molecular, and Optical Physics Division of the American Physical Society (APS) and consequently have been focusing on concerns of the science community in this country regarding the adequacy of funding for science. More particularly, I refer to the adequacy of funding for basic research by the individual investigators who comprise the bulk of the faculty of our Nation's universities and colleges and who are educating our next generation of scientists. Remarkably, the individual investigator is experiencing funding problems at a time when both Congress and the Nation have serious concerns regarding U.S. economic competitiveness vis-a-vis Europe and Japan, regarding environmental pollution of our air, land, and water as well as their long-term effects on the global climate, and regarding the poor understanding our youth and the public generally have of science and of science-based public issues. A healthy science infrastructure in this country can contribute much to the resolution of each of these current national concerns. However, the health of our science infrastructure is inevitably linked to the adequacy of support for basic research by individual investigators. The APS is attempting to increase Congressional awareness of this linkage. I urge those of you who are in a position to do so to support these efforts of the APS.

Once again, I wish to thank you, our alumni and friends, for your continuing financial support. Continuation of this support is essential to enable us to recruit new faculty and students, improve our teaching laboratories and demonstrations, support the activities of our Society of Physics Students, and underwrite some of the expenses of our service programs to further science education in Nebraska at all levels.

You will find enclosed with this mailing an information card and return envelope to inform us of your activities. I urge you to do so. We also enjoy seeing you when you are in Lincoln and, with some advance notice, can give you a tour of our "new" Department. Best wishes until next year.

Sincerely,

Anthony F. Starace
Professor and Chairman

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 leading physics journals.

In the Rapid Communications section of the 1 January 1990 issue of *Physical Review A*, postdoctoral researcher Cheng Pan, Professor Anthony F. Starace, and experimental groups from Oak Ridge National Laboratory and the University of Central Florida reported joint theoretical and experimental work on the decay of a resonant excited state of the beryllium atom produced by absorption of synchrotron light. Normally such an excited atomic state decays to the ground state of the corresponding ion by emitting an electron. Experimentally, however, it was found that the $\text{Be } 1s^2 2p \ ^1P$ excited state decays 95% of the time to the first excited state of the Be ion, $\text{Be}^+ 1s^2 2p \ ^1P$, rather than to the ionic ground state, $\text{Be}^+ 1s^2 s \ ^1S$. It was shown theoretically that the reason for this is the similarity of the 2p and 2s orbital wavefunctions, which leads to a cancellation in the amplitude for transition to the 2s ground state of the ion. This work points to a rather general means for selective production of excited-state ionic species with high purity.

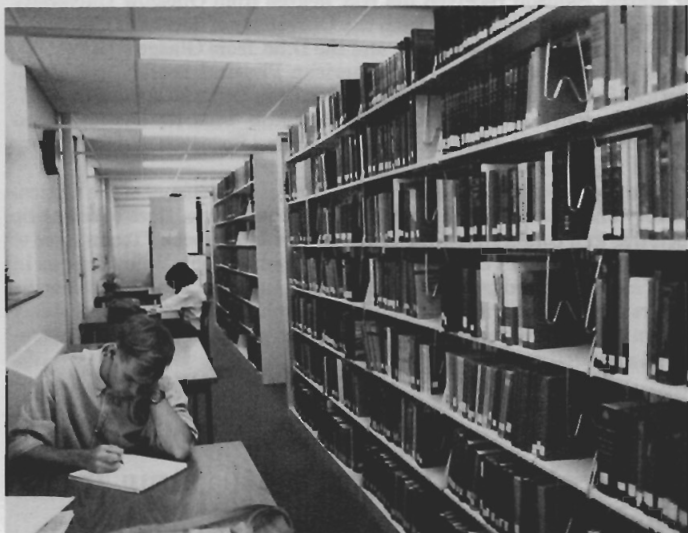
In the 5 February 1990 issue of *Physical Review Letters*, postdoctoral researcher Hsiao-Ming Lu and Professor John R. Hardy reported a new theoretical approach to first-principles simulations of the static and dynamic properties of ionic molecular crystals. Rather than calculating potentials between each element in the molecular crystal, entire molecular ions were treated as single entities using quantum chemical methods. The new approach was applied to the study of phase transitions near absolute zero in the ionic molecular crystal K_2SeO_4 , which has attracted extensive experimental and theoretical study. The new method gives very accurate descriptions of the phase transitions in this crystal and indicates that a double well structure in the potential energy surface is responsible for the phase transitions.

In the 3 December 1990 issue of *Physical Review Letters*, Professor James A. R. Samson reported empirical findings of a proportionality between the cross sections for two different physical processes, electron impact ionization of singly charged positive ions and double photoionization of neutral atoms. The proportionality factor for the two different cross sections contains the total photabsorption cross section for the atom, but is otherwise an energy-independent constant. The photon and electron impact data were shown to be proportional to within 9% for the first 70eV above threshold in a large number of atoms and molecules. Furthermore, this work indicates that the range of validity of the well-known Wannier threshold law for double photoionization can be extended significantly in energy by applying it to the ratio of the double ionization cross section and the total photoionization cross section.

UNL Observatory is Light Years Ahead

The Hubble Space Telescope may be having trouble focusing on faint stars because of faulty mirrors, but astronomy professor Edward Schmidt, with an eye to the sky at UNL's Behlen Observatory, is using the latest in down-on-earth technology to observe many faint and previously poorly observed variable stars that the space telescope was supposed to be observing. The Behlen Observatory at Mead, the first observatory in the world to combine electronic camera technology and extensive computer control, "has a unique capability for certain types of astronomical research," according to Schmidt. "We are now exploiting it to carry out photometric measurements of variable stars." Schmidt says that variable stars are among the oldest stars in the galaxy, but "our knowledge about them is in a very sorry state. Yet they contain many clues to how our galaxy was formed, and how the composition of stars changed as subsequent generations of stars came and went." To study such problems, data on a large sample of variable stars is needed. When Schmidt completes his survey of variable stars in about five years, he will have made approximately 15 observations of each of 6,200 variable stars. He described UNL's leadership in applying new technology to astronomical research at the 102nd annual meeting of the Astronomical Society of the Pacific in Boston, MA in July.

Remodeling in Brace and Behlen (Continued from page 1)



Library stacks and study area.

Laboratories in Behlen

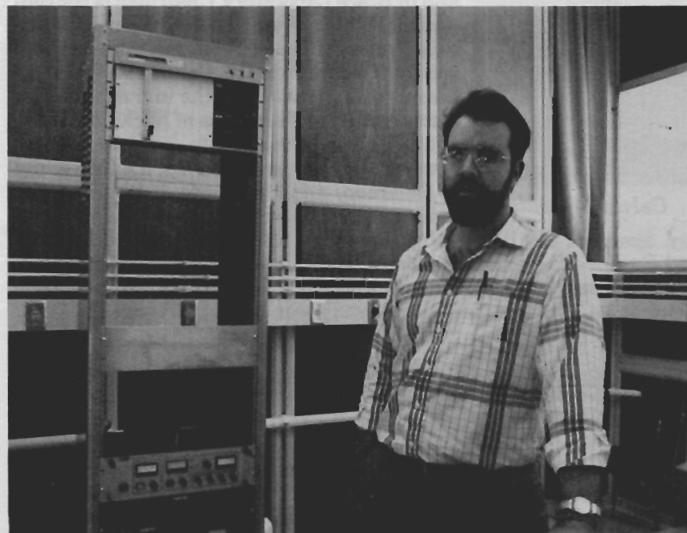
The space on second floor of Behlen Laboratory that was vacated by the library has been partitioned into three laboratory rooms. The one at the south end has become the condensed matter laboratory of Professor Joseph Woods and the adjacent small seminar room has become his office. The next room has been prepared for another condensed matter experimentalist who is being recruited at the present time. The third room, where the library office used to be and where the department office was when the building was first built, will also become a laboratory.

Business Office

In earlier times Brace 205S was part of the electrical laboratory that also occupied what is now 205N, a classroom. For some years it was a storeroom for lecture demonstration apparatus, more recently it has been an annex to the library, and for the last few years it was a storeroom again. It has now been made into quarters for the department Business Manager, Allen Specht, and the Accounting Clerk, Patty Christen. In addition it also contains the department office supplies and serves as the receiving room for the department. Its new ceiling, lighting fixtures, carpeting, new window air conditioners, and built-in cabinets make the room very attractive. New computers are also being added to help the business staff cope with the increased volume of transactions stemming from the increasing numbers of grants and from the establishment of the Center for Materials Research and Analysis, for which we do the accounting.



Business office with Allen Specht and Patty Christen.



Professor Joseph Woods in his laboratory space.

Offices

Funds allocated to the Center for Materials Research and Analysis (CMRA) have been used to remodel Brace 111 and 112. The latter is the office of Professor David Sellmyer, who is the Director of the Center. The adjacent room, formerly occupied by post-docs and graduate students, will be the office for the CMRA secretary, Shelli Krupicka. A new doorway had to be cut through the brick wall to join the rooms. An air conditioning system installed north of the building will serve those rooms and the two rooms being remodeled on the floor directly above.

Conference/Seminar Room and Meeting Room

To replace the small conference room next to the former library space, a new seminar and conference room is being readied in Brace 203. When the refurbishing has been completed and the carpet laid, a conference table and chairs will be added. We also plan to place in the room a cabinet with antique apparatus to illustrate some of the early history of the department and to provide a pleasant decor to the room. The adjacent room, Brace 204 will become an informal meeting and coffee room. This will replace the former student lounge in Brace 109 which has become a part of the new library. Back before Behlen Laboratory was built Brace 203 and 204 were the department office and the chairman's office. For a while one of the rooms contained the copy machine and recently the space has been used as the receiving room and business office.

More Moves

Although it doesn't involve any remodeling, another laboratory is being moved. This is the third floor laboratory of Professor Duane Jaecks which is to occupy room SB62 in the subbasement of Behlen Laboratory. This space was formerly the laboratory of Professor Donal Burns, who is now in the systems administration.

Other moves are being considered. Since there are better laboratory facilities (electricity, water, etc.) in Behlen than in Brace, we may move the department offices to the first floor of Brace Lab near the east door to make room for another laboratory in Behlen. But then we have the problem of where to relocate the junior-senior laboratory. It has been suggested that part of the attic in Brace Laboratory be remodeled for use as offices or perhaps student laboratories. Another possibility for additional space would be to add 4th and 5th floors to Behlen Laboratory. The footings and foundation for that building were made with that possibility in mind and even the elevator was equipped with buttons for two extra floors!

As you can see, we are coping as best we can with the need to accommodate new programs and new staff members in the department by using existing facilities. What is really needed, of course, is new construction, but that seems to be a long way off. Would anyone out there like to have a new building named after him/her?

Midwest Solid State Conference



Calvin F. Quate

The 38th Midwest Solid State Conference was held November 9-10 at the Lied Center and in Brace Laboratory. Chairman of the conference, which drew about 100 participants, was Professor David Sellmyer. The keynote speaker was Professor Calvin F. Quate of Stanford University and the invited speakers were Professors Jack Bass of Michigan State, John R. Clem of Iowa State, Talat Rahman of Kansas State, James F. Scott of the University of Colorado, and Dr. James J. Rhyne of the National Institute of Standards and Technology. Sponsors for the meeting were the Colleges of Arts and Sciences and Engineering and Technology, The Center for Materials Research and Analysis, the Department of Physics and Astronomy, and Dale Electronics. The last time the meeting was held at UNL was in 1984.

First State-wide Conference on Mathematics and Science Education

In August five hundred mathematics and science teachers from all parts of Nebraska attended the Nebraska Conference on Mathematics and Science Education, heralded as the first state response to President Bush's Governors Conference on Education in 1989. Physicist Dr. Joseph P. Allen, a former Shuttle astronaut, was the keynote speaker. The conference consisted of five sessions of seven parallel presentations dealing with concerns of teachers from kindergarten through college. Co-hosts were Professors Melvin Thornton of the Department of Mathematics and Statistics and Robert Fuller. Dr. Clifford Bettis, Lecture Demonstrations Manager and Assistant Research Professor of Physics and Astronomy also participated, making presentations at two sessions.

Staff Activities

During his sabbatical last spring, Professor Paul Burrow visited research groups doing electron scattering at Manchester University in England, the University of Paris-Orsay, Bologna, Italy, and Fribourg, Switzerland. He gave lectures at Manchester and at Fribourg.

Professor Robert Fuller and Visiting Professor Glenn Sowell were on the faculty of a workshop entitled "The Transforming Physics Content Workshop Using New Technologies." The two-week workshop, held at the U.S. Air Force Academy in Colorado, was attended by 34 college professors from 20 states.

Professor Duane Jaacks has been appointed Chairman of the National Research Council's Graduate Fellowship Evaluation Panel for Physics and Astronomy for the next three years.

Professor Kam-Ching Leung was recently appointed Co-chair of the Pacific Rim Colloquium on New Directions in Binary Star Research. In August Leung became Distinguished Professor at Shaanxi Observatory, Academia Sinica, China.

Professor David Sellmyer is the Chairman of the 38th Midwest Solid State Conference (see article) and is on the Foreign Committee for the Magneto-Optical Recording Conference to be held in Tokyo next year.

Professor Eugene Rudd has been appointed by the International Commission on Radiation Units and Measurements as the chairman of a committee to prepare a comprehensive report on secondary electron production from collisions of electrons and ions with atoms, molecules, and solids.

The Chairman of the American Physical Society's Division of Atomic, Molecular, and Optical Physics for this year is Professor Anthony Starace, who is also a member of the General Committee of the International Conference on the Physics of Electron and Atomic Physics.

Professor Frank Ullman was a guest of the Academy of Sciences of the USSR during the first two weeks of June. He lectured at the Institute of Crystallography in Moscow and at the Ioffe Institute in Leningrad.

Emeritus Professor John Weymouth has been appointed a Research Associate at Indiana University in the Glenn A. Black Laboratory. Weymouth's work in archaeological magnetometry (see article) was noted in an article entitled "Remote Sensing and Archaeology" by Farouk El-Baz in the 1991 *Yearbook of Science and the Future* published by the Encyclopaedia Britannica.

Samson Honored by Phi Beta Kappa

The University of Nebraska Chapter of the national honor society Phi Beta Kappa named Professor James Samson an honorary member in March. Samson received his B.S. degree from Glasgow University in 1952, his M.S. and Ph.D. from the University of Southern California in 1955 and 1958, respectively, and the D.Sc. from Glasgow University in 1970. He is a fellow of the American Physical Society and of the Optical Society of America and received the Lapeyre Award in 1987. The University of Nebraska presented him with its Distinguished Teaching Award in 1985 and its Outstanding Research and Creativity Award in 1987.

Samson has served as Associate Editor of the *Journal of the Optical Society* and has been on numerous panels and committees of scientific societies and conferences. He is the author of the book "Techniques of Vacuum Ultraviolet Spectroscopy" published by John Wiley & Sons in 1967 and reprinted in 1980. He has also authored over 110 scientific papers and has contributed to numerous published books and is widely recognized for his research in the area of photoionization and ultraviolet spectroscopy.

Research Grants Don't All Come from Washington

In addition to obtaining a record number of federal research and teaching grants this year, members of the department faculty have been able to secure a number of welcome grants from university and other state sources. John Yost, who was Vice Chancellor for Research and Graduate Studies at Nebraska provided four of the grants in June before leaving to become Vice President for Academic Affairs at the University of Alabama at Huntsville. One grant, funded by the University of Nebraska Foundation, was for \$33,240 and went to Professor Duane Jaacks for his project, "Novel Techniques for Studying Fundamental Three-Body Interactions." Professor Paul Burrow received \$5,000 for expenses relating to his NSF project, "Electron Scattering of Temporary Anion Formation in Hydrocarbons," and Professor James Samson was granted \$12,000 for instrumentation for an experiment entitled "Satellite States of Molecular Nitrogen." Another grant of \$8,640 went to Professor Edward Schmidt for his project "A Survey of Faint Variable Stars."

The Nebraska Energy Office provided grants to two members of the Condensed Matter Group. Professor Sy-Hwang Liou received \$68,200 for his project on "Magnetron Sputtering of High Critical Current Ti-Ba-Ca-Cu-O Films for Use in Electric Power Systems" and Professor David Sellmyer's project on "Development of New Permanent-Magnet Materials for Energy-Related Applications" was granted \$124,191.

Leung Leads U.S. Astronomical Delegation to Korea

A member of our faculty was the co-organizer of an astronomical meeting held in Korea in November 1990. The Colloquium on New Frontiers in Binary Star Research is sponsored jointly by the United States (through the National Science Foundation) and by Korea (through the Korean Science and Engineering Foundation). The meeting was organized by Professor Kam-Ching Leung of Nebraska and Professor Il-Seong Nha of Yonsei University in Korea. The meeting focused on contemporary techniques for investigating both close and wide binary star systems with emphasis on new approaches in acquiring data, deriving fundamental quantities, and interpreting and modelling binary systems.

A grant to the University of Nebraska of \$34,000 from NSF supported the attendance of a 12-member U.S. delegation, headed by Leung and selected by NSF from recommendations made by him. Binary star experts from 17 countries presented about 70 papers. The proceedings will be published by the Astronomical Society of the Pacific, with Leung as editor.

Bettis Speaks on Radiation Safety

Dr. Clifford Bettis, our Lecture Demonstrations Manager and Research Assistant Professor of Physics, has given many talks, especially on the subject of radiation, to audiences in Nebraska. We asked him to write about some of his experiences.

"One of the responsibilities I enjoy most is going about the state giving public lectures on various topics in physics, illustrating the talks as profusely as possible with many demonstrations. I've spoken to all sorts of groups: grade school and high school students, boy scouts, crowds at the state fair, science teachers, and citizens' groups. In the past two years one of the subjects that has been of great interest to people is radiation safety. There are two public issues that are the roots of this interest: one is the proposed low-level nuclear waste site in our state and the other is the controversial claim by the Environmental Protection Agency that typical household levels of radon concentration in our state represent a serious health concern.

"As mentioned, I like to illustrate my talks with demonstrations and the topic of radiation safety represents a challenge in that regard. I like to show my audiences a Geiger counter and various common radioactive substances to demonstrate the constant radioactivity around us from cosmic rays and from the earth itself. However, the subject of risk is hard to illustrate because it is statistical in nature and people are generally unaware of the common risks they take by choice everyday. How you express a risk makes a big difference in how people regard it. For instance, the EPA tells people that the risk from exposure to a residential level of radon of 4 picocuries per liter is the equivalent of the risk from having 400 chest x-rays per year. If you put this in terms of loss of life expectancy it sounds very different: for a non-smoker the calculated loss of life expectancy would be about 40 days; about the same as the loss of life expectancy due to drowning. Of course, this is a calculated risk and new epidemiological data seems to indicate that the real risk is much less.

"Doing lectures with demonstrations on the road takes a lot of effort and resources. The physics department has been very generous in supporting me in these activities. The question arises: is it worth it? As a teacher, I feel that every opportunity one has to reach a student ought to be exploited and that one cannot predict when those little teachable moments will happen. Early in November I was asked to speak to a group of 140 seniors at Omaha Westside High School on the topic "Radiation, Risk, and Radon." After the talk, as the students were filing out, a rather intense looking young man came up to me and asked some questions about the cosmic radiation I had mentioned when I showed the background radiation in the room. He wanted to know if anyone studied these cosmic rays. You can imagine how at once I was bemused and charmed by the question. He clearly felt that he was on to something. I told him yes, indeed people study cosmic rays and that even today they represent our most energetic source of subatomic particles. He left me feeling very glad that I had taken the trouble to come. We should not underestimate the importance of each person whose interest we excite in science.

"Some of the controversies surrounding a discussion of radioactive materials are political in nature, for instance whether Nebraska should have a low-level nuclear waste site. I try to maintain a strict neutrality about such issues and tell people that I don't speak for the university on those matters. Furthermore, I explain that I have no vested interest in whether or not a low-level nuclear waste site is built in the state. Lately, I have come to find out that this is not quite correct. One of the demonstrations I like to perform is to show the radioactivity of the potassium chloride sold in stores as a salt substitute. As part of the demonstration I eat some of it. Now, this is a perfectly safe and reasonable thing to do and a good demonstration of the fact that radioactive materials are not merely a folly of scientists gone mad but a rather common part of nature. However, according to the radiation safety manual under which the university operates, this constitutes an experiment with an animal (namely me) involving the ingestion of radioactive materials (the rules grant no tolerances for inconsequential amounts). According to the manual (Section 3.9.E), if the animal dies, it must be considered radioactive waste and disposed of "through the required channels." I interpret this to mean that if there is no low-level radioactive waste site in Nebraska when I die, my widowed wife will have to go out of state to lay flowers on my grave."



Survey team at the suspected Lewis and Clark site.

Weymouth Seeks Lewis and Clark Trail

When Lewis and Clark made their famous expedition to the West Coast in 1805, they recorded events on their trip in a journal which was later published in a number of forms. However, since their accounts lacked detail and were sometimes contradictory, they have been frustrating to historians and archaeologists who have attempted to find the sites where the explorers camped on their way. An archaeological team from the Montana State University and the Western History Research Company at Bozeman led by Kenneth Karsmizki has been attempting for four years to find the place where Lewis and Clark made their camp before making their massive portage around the falls on the Missouri River northeast of Great Falls, Montana. According to Karsmizki, nobody has conclusively located any of the Lewis and Clark campsites. In the past, their search involved digging five-foot square plots at intervals around the suspected site. This summer, however, they adopted a new method of searching, that of magnetometry, a method researched and practiced by Emeritus Professor John Weymouth, a recently retired UNL professor who assisted in the survey.

With this system the investigator walks over a preset grid in the area to be studied carrying a magnetometer probe. He is followed by an assistant who carries the power pack for the probe. At one-meter intervals they stop, put down the probe, and take a reading. The reading is compared to that of a stationary probe operated by a third person some distance away. The purpose of the stationary probe is to provide a baseline reading since magnetic fields can vary significantly during the day due to sunspot activity or other effects. At the end of each day in the field, Weymouth feeds the readings into a computer which analyzes the data and generates a map consisting of lines of constant magnetic field. Anomalies in the distribution of the lines appear, e.g., at sites of campfires.

This summer Weymouth and the crew from Bozeman located two spots on the riverbank terrace that merit excavation. In addition, they were able to narrow the search by ruling out about 1.5 acres where no anomalies were found. The technique is not always successful, but it has helped locate the remains of an 18th century French colonial fort near St. Louis and has guided excavation and reconstruction work at Fort Union near the point in western North Dakota where the Missouri and Yellowstone Rivers meet.

Bi-national Physics Educators' Team Organized at UNL

A bi-national team of physics educators from the USA and the Netherlands is in the process of developing thematic physical science lessons. These lessons will be created by a melding of lessons prepared by the Physics Curriculum Development Project of the Netherlands (PLON), interactive physics videodisc lessons made in the USA, and microcomputer-based laboratory equipment developed by the Netherlands Scientific and Technological Open Learning Environment (STOLE). The lessons will be designed for use by teachers and students in grades 8 through 12 in the USA and by 13 to 17 year olds in the Netherlands.

The first meeting of the steering committee was held on the UNL campus in March. The participants were Dean Zollman of Kansas State University, Charles Lang of Omaha Westside High School, Carol Ann Tripp of Providence Country Day School and two representatives from the Netherlands. Professor Robert Fuller was the host and also the Principal Investigator for the project, which is funded by the National Science Foundation.



Dodson Speaks at Recognition Luncheon



Brian W. Dodson

Brian W. Dodson (B.S. 1973) spoke to faculty, staff, and students on the topic "Formation of Interfaces" at the 1990 Recognition Luncheon in honor of 1989-90 Departmental bachelor's, master's, and doctoral degree recipients. Brian lived in Detroit and San Diego prior to moving to Lincoln in 1967, where he graduated from East High in 1968. At UNL as an undergraduate physics major he claims he got an awful lot of attention and had much interaction with faculty at an early stage in his career. In particular, the undergraduate labs at UNL provided a "real world atmosphere" in which one fights with equipment to get results. He applied to 23 graduate schools, but did not gain entrance to any that did research in general relativity. So he got an MS at the University of Illinois and then transferred to the University of Chicago to work with Robert Geroch on general relativity. Deciding that this was not the area for him after all, he returned to Illinois to get his Ph.D. in experimental low temperature physics. Upon graduation he switched fields again, joining Sandia National Lab to study first shock waves and then semiconductors. Currently he is the Supervisor of the Division of Structural Physics and Chemistry at Sandia.

In his talk on interaces, he pointed out that epitaxy between different materials (i.e., one material "growing" on another material) was discovered experimentally in 1823. Nevertheless, theoretical predictions for the expected layer thickness and other properties have proved notoriously difficult to make with any accuracy. A number of examples to illustrate this point were made.

Three New Videodiscs Developed

The project undertaken by the Instructional Materials Center in the department which was reported in the *Spectrum* last year is beginning to show results. The purpose of the project was to identify outstanding films for teaching physical science in secondary schools and to transfer them to videodisc. Besides editing and transferring the films, the Center provides teachers' manuals for the discs. The Principal Investigator for this project, which is sponsored by the American Association of Physics Teachers (AAPT) and funded by a \$590,815 grant from the U.S. Department of Education, is Professor Robert Fuller.

The first of the six videodiscs, entitled "Physics: Cinema Classics," was shown at the AAPT summer meeting in Minneapolis, and a progress report was made to the supervisory committee of AAPT. As of this writing, "Conservation Laws" and "Angular Momentum and Modern Physics" have been completed and "Mechanics" is next on the schedule. The discs are field tested by the committee and by a small number of selected high school teachers. AAPT will handle the marketing and distribution of the discs.

Sellmyer Lobbies in Washington

Scientists have not been in the forefront of lobbying activities on Capitol Hill, but in these days of tight budgets for support of scientific research, this is changing. The director of President Bush's Office of Science and Technology Policy, D. Allan Bromley, has repeatedly urged his fellow scientists to make their voices heard in Washington. He is asked by senators, e.g., that if the prospects for science are as dire as he tries to tell them, why don't they hear from the scientists themselves as they do from their other constituencies. In 1987 a lobbying consortium named the Council on Research and Technology (CORETECH) was formed which represents 165 universities, corporations, and trade associations. CORETECH's chairman is Roland W. Schmitt, president of Rensselaer Polytechnic Institute in New York. CORETECH organized a "Lobby Day" which in 1988 drew only 30 participants. But it doubled in 1989 and this year in April nearly 100 scientists from 39 states went to Washington to talk to members of Congress about such topics as funding for the National Science Foundation, tax credits for research and development, and the state of the nation's research and science teaching facilities.

Participating in this year's Lobby Day were Professor David Sellmyer of the Department of Physics and Astronomy and Vice Chancellor John Yost. For the April 24 reception, attended by Members of Congress and their staffs, Dave had a videotape exhibit demonstrating

Ruckman Lectures Highlight Physics Education

The Ruckman Lectures, named in honor of Jerry E. Ruckman (B.S. 1962), a long-standing supporter of the Department, bring to campus each year a distinguished speaker on a science education topic and serve as the focal point of an annual get-together of Department faculty with Lincoln and Omaha area high school physics teachers. At a dinner following the lecture and at evening workshops organized after dinner, fruitful exchanges have taken place over the years which have served to promote physics education in Nebraska. In particular, these dialogues have resulted in the organization of numerous summer workshops, summer courses, and funded grant proposals focusing on the development of new physics demonstrations, better instructional materials, and the introduction of computers, videodiscs, and other technologies in physics instruction.



Sheila Tobias

In October 1990, Sheila Tobias spoke on the topic of her new book, *They're Not Dumb — They're Different*, which deals with the question, "Why is physics difficult to learn?" Tobias achieved international attention in 1985 when she had faculty who were regarded as master physics teachers at the University of Chicago present physics lectures to well known Chicago faculty in areas outside the sciences. She asked these other faculty to record their reactions to the physics material being presented and why it was difficult to learn. Obviously these scholars could not be labeled "dumb." Yet they had difficulty learning physics since, Tobias claims, there are "two cultures" or styles for learning. In science courses one regards the lecture as something to be written down as rapidly as possible and studied at leisure afterward. The scholars in other fields, however, were simply unused to writing down concepts they did not yet completely understand. They expected more discussion to ensure that all aspects of each new concept were examined.

Recently, Tobias did the mirror image experiment: she had science faculty attend poetry lectures by distinguished English scholars. The physics faculty complained that lectures had no obvious direction and that the lecturers seemed to feel open discussion by the class to elicit each possible meaning in the text was the way to learn rather than to explain everything themselves.

Tobias' book has been reviewed by *Nature*, the *New York Times*, and the *London Times Literary Supplement*, among others. Copies are available for \$2.50 from Science News Books, 1719 N Street, Washington, D.C. 20036.

In October 1989, Roman Czujko of the Education and Employment Statistics Division of the American Institute of Physics (A.I.P.), spoke on the topic, "High School Physics: Demographics and Outcomes." This talk was based on a 1988 A.I.P. nationwide survey of secondary school teachers of physics. For his talk, Czujko presented unpublished data on the findings for the State of Nebraska. Whereas the number one complaint nationally was the poor state of demonstration and laboratory equipment, there were far fewer complaints in Nebraska. In Nebraska 60% of physics enrollment is in high schools having more than 200 students. These students take physics in either their junior (42%) or senior (58%) year. While 56% of Nebraska teachers of physics have physics degrees, compared with only 36% nationally, Nebraska physics teacher salaries lag 15% behind the national average salary. Czujko also noted that nationally success in high school physics is almost as good a predictor of success in college as success in high school math.

a joint project between UNL and the 3M Corporation on new magneto-optic data storage materials. The following day, along with a representative from 3M, the Nebraska group met with Representatives Douglas Bereuter and Virginia Smith and with members of the staffs of Senators J.J. Exon and Robert Kerrey. Their main efforts were to argue for an eventual doubling of the National Science Foundation budget, a permanent tax credit to encourage research by private industry, and an easing of government policy which discourages domestic research by U.S. companies with international operations. They argued, we hope successfully, that an increase of both the size and the stability of federal support for research is urgently needed for the long-term economic health of the country.

Lobby Day attracted press coverage by a number of publications, including the Los Angeles Times. As a result of the meetings, CORETECH was invited to testify at congressional hearings for the NSF appropriations.

Robert Chasson, 1919-1990



Robert Chasson
in 1956

Robert Lee Chasson, chairman of the University of Nebraska Physics Department from 1956 to 1962, died in August in Denver where he had lived since he left Nebraska. Chasson was born in Cincinnati, Ohio and was educated at the University of California at Berkeley where he received his A.B. in 1940, M.A. in 1950 and Ph.D. in 1951. In the 1940's he was in the Army Signal Corps and also worked in industrial and government laboratories. He came to Nebraska as an assistant professor after completing his doctoral work. Anxious

to get a research program in cosmic ray studies started, he volunteered to teach six 8 o'clock lectures per week in order to leave most of his days for research. After setting up a Geiger tube production facility, he began making coincidence measurements with cosmic-ray telescopes to determine correlations of cosmic-ray intensities with atmospheric variables. He expanded from a tiny room in the attic of Brace Laboratory to a larger, temperature controlled room, also in the attic. The work done by one of his students, Kaichi Maeda, was evidently the first scientific work at Nebraska to make extensive use of digital computers.

In 1956, after a visit by Sydney Chapman, the President of the International Geophysical Year project, Chasson obtained one of the earliest National Science Foundation grants in the department. In 1956 he became chairman of the department and was a vigorous leader until 1962 when he, along with several other key faculty members, resigned because of the perceived failure of the administration to keep faculty salaries on a par with those at other universities. At that time he went to the University of Denver as chairman of their Physics Department. He also carried on his cosmic ray research there and was the head of the Physics Division of the Denver Research Institute until 1976. He continued teaching until his retirement in 1985. The author of many research articles and contributions to several books, Chasson was a fellow of the American Physical Society and of the American Association for the Advancement of Science and a member of the American Geophysical Union.

Department History Book Awaits Publication

The Year 1988 marked the 100th anniversary of the founding of the Department of Physics at the University of Nebraska. Although we didn't stop to celebrate the event at the time, it was not completely forgotten. Professor Duane Jaecks suggested that it was a good time to write a history of the department. By some mysterious set of circumstances, the job of writing the history fell to Professor Eugene Rudd, who managed to sandwich in the project between teaching classes, attending committee meetings and conferences, and doing atomic physics research.

It started out to be a short outline history with a few stories added, perhaps to be published as a pamphlet or a set of stapled sheets, but as more and more interesting material was unearthed and as alumni and present and former faculty members supplied stories and pictures, the project grew until it is now a manuscript of over 200 pages plus about 75 photographs, graphs, and drawings with the title *Science on the Great Plains: The History of Physics and Astronomy at the University of Nebraska-Lincoln*. Well known professors from earlier days such as Aughey, Brace, Skinner, Moore, Almy, Marvin, Smith, Jehle, Skapski, Jorgensen, Zimmerman, and Chasson are featured as well as more recent faculty. A section on Women in Physics at Nebraska is included as are the stories behind the founding of two other departments, Electrical Engineering and Computer Science, by members of the Physics Department. The building of Brace Laboratory, Behlen Laboratory, and Behlen Observatory are detailed as is the founding of the present research programs. In addition to writing a narrative of the Department's past, Rudd has shown how that history was influenced by state, national, and international events and trends.

While physics and astronomy courses were taught from the very beginning of the university, the programs were pitifully small until DeWitt Bristol Brace came in 1887. With enormous energy and skill he not only established the Department of Physics but also started a

Recollections of Jean Wirsig

Jean C. Wirsig (B.S. 1954 Math/Physics) wrote recently of her recollections of the Department and of her experience as UNL's first woman physics major. We present excerpts here.

"I was a double major, with a first major in Mathematics and a second major in Physics. The two departments nominated me for Associate Member of Sigma Xi. I was President of Pi Mu Epsilon and a member of Phi Beta Kappa. I worked for the Department as an undergraduate laboratory assistant in the beginning course for engineers and majors and in the special course taken by pharmacists, etc. . . .

"I received significant encouragement and support from Dr. Chasson and Dr. Moore and from the young men who attended the same classes, when I broke tradition by majoring in physics. My first major was mathematics, but I was not the only woman math major in my student generation and certainly not a pioneer there. . . .

"Although I was always given opportunity and consideration by all of the faculty of the Physics Department and by almost all of the other University staff who had me as a lone-woman student, I developed a permanent turned-head posture for attentive listening, because they always seated me in the left-most chair of the front row, and then alphabetized the men.

"When I decided in my sophomore year to take a second major in physics, all of my male student colleagues in math and chemistry warned me that "T-squared" Smith was of the "Old School" and would be very much against a woman major. They implied that he would eat me for breakfast. About the second week of class, he asked a hypothetical question after having, I believed, made an intentional mistake, challenging us to catch it. I raised my hand and said "Because you made a mistake." There was a collective gasp, then the room was dead quiet as all the young men held their breath, waiting for him to pounce. They were very disappointed, since my diagnosis of the mistake was right. . . .

"When I announced to the Department Secretary in her office at Brace Lab that I would be majoring in physics, she said, "Thank heavens there will be another woman in the building regularly, so they won't know who caused it when they hear the women's toilet flush!" By the 1950's toilets with ceiling-mounted tanks and pull-chains were considered museum curiosities, but the one in Brace Lab's Women's Room had been so little used it was still in perfect working condition, and made a water-fall roar that could be heard throughout the building.

"It was exciting in the Nebraska of the 50's to have Dr. Jehle as a teacher. He had a slightly exotic accent and we understood that he was a "Displaced Person" from World War II. He was also a dedicated and effective teacher. When he was teaching us about elasticity, I gave him some "Silly Putty." He was like a child with a new toy, throwing it to the floor with so much force that it rebounded from walls and ceiling several times. . . .

"As the first woman major, I was the first woman to take Electronics and its lab. The Graduate Assistant was very careful to treat me just like all of the others, but was obviously nervous with our pioneering roles. One day I got a robust shock from hand to elbow when a defective capacitor discharged to my breadboard through my arm. I must have gasped, because everything stopped while they all watched to see what females do when they get a shock. It seemed appropriate to say "Damn!" After that, the nice Graduate Assistant relaxed and our only problem was that the soldering iron handle was so big I could hardly get my hand around it.

"I have fond recollections of my years at Nebraska, and of the support I received in my unconventional, for the times, program. Although I have seldom made conventional use of that training, my education has enriched my life on a daily basis and I have never been sorry that I pursued it. . . ."

research program which brought Nebraska to the forefront of physics during his short lifetime. After this initial momentum was lost, the Department went into a long decline, partly due to the effects of World War I, the Dust Bowl, and the Great Depression. It was only after World War II, when federal funding of science underwent a large increase and state support of the university improved, that the department began to grow again in size and reputation.

The manuscript was completed this spring and negotiations are under way to have it published. When it is printed, alumni and others on the mailing list for the *Spectrum* will be notified and given a opportunity to order a copy.

Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1989 - 31 October 1990. 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 to which account the money is intended. Those contributors whose employers have a matching gift program should indicate this. Thank you very much!

Richard C. Altmann (B.S. 1962 Physics/Math)

Baltimore Gas and Electric Co.

Bell Communications Research, Inc.

Bradley S. Bickford (B.A. 1984)

Marvin E. Bowman (B.S. 1969)

CBS Inc.

Robert G. Fuller

Thoms E. Furtak (B.S. 1971)

C. Fred Gayton

Richard Gleeson (B.S. 1967)

Donald L. Hagrman (B.S. 1962)

Walter W. Heinze (B.S. 1954, M.S. 1956)

Gregory G. Henry (B.S. 1972)

IBM Corp.

William J. Lannan (M.A. 1956)

Joseph H. Macek

Robert L. Maher (M.S. 1975, Ph.D. 1980)

Paul Marquard (M.S. 1986)

Charles B. Minnich (B.Sc. EE 1937)

Douglas Mitchell

NCR Corp.

Stuart O. Nelson (M.A. 1954)

Ruth J. Owens

Chang-Hwan Park (Ph.D. 1984)

Rebecca 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)

Theodore J. Schuldt (B.S. 1959, M.A. 1961)

David J. Sellmyer

Charles E. Skov (Ph.D. 1963 Physics/Math)

Andrew N. Smith (A.B. 1947 Physics/Math)

Michael R. Stamm (M.S. 1966, Ph.D. 1976)

Anthony F. Starace

George A. Sullivan (Ph.D. 1964)

We Heard From . . .

Allen, Glenn E. (B.S. 1989 Physics/Math) 8767 Contee Road, #401, Laurel, MD 20708-1931. Is a Graduate Teaching Assistant at the University of Maryland-College Park.

Aylesworth, Kevin (M.S. 1986, Ph.D. 1989) 521 E. Duncan, Ave., Alexandria, VA 22301. Is a National Research Council Postdoctoral Research Associate with the Naval Research Lab.

Bailey, Kevin G. (B.S. 1989) Bldg. 212 Rm #CL-234, Materials Science Division, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439. "I am working with Lars Smedskjaer in the investigation of the surface properties of the new high T_c 1-2-3 superconductors. We are using positron annihilation to observe the Fermi surface of single crystals of YBCO. The experimental technique is called 2-D ACAR, two dimensional angular correlation of annihilation radiation. I have an enormous amount of information to assimilate. In addition to daily tasks I have the VAX computer system to learn and of course a review of my solid state physics. I hope to continue my education, but I have way too much to do at the present."

Beardsley, Thomas E. (B.A. 1988) 5724 Glade, Lincoln, NE 68506. Is working in sales for Prudential Insurance. "I'm working on a stereo-ocular project and seeking financial backing for a large production run. This stereo-ocular is designed as an after-market accessory for the amateur astronomy market. I am also perfecting a bar-encoded telephone book and a bar code phone dialing device for market testing."

Bradley, Wendell G. (M.S. 1961, Ph.D. 1970) RR1, Edgewood, IA 52042. Retired. "All facts are theory dependent. A fact becomes what it is for us because of the way we categorize it (Newtonian vs. Einsteinian mass). And how we classify it depends on the theory we use. Yet in order to judge theories, one must rely on independent facts. Things are what they are no matter what we think they ought to be. Who can write to me explaining a resolution of this?"

Fencl, Heidi (Scheel) (M.S. 1986) 1855 Wetherburn Dr., Worthington, OH 43085. Has passed her Ph.D. Qualifying Exam at Ohio State University and is now working on a theoretical problem in nuclear astrophysics with Professor Richard N. Boyd.

Fox, David H. (B.S. 1985, M.S. 1988) 2407 Sun Lake Dr., St. Charles, MO 63301. "I moved to St. Louis and went to work for McDonnell Aircraft Co. I'm working on devising new and better methods for non-destructively testing materials and aircraft components."

Gao, Bo (M.S. 1986, Ph.D. 1989) J.I.L.A., University of Colorado, Campus Box 440, Boulder, CO 80309-0440. Is a postdoctoral research associate at the Joint Institute for Laboratory Astrophysics in Boulder.

Gayton, Charles F. Is the Electronic News Gathering "Camera" for CBS-News Inc. "While studying for my BSEE, I was allowed to take "for a non-technical option" courses in Astronomy, which were interesting. Professor Collins and his celestial navigation system started an interest that continues to this day. As with all education it has profound influences on one's life."

Gealy, Mark (Former Staff). Is an Assistant Professor at Concordia College, Moorhead, MN. "I am pleased to have had the privilege to work with the fine faculty, staff and students in the Department at UNL. I have gained much-needed experience and confidence as a researcher."

James, David E. (B.S. 1984) 921 Hastings St., Delta, CO 81416-2351

Katkanant, Vanvilai (M.S. 1979, Ph.D. 1983) Department of Physics, California State University, Fresno, CA 93740-037. Was promoted to full professor with tenure in the physics department as California State University-Fresno. She has also been awarded a research grant by the Research Corp.

Kumru, Semih S. (B.S. 1987) 3515 University Ave., Grand Forks, ND 58203. Is a graduate teaching assistant in the physics department at the University of North Dakota.

- Li, Yan-Feng** (M.S. 1984, Ph.D. 1986) 11321 Decatur Plaza, Apt 812, Omaha, NE 68154. Is a System Administrator with Call Interactive Co.
- Liu, Chih-Ray** (M.S. 1985, Ph.D. 1988) 950 Walnut Street Apt #316, Philadelphia, PA 19107. Is a medical physics postdoctoral fellow at Thomas Jefferson University Hospital in Philadelphia.
- Macek, Joseph** (Former Professor 1968-1988) Distinguished Professor of physics, The University of Tennessee, 200 South College, Knoxville, TN 37996-1501. "It was good to see Jaecks and Hardy recognized [by last year's Outstanding Teacher-Scholar and ORCA Awards]."
- Maleki, Nasser** (M.S. 1977, Ph.D. 1981) Memorial Medical Center, P.O. Box 23089, Savannah, GA 31410 or 736 Wilmington Island Road, Savannah, GA 31410. "It has been a long time since I heard from my graduate school colleagues. I am in touch with Siamak Shahabi often and he tells me about the current state of affairs in Lincoln, in particular the Physics Department. In 1980s I became a husband to a beautiful woman named Johanna and consequently a father of two sweet boys, Gian 2.5 years and Aria 8 months old. Last year we moved from New York to Savannah. Slowly but surely we are beginning to understand southern ways, which are 180° apart from New York ways. I am the Director of Medical Physics at Memorial Medical Center in Savannah and Johanna is a part-time house-wife and a part time Anesthetist. With a new career, complemented by my family, life is quite busy and exciting. We are all enjoying the Southeast Coastal area. I love to continue receiving the Physics Department's Newsletters and look forward to hearing from all of my graduate school friends."
- Meyer, Kurt W.** (B.S. 1988) 211B Windsong Lane, Hampton, VA 23666. "I am currently enrolled in a graduate program through George Washington University and am conducting research at the NASA-Langley base in Hampton. I hope to receive a Master's Degree in astronautics by August, 1991. My master's thesis involves studying the orbital lifetimes of lunar satellites. Constructing a gravitational model of the moon is difficult since the moon is highly nonspherical. Also, the gravitational field on the dark side of the moon is not accurately known (since there is no tracking data of satellites available as they pass behind the back side of the moon)."
- Minnich, Cmdr Charles B.** (B.S. E.E., 1937) 5120 Monet Ave., Orlando, FL 32812-1049. Retired. "I can't take the Minnich Telescope with me, but I can certainly take the stars with me on cruise ships when aboard as guest lecturer. The last cruise with Royal Viking Line was #37, of which 25 have been as astronomy lecturer with their cultural enrichment program. Some of the spectaculars have been two cruises for the passage of Halley's comet, and two total solar eclipses at sea."
- Molskness, Debra Cleveland** (B.S. 1988) 1717 Florine Blvd., St. Charles, MO 63303. "I am an Engineer doing nondestructive evaluation with McDonnell Aircraft Co (McDonnell Douglas Co). I was pleased to see the physics department has become involved in the research area of materials science. This is a very important area to all types of industries. Most materials scientists I work with have physics backgrounds. The group I work in not only has to determine ways to inspect materials, but also has to understand the 'physics' of the material itself."
- Morgan, Jack F.** (Ph.D. 1943 Chemistry/Physics) Box 233, So. Wellfleet, MA 02663. Retired. "Continuing to enjoy retirement on Cape Cod. Won club (golf) championship 1986, 87, 88 at Famous Captains' Course in Brewster. Enjoy also gardening, shell fishing, bird watching, reading and stamp collecting."
- Newman, Richard L.** (B.S. 1985, M.S. 1987) 2001 Plaza Del Amo, #8, Torrance, CA 90501. Is a research scientist with Dynamics Technology, Inc.
- Pareek, Prem N.** (M.S. 1980, Ph.D. 1983) 2504 Panorama Place, Birmingham, AL 35216. Is an Assistant Professor in the Department of Radiation Oncology at the University of Alabama School of Medicine. "I always enjoy *SPECTRUM!* Reminds me of the good time I had at UNL."
- Park, Chang-Hwan** (Ph.D. 1984) 7622 Westport Rd., Louisville, KY 40222. Is an Assistant Professor in the Department of Radiation Oncology, University of Louisville School of Medicine, Louisville, KY 40222.
- Perera, Harold** (M.S. 1985, Ph.D. 1990) 7321 Wise Ave., Apt C, St. Louis, MO 63117 or Malinckrodt Institute of Radiology, 510 S. Kingshighway Blvd., St. Louis, MO 63110.
- Reinhard, Kent E.** (B.S. 1985 Astronomy/Physics) 9717 Branchleigh Rd. #204, Randallstown, MD 21133.
- Shefer, Yigal** (Former Staff) 75 Hacalanit St., P.O. Box 736, Mevasseret Zion 90805, Israel. Is a Systems Division Director with ORLIL Ltd - Night Vision Tubes and Equipment.
- Roper, Steven N.** (B.S. 1979) CINCUSNAVEUR N2, Box 7, FPO NY 09510-01512. Is an LCDR in the US Navy.
- Shamloo, Kaveh** (B.S. 1983 Engineering Physics) 2609 Crestview Rd., Norfolk, NE 68701. Is a Process Engineer with Dale Electronics Inc.
- Thompson, Laird** (Former Staff) University of Illinois, Urbana, IL. Was married last summer in Scotland. Is presently an Associate Professor in the Astronomy Dept. at Illinois.
- Webster, Gary L.** (Ph.D. 1981) General Dynamics-Convaair Div., P.O. Box 85357/MZ 15-6000, San Diego, CA 92138. Is an Engineering Specialist with General Dynamics-Convaair. "I have been working at GD/Convaair for seven and a half years in the Guidance, Navigation and Control group, initially involved with the space program on the ill-fated Shuttle/Centaur program, and more recently involved with the guidance and navigation problems of cruise missiles. Our currently funded program is a Concept Definition phase for the next-generation weapons system, in which we are incorporating the latest technology in order to improve our nation's deterrent and rapid strike capabilities. Personally, Kathy and I will be married 4 years in March, I'm still rock climbing (more than ever) and trying to stay crazy."
- Wirsig, Jean C.** (B.S. 1954 Math/Physics) 111 Imperial #104, W. St. Paul, MN 55118. Has retired from her position as Assistant Professor in the Mathematics and Computer Systems Department at the University of Wisconsin at River Falls. She now spends her time being a professional investor and a semi-professional volunteer, teaching Volunteer Tax Counselors for the Elderly for the Internal Revenue Service. She also helps at a local nature center. She also travels, having visited New Zealand and Egypt in the last two years. Mrs. Wirsig (née Jean Claire Davis) was the first undergraduate woman to major in physics at Nebraska. [See the article about her recollections in this issue of *SPECTRUM!*]

THE RECORD

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

No. 6 Fall 1990

Anthony F. Starace, Editor

1989-90 DEGREE RECIPIENTS

Bachelor of Arts

Gregory E. Bodtke (December 1989). Is studying electronics at Southeast Community College.

Bachelor of Science

Bradley A. Gross (August 1989). Is residing in Lincoln, NE.
Andrew T. Groebner (December 1989). Is employed by NASA at the International Ultraviolet Explorer Observatory at Goddard Space Flight Center, Greenbelt, Maryland.

Kayla L. Kadlec (December 1989). Has enrolled in the graduate physics program at New Mexico State University.

Mark T. Theis (December 1989). Is an inspector with the State Department of Agriculture.

John P. Benal (May, 1990). Is a 2nd Lieutenant at the U.S. Army Flight School in Fort Rucker, AL.

Bradley P. Jacobsen (May 1990). Has enrolled in the graduate physics program at the University of California-Santa Barbara.

Scott A. McCartney (May 1990). Has enrolled in the graduate astronomy program at the University of Oklahoma.

George E. Stephens (May 1990). Is residing in Shelton, NE.

Scott A. Wesely (May 1990). Is traveling for a year and doing some writing.

Scott N. Backhaus (Engineering Physics, May 1990). Has enrolled in the graduate physics program at the University of California-Berkeley.

Master of Science

William A. Brda (August 1989). Is job hunting.

Anthony S. Fernando (December 1989). Is engaged in doctoral research with Professor David J. Sellmyer.

Ping He (December 1989). Is engaged in doctoral research with Professor John Woollam.

Joseph D. Maciarz (December 1989). Is job hunting.

Donald M. Pearl (December 1989). Is engaged in doctoral research with Professor Paul D. Burrow.

Yong-Gang Ren (December 1989). Is in the graduate physics program at Massachusetts Institute of Technology in Cambridge.

Dexin Wang (December 1989). Is engaged in doctoral research with Professor David J. Sellmyer.

Yi-Ming Xiong (December 1989). Is engaged in doctoral research with Professor John Woollam.

Yuming Zhou (December 1989). Is in the doctoral graduate materials science program at the University of Minnesota in Minneapolis.

Vincent K. Chan (May 1990). Is engaged in doctoral research with Professor Sy-Hwang Liou.

Carolyn J. Gold (May 1990). Is engaged in doctoral research with Professor Rod Dillon.

Apostolos Sarris (May 1990). Is engaged in doctoral research with Professor Emeritus John W. Weymouth.

Suraiyati B. Yusoff (May 1990). Is residing in Minneapolis, MN.

Doctor of Philosophy

Kevin D. Aylesworth (December 1989). Is a National Research Council post-doctoral research associate at The Naval Research Lab in Alexandria, VA.

Shi-Chung Chu (December 1989). Is employed by Transcript International Company in Lincoln.

Youngmin Chung (December 1989). Is a postdoctoral research associate with Professor James A.R. Samson.

Bo Gao (December 1989). Is a postdoctoral research associate at the Joint Institute for Laboratory Astrophysics in Boulder.

Eun-Mee Lee (December 1989). Is a postdoctoral research associate with Professor James A.R. Samson.

Zhengsheng Shan (May 1990). Is a postdoctoral research associate with Professor David J. Sellmyer.

N.W.P.H. Perera (May 1990). Is at the Mallinckrodt Institute of Radiology in St. Louis.

1989-90 HONORS

1989-90 Scholarships

Timothy Goeke	U.S. Harkson Scholarship
Andrew T. Groebner	John E. Almy Scholarship
Bradley Jacobsen	U.S. Harkson Scholarship
Nikelle M. Kudrna	Henry H. Marvin Scholarship
Jane Peterkin	John E. Almy Scholarship
Christopher Potter	U.S. Harkson Scholarship
Thomas G. Snodgrass	U.S. Harkson Scholarship
Keith Strizek	Joel Stebbins Scholarship
Scott A. Wesely	Joel Stebbins Scholarship
Yuxin Zhang	Physics & Astronomy Alumni Scholarship

1989-90 Fellows

Bo Gao	Parker Teaching Fellowship
Kenneth W. McLaughlin	Avery Summer Fellowship
Brian W. Moudry	Avery Summer Fellowship
Dulip A. Welipitiya	Avery Teaching Fellowship

1990 Departmental Distinguished Teaching Assistant Awards
Vincent K. Chan Kenneth W. McLaughlin Donald M. Pearl

1990 Sigma Xi Support-of-Research Award
Walter F. Leuken

1989-90 Society for Physics Students Officers

Scott Wesely, President	Lisa Wiese, Vice President
Kayla Kadlec, Secretary	Jane Peterkin, Treasurer

1990-91 National Science Foundation Graduate Fellow
Scott N. Backhaus

Faculty Professional Activities

In addition to service on Departmental, College and University-wide committees, for 1990-91 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; Organizing Committee, Western Science Council (WSC).

Robert G. Fuller: Author, Ask the Medium Column, AAPT Announcer; Editor, AAPT Instructional Materials Center; Member, AAPT Publications Committee; Collaborator, Interactive Physics, Dickinson College; Editorial Review Board, Journal of Science Teaching; Steering Committee, C.U.P.L.E. (Comprehensive, Unified Physics Learning Environment), University of Maryland and RPI; Steering Committee, Physics Academic Software.

John R. Hardy: Consultant, Lawrence Livermore National Laboratory; Consultant, U.S. Naval Research Laboratory.

Robert J. Hardy: Consultant, Lawrence Livermore National Laboratory.

Duane H. Jaecks: Consultant, Edgerton Museum Project, Plainsman Museum, Aurora, Nebraska; National Research Council Graduate Fellowship Evaluation Panel for Physics and Astronomy (Chairman).

Roger D. Kirby: Consultant to Colorado State University.

Kam-Ching Leung: Chrétien International Research Grant Committee of the American Astronomical Society; Organizing Committee, Commission 38 (Ex-

change of Astronomers), I.A.U.; Organizing Committee, Commission 42 (Close Binary Stars), I.A.U.; Editorial Board, Chinese Astronomy and Astrophysics (Pergamon Press); Distinguished Professor, Shaanxi Observatory, Academia Sinica, China; Co-Chair, Pacific Rim Colloquium on New Directions in Binary Star Research.

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

M. Eugene Rudd: Consultant, Edgerton Museum Project, Plainsman Museum, Aurora, Nebraska; 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: Program Committee, 6th National Conference on Synchrotron Radiation Instrumentation; X-Ray and Ultraviolet Techniques Committee, Optical Society of America; 1992 William F. Meggers Award Committee, Optical Society of America.

David J. Sellmyer: Co-Chair, Program Committee, Joint 3M/Intermag Conference, 1991; Conference Chairman, 38th Midwest Solid State Conference; Foreign Committee, Magneto-Optical Recording Conference, Tokyo, 1991; Program Committee, Magnetism & Magnetic Materials Conference.

Anthony F. Starace: Chairman, APS Division of Atomic, Molecular and Optical Physics; General Committee, International Conference on the Physics of Electronic and Atomic Collisions; Program Committee, 1991 Gordon Conference on Atomic Physics.

1990-91 Visiting Staff Members

Visiting our Department in Academic Year 1990-91 is Professor of Physics Carl R. Throckmorton, on sabbatical leave from Hasting College.

On our staff as Visiting Professors this year are experimental atomic physicist Sam J. Cipolla (Ph.D. 1969, Purdue) from Creighton University; and condensed matter theorist John Flocken (Ph.D. 1969, Nebraska) from the University of Nebraska-Omaha.

Visiting Associate Professor this year is elementary particle theorist and computational physicist Glenn A. Sowell (Ph.D. 1982, Florida State) from the Supercomputer Computations Research Institute at Florida State.

Visiting Assistant Professor this year is experimental condensed matter physicist Charles G. Robbins (Ph.D. 1969, Illinois).

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 Samson; 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; 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 Zhengsheng Sham (Ph.D. 1990, Nebraska), working with Professor Sellmyer; and experimental atomic physicist Orhan Yenen (Ph.D. 1986, Nebraska), working with Professor Jaecks.

1989 Fall Semester Colloquia

- September 7: Professor Thomas Furtak, Colorado School of Mines
"Nonlinear Optical Phenomena at Buried Interfaces"
- September 14: Professor John Rutherford, University of Arizona
"Four Generations of Dimuon Detectors"
- September 21: Dr. Ming-Hwei Hong, AT&T Bell Laboratories
"High T_c Superconducting Oxide Films"
- September 27: Professor David M. Cook, Lawrence University
"Building The Expertise of Undergraduates in Computational Physics"
- October 5: Professor M. E. Rudd, University of Nebraska-Lincoln
"A Model for the Energy Spectra of Electrons from Ion-Atom Collisions, or How to Represent 10,000 Data Points with 10 Parameters"
- October 12: Dr. Joseph N. Marcus, Creighton University
"Biological Implications of Organic Compounds in Comets"
- October 19: *The Jerry E. Ruckman Lecture*: Roman Czujko, Assistant Manager, Education and Employment Statistics Division, American Institute of Physics
"High School Physics: Demographics and Outcomes"
- October 26: Professor Kam-Ching Leung, University of Nebraska-Lincoln
"The Types of Double-Star Systems In Which No One Believes"
- November 2: Professor Dennis J. Hegyi, University of Michigan
"The Cosmic Fireball: Echo of the Big Bang"
- November 9: Professor Purusottam Jena, Virginia Commonwealth University
"Physics of Small Atomic Clusters"
- November 27: Dr. Mark E. Ander, Los Alamos National Laboratory
"Geophysical Experiments to Search for Non-Newtonian Components of Gravity"
- November 30: Dr. David W. Norcross, Joint Institute for Laboratory Astrophysics
"Vibrational Excitation of Small Diatomic Molecules by Electrons"
- December 7: Dr. John N. Howard, V.P., Optical Society of America; Editor, Optics News
"The Scientific Contributions of Lord Rayleigh"

1990 Spring Semester Colloquia

- January 25: Professor John Weymouth, University of Nebraska-Lincoln
"Exploring Archaeological Sites with Physics"
- February 1: Professor A. O. Barut, MASUA Honor Lecturer, University of Colorado-Boulder
"Foundation of Quantum Electrodynamics and Quantum Mechanics"
- February 8: Professor Ronald E. Olsen, University of Missouri at Rolla
"Interactions of Energetic Multiply-Charged Ions with Matter"
- February 15: Professor Paul Finkler, University of Nebraska-Lincoln
"The Possibility of Conserved Quantities in Chaotic Dynamical Systems"
- February 22: Dr. Spencer R. Weart, Center for History of Science, American Institute of Physics
"The Rise of Dirty Physics: Solid State Physics in the 1940's"
- February 23: Dr. Michael Butler, Sandia National Laboratories
"Cold Fusion: A Personal Perspective"
- March 1: Professor John B. Delos, College of William and Mary
"Order and Chaos in Quantum Systems: Spectra of Atoms in External Fields"
- March 15: Professor Wallace L.W. Sargent, California Institute of Technology
"The 10-Meter Keck Telescope, The Next Generation Huge Optical Telescope"
- April 15: Dr. Jack G. Gay, General Motors Research Laboratories
"Spin Anisotropy in Ferromagnetic Layers"
- April 9: Dr. Robert Hauenstein, Hughes Research Laboratories
"Si_{1-x}Ge_xSi Heterostructures Grown by MBE: Physics and Device Prospects"
- April 12: Professor Geraldine J. Peters, University of Southern California
"Rapid Variability of Brightness in Hot Emission-Line Stars"
- April 13: Professor Carl Rau, Rice University
"Spin-polarized Electron Emission Spectroscopy to Study Surface Magnetic and Electronic Properties"
- April 16: David Niles, Synchrotron Radiation Center, University of Wisconsin-Madison
"The MBE Growth of Semiconductors on Lattice Mismatched Substrates: Photoemission Studies"
- April 20: *The Montgomery Lecture*: Professor Kip S. Thorne, California Institute of Technology
"Worm Holes and Time Travel"
- May 3: Dr. Roger Azria, Laboratoire de Collisions Atomique at Moléculaires, Université Paris-Sud
"Photon and Electron Stimulated Desorption of Ions from Condensed Systems"



New Research Grants and Contracts

During the period 1 November 1989—31 October 1990 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	S.H. Liou	Magnetron Sputtering of High Critical Current Ti-Ba-Cu-O Films for Use in Electric Power Systems (Nebraska Energy Office)	\$ 68.2
I.I. Fabrikant	Atomic Processes Involving Negative Ions (NSF)	\$ 42.5	S.H. Liou	Superconductivity (NASA)	\$ 19.0
R.G. Fuller	Bridges, Bicycles and Traffic: Thematic Physical Science Lessons (NSF)	\$ 73.2	M.E. Rudd/ D. Jaecks	Inelastic Processes in Atomic Collisions (NSF)	\$328.4
R.G. Fuller	National Interactive Media Project for Secondary Physical Science (Department of Education)	\$ 95.5	J.A.R. Samson	Interaction of Radiation with Planetary Gases (NASA)	\$ 39.3
R.G. Fuller	Transforming Physics Content Using New Technologies (NSF)	\$113.0	J.A.R. Samson	Photoionization Studies of Atoms (NSF)	\$ 85.0
J.R. Hardy/ F.G. Ullman	Incommensurate Phases and Superlattice Production (ARO)	\$ 65.0	J.A.R. Samson	Ultraviolet and X-ray Bombardment of Planetary Atmospheres (NSF)	\$ 65.0
J.R. Hardy	Studies of Ionic Molecular Solids (ARO)	\$ 60.0	E.G. Schmidt	Survey of Poorly Studied Variable Stars (NSF)	\$ 54.5
J.R. Hardy	Theoretical Studies of Fundamental Lattice Absorption in Highly Transparent Solids (ONR)	\$103.7	D.J. Sellmyer	Development of New Permanent-Magnet Materials for Energy-Related Applications (Nebraska Energy Office)	\$124.2
D. Jaecks	Experimental Tests of Excitation Mechanisms for keV Ion-Molecule Collisions (NATO)	\$ 6.0	D.J. Sellmyer	Fundamental Studies of Strongly Magnetic Rare Earth-Transition Metal Alloys (DOE)	\$ 58.9
D. Jaecks	Novel Techniques for Studying Fundamental Three Body Interactions (UN Foundation)	\$ 33.2	D.J. Sellmyer	Magnetism and Magneto-Optics of Artificially Structured Materials (NSF)	\$ 55.5
R. Katz	Theory of Biological Effectiveness (DOE)	\$ 49.3	D.J. Sellmyer	Physics of Compositionally Modulated Disordered Magnetic Films (NSF)	\$ 60.0
R. Kirby	Magneto-Optical Properties of Novel Artificially Structured Multilayers and Intermetallic Compounds (Research Corp.)	\$ 20.0	A.F. Starace	Dynamics of Collision Processes (DOE)	\$ 63.1
K.C. Leung	A US-Korea Seminar on Binary Star Astronomy (NSF)	\$ 34.0	A.F. Starace	Dynamics of Photon-Atom Interactions (NSF)	\$ 61.0
S.H. Liou	Equipment for Superconducting and Magnetic Thin Film Research (NU Foundation)	\$ 28.2	J.W. Weymouth	Magnetic Survey-Lewis & Clark Lower Portage Camp Site (Western History Research)	\$ 5.0
			J.W. Weymouth	Proton Magnetometer Survey (U.S. Department of Interior)	\$ 1.0
				TOTAL	\$1,886.6



1989 Faculty Publications

ASTRONOMY AND ASTROPHYSICS

- K.C. Leung, "Reverse Algols," *Space Science Reviews* 50, 279-288 (1989).
- E.G. Schmidt and G.G. Spear, "Pulsational Properties of Extragalactic Cepheids I. Differential Light Curves for Field 1 in NGC 6822," *Monthly Notices of the Royal Astronomical Society* 236, 567 (1989).
- E. G. Schmidt, "The Behlen Observatory Variable Star Survey," in *Automated Small Telescopes*, Edited by D.S. Hayes and R.M. Genet (Fairborn Press 1989), p. 195.
- E.G. Schmidt, "Cepheids in Local Group Galaxies," in *The Use of Pulsating Stars in Fundamental Problems of Astronomy*, I.A.U. Colloquium 111, Edited by E. Schmidt (Cambridge University Press, 1989), p. 177.
- E.G. Schmidt and K.H. Wiese, "The Period-Decline Rate Relation for Pulsating Stars," *Astronomical Journal* 90, 1659 (1989).
- C.G. Loomis and E.G. Schmidt, "HR Aur: An Active Binary?," *Astrophysical Journal Letters* 347, L77 (1989).
- E.G. Schmidt, "The Use of Pulsating Stars in Fundamental Problems in Astronomy," in *Proceedings of IAU Colloquium 111* Edited by E. Schmidt (Cambridge University Press, 1989).
- T.J. Teays, E.G. Schmidt, L. Pasinetti-Fracassini and M. Fracassini, "The Chromospheres of Beta Cas," *Astrophysical Journal* 343, 916 (1989).
- C. Loomis, E.G. Schmidt and N.R. Simon, "Photometry of Variable Stars with Periods Near One Day," *Monthly Notices of the Royal Astronomical Society* 235, 1059 (1989).
- N.R. Simon, "Application of the Baade-Wessellink Inversion Technique to SW Dra, X Ari and U Sgr," *Monthly Notices of the Royal Astronomical Society* 237, 163 (1989).
- N.R. Simon, "On the Masses and Luminosities of RR Lyrae Stars," *Astrophysical Journal Letters* 343, L17 (1989).

ATOMIC, MOLECULAR AND OPTICAL PHYSICS

- P.D. Burrow, A.R. Johnston and G.A. Gallup, "Low-lying Negative Ion States of Calcium," *Physical Review A* 40, 4770 (1989).
- I.I. Fabrikant, "Rescattering of Photodetached Electrons in a Stark Field," *Physical Review A* 40, 2373 (1989).
- I.I. Fabrikant, "Electron Drift in Caesium Vapors," *Teplofizika Vysokikh Temperatur (High Temperature Thermal Physics)* 27, 240 (1989).
- O. Yenen, D.H. Jaacks, and L.M. Wiese, "Energy Distribution of H⁻ from the Collision-Induced Three-Particle Breakup of H₃⁺," *Physical Review A* 39, 1767 (1989).
- D.H. Jaacks, O. Yenen, C. Engelhardt and L. Wiese, "Collisional Dissociation Spectroscopy of (H₃⁺)^{*} and (He₂⁺)^{*} Using Small Accelerators," *Nuclear Instruments and Methods B40/41*, 225 (1989).
- Wen-qin Cheng, M.E. Rudd, and Ying-Yuan Hsu, "Differential Cross Sections for the Ejection of Electrons from Rare Gases by 7.5 - 150 keV Protons," *Physical Review A* 39, 2359-2366 (1989).
- Wen-qin Cheng, M.E. Rudd, and Ying-Yuan Hsu, "Angular and Energy Distributions of Electrons from 7.5 - 150 keV Proton Collisions with Oxygen and Carbon Dioxide," *Physical Review A* 40, 3599-3604 (1989).
- M.E. Rudd, "User-Friendly Model for the Energy Distribution of Electrons from Proton or Electron Collisions," in *Nuclear Tracks and Radiation Measurements* 16, 213 (1989).
- J.A.R. Samson, G.N. Haddad, T. Masuoka, P.N. Pareek, and D.A.L. Kilcoyne, "Total Absorption, Ionization Yields, and Dissociative Photoionization Cross Sections of CH₄ from 110 to 950 Å," *Journal of Chemical Physics* 90, 6925 (1989).
- J.A.R. Samson and L. Yin, "Precision Measurements of Photoabsorption Cross Sections of Ar, Kr, Xe, and Selected Molecules at 58.4, 73.6, and 74.4 nm," *Journal of the Optical Society of America B* 6, 2326 (1989).
- C.-R. Liu and A.F. Starace, "Low-Energy Features of the e⁻ - H(n=2) System Exhibited in Fast H⁻ Detachment Collisions," *Physical Review Letters* 62, 407 (1989).
- B. Gao and A.F. Starace, "Variational Principle for High Order Perturbations with Application to Multiphoton Processes," *Physical Review A* 39, 4550 (1989).
- C.-R. Liu and A.F. Starace, "Doubly Differential Cross Sections for 0.5 MeV H⁻ on He Including Projectile Excitation to H(n=2)," *Physical Review A* 40, 4926 (1989).

CONDENSED MATTER PHYSICS

- P.J. Edwardson, L.L. Boyer, R.L. Newman, D.H. Fox, J.R. Hardy, J.W. Flocken, R.A. Guenther, and W. Mei, "Ferroelectricity in Perovskitelike NaCaF₃ Predicted Ab Initio," *Physical Review B* 39, 9378 (1989).
- D.P. Billesbach, J.R. Hardy, and P.J. Edwardson, "Theoretical Study of Lattice Instabilities in YBa₂Cu₃O₇," *Physical Review B* 39, 202 (1989).
- J.L. Feldman, L.L. Boyer, P.J. Edwardson, and J.R. Hardy, "Calculation of Dielectric Susceptibility for Complex Ionic Systems: Application to a Predicted Superlattice," *Physical Review B* 40, 4105 (1989).
- J.R. Hardy and J.W. Flocken, "Possible Origin of High T_c Superconductivity," *Ferroelectrics* 92, 175 (1989).
- V. Katkanant, P.J. Edwardson, and J.R. Hardy, "Gyrotropy in Incommensurate Insulating Crystals," *Ferroelectrics* 94, 349 (1989).
- J.W. Flocken, R.A. Guenther, J.R. Hardy, and L.L. Boyer, "Dielectric Response Spectrum of a Damped One-dimensional Double Well Oscillator," *Physical Review B* 40, 4015 (1989).
- J.W. Flocken, W.N. Mei, R.A. Guenther, J.R. Hardy, P.J. Edwardson and L.L. Boyer, "Ferroelectric Phase Transitions in Na-Ca-Halide Perovskites," *Ferroelectrics* 104, 411 (1989).
- V. Katkanant, J.R. Hardy, R.D. Kirby, and F.G. Ullman, "Raman Scattering Studies of Rb₂ZnCl₄ and K₂ZnCl₄," *Ferroelectrics* 99, 213 (1989).
- V. Katkanant and R.D. Kirby, "Mixed-Crystal Lattice Dynamics of Hf₂Ti_{1-x}Se₂," *Physical Review B* 40, 1152 (1989).
- H. Erdogan and R.D. Kirby, "Raman Spectrum and Lattice Dynamics of NbTe₂," *Solid State Communications* 70, 713 (1989).
- R.L. Fagerquist, R.D. Kirby, and E.A. Pearlstein, "Metastable Conduction States in Mo₂S₃: Conductivity Fluctuations," *Physical Review B* 39, 5139 (1989).
- J.X. Shen, R.D. Kirby, and D.J. Sellmyer, "Magneto-Optic Properties of Evaporated Mn-Bi-Al Films," *Journal of Magnetism and Magnetic Materials* 81, 107 (1989).
- R.O. Dillon, R.D. Kirby, and I. Spain, "Electrical Noise in Carbon Fibers," *Journal of Applied Physics* 66, 4284 (1989).
- S.H. Liou, C.H. Chen, H.S. Chen, and C.L. Chien, "Origin of High Coercivity in Granular Fe-SiO₂ Films," in *Multicomponent Ultrafine Microstructures*, Edited by L.E. McCandlish, D.E. Polk, R.W. Siegel, and B.H. Kear (Materials Research Society, Pittsburgh, PA, 1989), p. 191.
- M. Hong, J. Kwo, C.H. Chen, A.R. Kortan, D.D. Bacon, and S.H. Liou, "Preparation and Characterization of High T_c Superconducting Tl₂Ba₂Ca₂Cu₃O₁₀ Thin Films," *American Institute of Physics Conference Proceedings* 182, 107 (1989).
- S.H. Liou, M. Hong, A.R. Kortan, J. Kwo, D.D. Bacon, C.H. Chen, R.C. Farrow, and G.S. Grader, "Superconducting Tl-Ba-Ca-Cu-O Thin Films with 2:2:2:3 Phase," *Proceedings of the Conference on the Science and Technology of Thin Film Superconductors*, Colorado Springs, Colorado 1988, Edited by R.D. McConnell and S.A. Wolf (Plenum; New York, 1989), p. 229.
- S.H. Liou, N.J. Ianno, B. Johs, D. Thompson, D. Meyer, J.W. Woollam, "Pulse Laser Evaporation of Tl-Ba-Ca-Cu-O Films," *Proceedings of the Conference on the Science and Technology of Thin Film Superconductors*, Colorado Springs, Colorado 1988, Edited by R.D. McConnell and S.A. Wolf (Plenum, New York, 1989), p. 35.
- W.S. Brocklesby, D. Monroe, A.F.J. Levi, M. Hong, S.H. Liou, J. Kwo, C.E. Rice, P.M. Mankiewich, and R.E. Howard, "Electrical Response of Superconducting YBa₂Cu₃O_{7-x} to Light," *Applied Physics Letters* 54, 1175 (1989).
- S.H. Liou, N.J. Ianno, B. Johs, D. Thompson, D. Meyer, K.D. Aylesworth, J.A. Woollam, and Colleen Barry, "Highly Oriented Tl₂Ba₂Ca₂Cu₃O₁₀ Thin Films by Pulsed Laser Evaporation," *Applied Physics Letters* 54, 760 (1989).
- C.H. Chen, M. Hong, D.J. Werder, J. Kwo, S.H. Liou, and D.D. Bacon, "Superlattice Modulation and Epitaxy of Tl₂Ba₂Ca₂Cu₂O₁₀ Thin Films Grown on MgO and SrTiO₃ Substrates," *Applied Physics Letters* 54, 1579 (1989).

CONDENSED MATTER PHYSICS (Continued)

- B. Johs, D. Thompson, N.J. Ianno, J.A. Woollam, S.H. Liou, A.M. Hermann, Z.Z. Sheng, W. Kiehl, Q. Shams, X. Fei, L. Sheng, and Y.H. Liou, "Preparation of High T_c Tl-Ba-Ca-Cu-O Thin Films by Pulsed Laser Evaporation and Tl₂O₃ Vapor Processing," *Applied Physics Letters* 54, 1810 (1989).
- W.K. Ford, J. Anderson, G.V. Rubenacker, John E. Drumheller, C.T. Chen, M. Hong, J. Kwo, S.H. Liou, "Physical Processing Effects on Polycrystalline YBa₂Cu₃O_x," *Journal of Materials Research* 4, 16 (1989).
- J. Childress, S.H. Liou, C.L. Chien, "Magnetic Properties of Metastable 304 Stainless Steel with BCC Structure," *Journal de Physique C8*, 113 (1989).
- Z.S. Shan, D.J. Sellmyer, S.S. Jaswal, Y.J. Wang and J.X. Shen, "Magnetism of Rare Earth-Transition Metal Nanoscale Multilayers," *Physical Review Letters* 63, 449 (1989).
- D.J. Sellmyer and Z.S. Shan, "Perpendicular Magnetic Anisotropy of Compositionally-Modulated Rare-Earth Transition-Metal Films," *Proceedings of Materials Research Society International Meeting on Advanced Materials*, Tokyo, 10, 269 (1989).
- L.Y. Chen, W.a. McGahan, Z.S. Shan, D.J. Sellmyer, and J.A. Woollam, "Resonant Moke Spectra of Magnetic Layers on Silver," *Proceedings of Materials Research Society Symposium, Materials for Magneto-Optic Data Storage* 150, 109 (1989).
- M.A. Langell, Y.G. Ren, and D.J. Sellmyer, "AES/XPS Studies of Oxidized R₂Fe_{1-x}B Alloys," *Journal of Magnetism and Magnetic Materials* 82, 213 (1989).
- K.D. Aylesworth, Z.R. Zhao, D.J. Sellmyer, and G.C. Hadjipanayis, "Growth and Control of the Microstructure and Magnetic Properties of Sputtered Nd₂Fe_{1-x}B Films and Multilayers," *Journal of Magnetism and Magnetic Materials* 82, 48 (1989).
- W.A. McGahan, L.Y. Chen, Z.S. Shan, D.J. Sellmyer, and J.A. Woollam, "Enhanced Magneto-Optic Kerr Effects in Thin Magnetic/Metallic Layered Structures," *Applied Physics Letters* 55, 2479 (1989).
- D.J. Sellmyer, J.A. Woollam, Z.S. Shan, and W.A. McGahan, "Magnetic and Magneto-Optic Properties of Nanostructured Rare Earth-Transition Metal Multi-Layered Films," *Materials Research Society Symposium, Materials for Magneto-Optic Data Storage* 150, 51 (1989).
- J. Woods, M. Tobise, and R.C. O'Handley, "A Coaxial Electrostatic Lens Designed for the Low Energy Electron Spin Detector," *Review of Scientific Instruments* 60, 688 (1989).

ELEMENTARY PARTICLES AND FIELDS

- W.B. Campbell, "An Electronic Casimir Force for QED in an External Coulomb Field," *Proceedings of the Storrs Meeting, Division of Particles and Fields* (World Scientific, Singapore, 1989), p 778.

INTERDISCIPLINARY PHYSICS

(a) Arms Control

- L. Sartori, "Nuclear Weapons and Strategic Doctrine," in *The Future of Land-Based Strategic Missiles*, Edited by B. Lefi, M. Sakitt and A. Tobson (American Institute of Physics, New York, 1989) p 13-27.

(b) Physics Education

- T.E. Gist, G.L. Lorenzen, R.E. Swanson, M.K. McQuade, and R.G. Fuller, "The Air Force Academy Instructor Workstation (IWS): I. Design and Implementation," *Journal of Educational Technology Systems* 17(4), 273-284 (1988-89).
- T.E. Gist, M.K. McQuade, R.E. Swanson, G.L. Lorenzen, J.R. Boudot, and R.G. Fuller, "The Air Force Academy Instructor Workstation (ISW): II. Effectiveness," *Journal of Educational Technology Systems* 17(4), 285-295 (1988-89).
- R.G. Fuller, "Beyond Where the Sidewalk Ends," *CD-ROM End User Paper I*(4), 39 (1989).

(c) Track Physics

- R. Katz, "Particle Tracks in Diverse Media," *Nuclear Instruments and Measurements in Physics Research B40/41*, 1271-1274 (1989).
- R. Katz, "Perspectives on the Development of Track Physics," *Nuclear Tracks and Radiation Measurements* 16, 221-224 (1989).
- R. Katz, "Detector Response to Swift Heavy Ions," *Radiation Effects and Defects in Solids* 110, 177-180 (1989).
- M.P.R. Waligorski, G. Danialy, Kim Sum Loh, and R. Katz, "Response of the Alanine Dosimeter to Charged Particle and Neutron Irradiations," *Journal of Applied Radiation and Isotopes* 40, 923-933 (1989).
- R. Katz and Guo-Rong Huang, "Track 'CORE' Effects in Heavy Ion Radiolysis," *Radiation Physics and Chemistry* 33, 345-349 (1989).
- M.E. Rudd and J.J. Fowler, "Robert Katz: A Biographical Sketch," *Nuclear Tracks and Radiation Measurements* 16, 83 (1989).

