

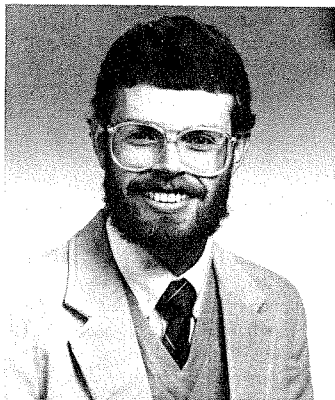
# h SPECTRUM

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

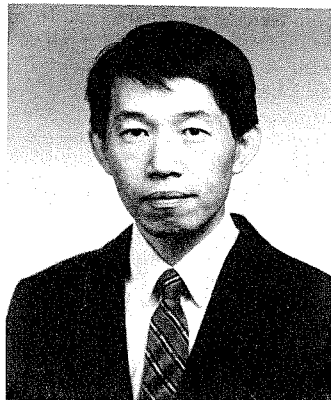
No. 9 Fall 1988

M. Eugene Rudd, Editor

## Duquette and Liou Join Department



David W. Duquette



Sy-Hwang Liou

Two young experimental physicists have accepted Assistant Professor appointments in the Department beginning in the Fall 1988 semester. They are the first new faculty to join the Department since Professor **Paul D. Burrow** was hired in Fall 1976. They each bring to the Department expertise in two of the newest experimental areas in physics: laser atomic physics and high temperature superconductivity. These two areas are among the most difficult ones for universities to hire faculty in, due to the competition with industrial employers. At the same time these are the areas in which our students most want to be trained. The Department is indeed grateful to the University of Nebraska administration for providing the financial support needed to purchase the state-of-the-art equipment for the new laboratories, each of which will cost in excess of \$200 K to establish.

**David W. Duquette** received his Ph.D. in physics in 1985 from the University of Wisconsin-Madison. His undergraduate degree is from Concordia College, Moorhead, Minnesota, where he obtained a B.A. in 1980, graduating Magna Cum Laude with majors in physics, mathematics, and music. Duquette's doctoral research, under the supervision of Professor James E. Lawler, involved the development and application of laser techniques for measurement of absolute atomic transition probabilities in certain transition elements of astrophysical interest. Two recent review articles feature his work prominently. Prior to joining the Department, he was employed as a postdoctoral researcher at the Harvard-Smithsonian Center for Astrophysics, where he was involved in a project to measure the radiative lifetimes of positive ions produced and stored in an ion trap. At UNL, Duquette plans to investigate the optical spectra of multiply-charged molecular ions, laser-driven charge exchange collisions, and collisions of atoms and molecules in laser-excited states.

**Sy-Hwang Liou** received his Ph.D. in physics in 1985 from The Johns Hopkins University. His undergraduate degree is from Soochow University, Taiwan, where he obtained a B.S. in physics in 1974. Liou's doctoral research, under the supervision of C.L. Chien, was carried out in an unusually large number of highly competitive areas including vapor-quenched amorphous solids, metastable crystalline alloys, modulated solid superlattices, quasicrystals, and both bulk and thin film high temperature superconductors. This thesis work resulted in no fewer than 25 research publications. After a short postdoctoral appointment at Johns Hopkins, Liou worked as a postdoctoral researcher at AT&T Bell Laboratories in Murray Hill, New Jersey, where he was involved in the preparation and study of novel materials, including high temperature superconducting materials as well as magnetic materials, before joining the Department. At UNL, Liou's immediate research plans are to investigate the preparation and characterization of both high temperature superconducting thin films and granular metal films.

## Katz Cited by DOE At Track Physics Conference

Professor **Robert Katz** of the Department of Physics and Astronomy was presented with a Certificate of Appreciation by the U.S. Department of Energy. The Certificate was signed by James F. Decker, Acting Director of the DOE Office of Energy Research and was presented by Robert W. Wood, Acting Associate Director of the Office of Health and Environmental Research. Katz was nominated for this honor by Dr. Matesh Varma, Manager of DOE's Radiological and Chemical Physics Program.

Varma stated that this is only the second Certificate of Appreciation ever given by his program. It reads as follows:

In recognition of continuous and meritorious contribution to the Radiological and Chemical Physics Program over a period of more than twenty years. In particular, for development of new and innovative concepts which related energy deposition patterns for the determination of radiation effects in biological, chemical, and physical systems.

This presentation was made at the banquet of the Track Physics Conference held at UNL 18-20 October 1988 in honor of Robert Katz on the occasion of his retirement. More than 40 scientists from throughout the world attended the conference, including some from England, Japan, Poland, Switzerland, and West Germany. Among Department alumni and former staff attending the conference were **David L. Amstutz** (M.S. 1969), **Chris E. Kuyatt** (B.S. 1952, M.S. 1953 Physics/Math, Ph.D. 1960 Physics/Math), **Leif Larsson**, **Joseph Macek**, **M. Eugene Rudd** (Ph.D. 1962), **Siamak Shahabi** (M.S. 1977, Ph.D. 1983), **Subhash C. Sharma** (M.S. 1970, Ph.D. 1971), and **Michael Waligorski**.

The Conference focused on research concerning the structure of particle tracks and its influence upon atomic physics, particle detection, radiation chemistry, and radiobiology on the occasion of the retirement of Professor Robert Katz, whose contributions have helped to mold these studies into a discipline. Some 30 years ago, it was his interest in the possible identification of the track of a magnetic monopole from among the many tracks produced by cosmic rays that motivated Robert Katz's interest in track physics.

At the banquet, the conferees were joined by some of Katz's fellow faculty by some former students, and by friends. **Anthony F. Starace**, Department Chair, read telexes and letters from colleagues of Katz's from around the world, including Eugen Merzbacher, the Vice President of the American Physical Society; Ken Chadwick and Henk Leenhouts, of the Radiation Protection Programme of the Commission of the European Communities in Brussels; and Professor Zhang Chunxiang, Vice President of Zhongshan University in the People's Republic of China.



Robert Katz holding Certificate of Appreciation presented by Robert Wood (left) and Matesh Varma (right) of D.O.E.

## Chairman's Letter

Dear Alumni and Friends,



Anthony F. Starace

Major changes have occurred in the Department in the last year. Furthermore, the Department is developing strategic plans for further changes in the near future. These changes and the opportunities they present are what come to my mind as I write this year's letter to you.

After a dozen years of stability, personnel changes are occurring at a rapid rate. In the last two years Professors Burns, Macek, and Schlitt have left for jobs elsewhere. Professor Katz officially retired last July 1st, but is continuing on a special half-time appointment to continue his research in Track Physics. Other retirements are planned for 1989. At the same time, I am pleased to report that the Department has successfully hired two excellent new Assistant Professors, Duquette and Liou, each of whom were top-ranked by the relevant Search Committees from among 4 to 5 dozen applicants. Two additional searches are under way this year and our experience last year makes me optimistic that the Department shall again be able to hire very talented young faculty.

The Department has prepared for the challenges and opportunities ahead. In Spring 1988 an Academic Program Review of the Department was carried out by a team of both external and local faculty as well as students. The external members were Professor David W. Lynch, a condensed matter physicist and Chair of the Physics & Astronomy Department at Iowa State, Professor Bernd Crasemann, an experimental atomic physicist and former Director of the Institute for Chemical Physics at the University of Oregon, and Dr. John S. Gallagher, an astronomer and currently the Director of Lowell Observatory. Professor Lynch chaired the Review Team. In preparation for this Review, the Department spent the previous year carrying out a number of self-studies, which have been enormously valuable and which have brought about a large measure of consensus among the faculty as to our plans for the future. I am pleased to report that this Departmental consensus was generally endorsed by the Review Team, giving the Department a firm basis on which to plan our future. While these plans and the Review Team's recommendations for our research, teaching, and service programs and for the resources available to us are too lengthy and detailed to discuss briefly, one major goal that was strongly endorsed is to increase the number of experimental faculty in the Department.

At the same time that the Department has both the opportunity to make changes and has a consensus on what changes to make, the State of Nebraska and the University are simultaneously supporting excellence in the University's research and teaching programs as never before. This commitment has benefited the Department in a number of ways, of which I shall list three. First and foremost, Governor Kay Orr's Research Initiative has been an enormous boost to the condensed matter physics group in the Department through its participation in the newly formed Center for Materials Research and Analysis. Secondly, as mentioned above already, the University has supported our efforts to attract and hire the very best young faculty available, which will have immediate and lasting benefits to both our teaching and research programs. Thirdly, our need for up-to-date equipment in both our research and teaching laboratories in order to both measure and demonstrate physical phenomena is being recognized and supported financially. In short, with talented people, good equipment, and a supportive environment, the Department's prospects appear very favorable.

Before closing, I want to thank you—our alumni and friends—for your continuing financial support. Private donations allow us to enhance our programs, such as in supplementing our own resources for the purchase of modern teaching and research apparatus, and also permit us to do things for which State or Federal funds would be inappropriate, such as supporting the activities of our Society of Physics Students or our annual get-togethers with area high school physics teachers. We shall continue to work diligently to merit your continued support.

Finally, I hope you will use the enclosed postcard to keep in touch with us. We enjoy hearing from you and learning of your recent activities. We are also happy to see you when you happen to be in Lincoln. Best wishes until next year.

Sincerely,

Anthony F. Starace  
Professor & Chairman

## Macek Named Distinguished Scientist at Tennessee

**Joseph H. Macek**, former George Holmes Professor of Physics at UNL, has accepted an appointment as Professor of Physics at the University of Tennessee-Knoxville (UTK) and as a University of Tennessee/Oak Ridge National Laboratory (ORNL) Distinguished Scientist beginning in Fall 1988. Under the terms of the Distinguished Scientist appointment, Macek will spend half his time at UTK and half at ORNL. He will also be provided with an annual stipend for his research.

During his twenty year career at UNL, Macek developed an international reputation as a theoretical atomic physicist. He received his B.S. degree in 1960 from South Dakota State College and his Ph.D. in 1964 from Rensselaer Polytechnic Institute. Following postdoctoral appointments at the National Bureau of Standards in Washington, D.C., and at the Atomic Energy Research Establishment in Harwell, England, Macek joined the Department as an Assistant Professor in 1968. He was promoted to Associate Professor in 1970, Professor in 1973, and was named George Holmes Professor of Physics in 1986. While at UNL he held Guest Professorships at the Free University of Berlin, Aarhus University in Denmark, Freiburg University in West Germany, and at the Pierre and Marie Curie Institute in Paris. His honors include an Award for Excellence from the National Bureau of Standards in 1964, Fellowship in the American Physical Society in 1976, a University of Nebraska Award for Outstanding Research in 1979, and a MASUA Honor Lectureship in 1981. His many professional service activities have included membership on the Editorial Boards of both *Journal of Physics B* and *Physical Review A* and membership on the newly formed Department of Energy Basic Energy Sciences Advisory Committee. Among his many research contributions is the theory for the forward peak found experimentally in the angular distribution of electrons ejected in fast proton collisions. This process, now known as "charge transfer to the continuum," was discovered experimentally at Nebraska in 1970 by **Geoffrey B. Crooks** (B.S. 1965, M.S. 1967, Ph.D. 1972) and **M. Eugene Rudd** (Ph.D. 1962).



## Schlitt Heads Computer Facility at CCNY

**Dan W. Schlitt**, former Professor of Physics at UNL, has accepted an appointment as the Administrator of the Science Division Computer Facility at the City College of the City University of New York effective July 1988. He had been on leave of absence from UNL at the City College since January 1987. In his new position Schlitt is involved with many areas of science which require intensive computing. Recently he completed the installation of a dedicated computer and graphics software employing the Brookhaven Protein Database to display and manipulate protein molecules, of a dedicated computer and appropriate software to do computational fluid dynamics in the Levich Institute of Fluid Dynamics, of an ethernet local area network, of a computer-aided genetic engineering software package, and a connection to a computer network called "nysernet," among other more routine tasks.

Schlitt's career at UNL spanned more than twenty-two years. The only native of Lincoln on the Department's faculty, Schlitt received an S.B. degree from M.I.T. in 1957 and a Ph.D. degree from the University of Washington in Seattle in 1963. Following a year as a Visiting Assistant Professor at the University of Maryland, Schlitt was appointed an Assistant Professor in the Department in 1964. He was promoted to Associate Professor in 1968 and to Professor in 1977. In 1972-73 he spent a sabbatical year at the Institute of Theoretical Physics in Utrecht, The Netherlands. Among his professional activities, he served as the Chair of the Physics Section of the Nebraska Academy of Sciences, as the Department's Representative to the UNL Faculty Senate, and as the Chairman of the Department's Computer Committee. His theoretical research spanned a number of areas of physics, including elementary particle physics, statistical mechanics, and mathematical physics.

## Research Highlights

The core of this Department is its research activity. This activity literally creates new knowledge, almost always with the active participation of our graduate students, postdoctoral researchers, and, increasingly, our undergraduate majors. This new knowledge then enriches our teaching program and is transmitted to succeeding generations of students. This research activity is so extensive and diverse, however, that it is difficult to survey briefly. In this article, therefore, only a selection of recent research results by the Department's faculty, staff, and students is presented. All of the work presented below has been published recently in *Physical Review Letters* (PRL), a journal "dealing with important new discoveries or topics of high current interest" and aimed at the physics community at large. The works are presented chronologically.

In the 16 May 1988 issue of PRL Professors **David J. Sellmyer** and **Sitaram S. Jaswal**, graduate student **Michael A. Engelhardt** (M.S. 1983, Ph.D. 1988), and collaborator A.J. Arko of Argonne National Lab presented both experimental and theoretical results on the "Electronic Structure and Magnetism of  $Nd_2Fe_{14}B$  and Related Compounds." These recently discovered new materials are very strong permanent magnets and as such have great potential for significant technological applications, such as, e.g., in reducing the size and weight of motors and other devices which employ magnets. However these compounds have extremely complex tetragonal structures with 68 atoms per unit cell. The valence electrons, which control the properties of these materials, have both itinerant and localized characteristics. Only if the structural and electronic properties of these materials are understood will physicists be able to design new materials with even better magnetic properties. The work of the UNL group represents the first measurements of the electronic structure of these materials and the first self-consistent, spin-polarized band calculations for these materials. They found that all of these compounds have essentially identical electronic structures except for the 4f levels. They conclude that "this work indicates the electronic structures of these and other complex magnetic materials can be calculated from first principles; in due course this will be important for tailoring them to enhance their already outstanding properties."

In the 23 May 1988 issue of PRL Professors **John R. Hardy** of UNL and **John W. Flocken** (M.S. 1964, Ph.D. 1969) of UNO presented theoretical work on "Possible Origins of High-T<sub>c</sub> Superconductivity." The experimental discovery of high temperature superconductivity in lanthanum-barium-copper-oxide compounds at 35-40 K in 1986 and in yttrium-barium-copper-oxide compounds at 90-100 K in 1987 electrified the world's science community and promised enormously significant technological applications, which have been widely publicized in the popular press. However, the established BCS theory of superconductivity as normally applied is not thought to explain the high transition temperatures of these new superconducting materials. Hence, condensed matter theorists have been searching for other mechanisms to understand the new materials. Hardy and Flocken postulate in this paper that the potential governing the lattice vibrations in these new materials is a double well potential rather than the usually-assumed harmonic oscillator potential. Such a double well would split the lowest energy levels by a small amount thereby making it much easier for electrons to exchange energy with the lattice. As the authors note, "This opens a possibility for increasing the magnitude of the electron-lattice coupling that appears hitherto unexplored." In fact the model calculations presented in this paper indicate a large increase in the superconducting transition temperature when double well potentials for these materials are used. Furthermore the authors note that there is strong experimental evidence that these materials do indeed have double-well-type potentials and that this is also the case for the newer, even higher temperature (e.g., 125 K) superconducting materials.

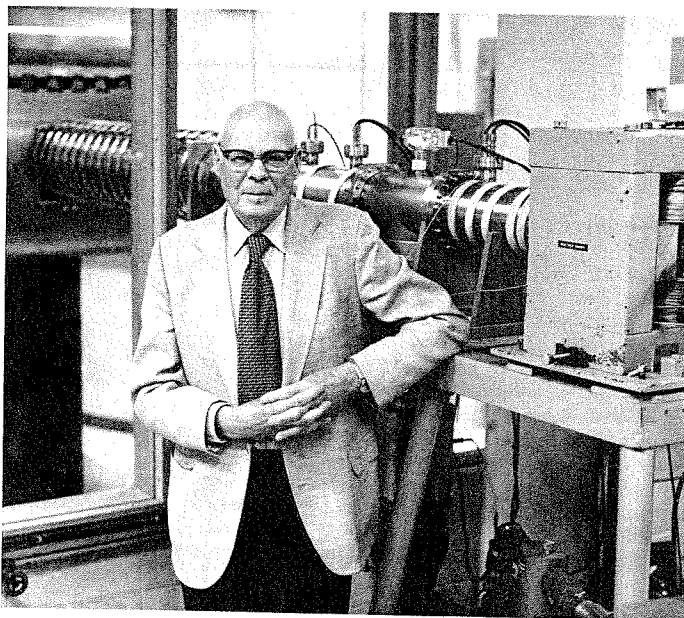
In the 25 July 1988 issue of PRL graduate student **Bo Gao** (M.S. 1986) and Professor **Anthony F. Starace** presented theoretical work on the "Variational Calculation of Multiphoton Ionization Processes for the H Atom." Multiphoton processes are increasingly being studied experimentally as laboratory lasers become more powerful. Theory is searching for reliable techniques to predict multiphoton transition rates, since the crude models of the past have been found wanting. The most basic theoretical problem in calculating the transition amplitude for a perturbative N-photon process is the necessity of summing over N-1 sets of generally infinite numbers of intermediate states. The authors present here a novel variational procedure which eliminates the need to carry out these intermediate state summations. Furthermore the procedure is variationally stable with respect to the approximations employed. Also, the computational labor in their method does not increase as some power of the number of photons N, as do more standard procedures, but in fact increases only slowly with increasing N. The numerical results presented are nevertheless in agreement with those of the most elaborate alternative calculational procedures.

In the 3 October 1988 issue of PRL Professor **James A.R. Samson** and postdoctoral research associate **Gordon Angel** presented an experimental "Test of the Threshold Law for Triple Photoionization in Atomic Oxygen and Neon." When a single photon ionizes an atom so that a single electron escapes, the cross section of the process is generally finite at threshold. However, when two or more electrons are photoionized simultaneously, the cross section starts at zero at threshold and increases as some power,  $a$ , of the kinetic energy,  $E$ , of the escaping electrons. That is, the cross section is proportional to  $E^a$ . For two electron escape, the power,  $a$ , was predicted by Gregory Wannier in 1953 to equal 1.127. This power law has been confirmed experimentally. The authors present in this paper the first experimental test of the theoretically predicted value,  $a=2.162$ , for the case of triple photoionization (i.e., three electrons photoionized simultaneously). Samson and Angel measure the value  $a=2.17$ , which is in excellent agreement with theory, thereby confirming current theoretical understanding of the dynamics of the electron escape process at low energies.



## Jorgensen Accelerator Refurbished

In the last year's *Spectrum* we told about the plans to rebuild the 300 keV accelerator built by **Ted Jorgensen** after World War II. That upgrading has now been completed. A new accelerating column built in England has been installed, a new drift tube built in our shop, a more efficient pumping system added, and a new commercial RF ion source put in place. We are happy to report that the base vacuum is now a factor of 10 better than it was previously, but in spite of the installation of the new system, the beam current we now get is not greatly improved over what it was before the change. The old system must have been engineered pretty well!



*Theodore Jorgensen and the refurbished accelerator*



## Department History Project

In last year's *Spectrum* we told you of our plans to write an informal history of the Department to celebrate its 100th anniversary. Next semester **Professor Eugene Rudd** will be on leave but will spend most of his time in Lincoln working on several writing projects, one of which is the Department history. We plan to include a listing of all the faculty members and the advanced degree recipients. We will include stories and pictures from the recent past as well as from earlier days. So, if you can contribute photographs or anecdotes, they will be much appreciated. Send them either to Rudd or to the Department chairman. If you wish to have any photographs returned, please indicate that on the backs of the pictures and we'll make sure that you get them back. Otherwise we will be happy to add them to our archives.

## Fuller Receives Missouri Alumni Award

Professor **Robert G. Fuller** of our department received an Alumni Merit Award from the University of Missouri-Rolla Alumni Association in October. The award was presented at the annual Homecoming Awards Banquet. Fuller received his B.S. degree in physics at Rolla in 1957 and his M.S. and Ph.D. degrees from the University of Illinois. Before coming to Nebraska, he was a research physicist at the Naval Research Laboratory in Washington. He has served as visiting professor at the University of California-Berkeley and at the U.S. Air Force Academy. In 1980 he served as president of the American Association of Physics Teachers. Fuller has received wide recognition for his activity in developing innovative methods of teaching physics. He is the author of several books, one of which he co-authored with his brother and his father who are also physicists.



Robert G. Fuller, left, receiving award from Arthur G. Baehler, immediate past president of the UMR Alumni Association



## Jorgensen Teaches Course for University Foundations Program

*(Editor's note: Although Ted Jorgensen is now 83 years of age and has been retired for 13 years, he is not ready for his rocking chair yet. This fall he was asked to teach an orientation course for incoming freshmen and he has approached it with typical Jorgensen enthusiasm and creativity. We asked him to write about his experiences with the course.)*

It gave me quite a lift when, after thirteen years of retirement, I was asked to return to the University to teach a section of the University Foundations Program. This program, as I see it, is designed to acquaint incoming students with all aspects of the University, the library, student health services, financial assistance, counseling service, among others, and to be motivated in small groups of about 25 students by a faculty member to prevent them from dropping out of the University.

My attempt at motivation has been to introduce my students to examples of original thinking by such persons as Kepler, Galileo, Descartes, and Newton, and to ask each student to report orally in class on an individual who has done some original thinking, telling of his life, the original thinking for which he is known, and the cultural consequences of his thinking.

One serious difficulty arose because I used some simple algebra in my discussions. At the instigation of a member of the class, I gave a simple test to find whether the class had the algebraic understanding and skills that I expected from high school graduates. Only two students of my class, in my opinion, had enough mathematical background to be expected to survive any University course in which mathematics no higher than high school algebra is used. Class discussions led me to believe that my students had been cheated by the school system; they had been certified by a high school diploma without being held to accomplishments on which they could build a university education. Some of my colleagues tell me that other areas besides mathematics contribute to this problem.

I conclude that the University is trying to keep students by an approach which in large degree does not even consider the main factor contributing to their leaving it.

## Staff News

**Clifford Bettis**, our Lecture Demonstrations Manager, was awarded one of two honorable mention ribbons by the American Association of Physics Teachers at their June 1988 Apparatus Competition held at Cornell. Bettis's entry was a electrophorus plate demonstration apparatus. This fine piece of craftsmanship was designed by Cliff and built by **Walter Lueken** in our Instrument Shop. Bettis has been active in designing new demonstrations for our large enrollment physics courses. And our Instrument Shop has built many of them.

Professors **William B. Campbell** and **Norman R. Simon** were each awarded 1988 Maude Hammond Fling Faculty Summer Fellowships. Campbell's project was for research on the "Vacuum State for Super-critical Z." Simon's project was for research on the "Interior and Atmospheric Dynamics of Pulsating Stars."

**Craig J. Eckhardt**, Professor of Chemistry, has been given a courtesy faculty appointment in the Department. Eckhardt's research overlaps both chemical physics and condensed matter physics. He is currently investigating electronic interactions in molecular aggregates, the electronic structure of large molecules, nonlinear optical properties of molecular solids, Raman and reflection spectra of solids, and phase transitions in molecular crystals.

**Brian S. Farleigh**, one of our Electronics Technicians, was selected as a runner-up for the 1987 Technician of the Year Award. This award is given annually by The Professional Electronics Technicians Association, based in Greencastle, Indiana. Farleigh has traveled to Greenland in connection with his work for UNL's Polar Ice Coring Office. He also regularly teaches electronics evening classes at Lincoln's Southeast Community College.

Professor **Robert G. Fuller** was recognized by the 90th Legislature of the State of Nebraska in Legislative Resolution 307 submitted by Senator Shirley Marsh. The Resolution states "that the Legislature extends its congratulations to Professor Robert G. Fuller who has, through teaching, research, and service to his fellow educators, substantially enriched the common body of knowledge on physics instruction and brought national recognition to the University of Nebraska at Lincoln and the State of Nebraska."

**Robert Fuller** has also been selected by *Macworld* magazine as a winner of their Super Stacks contest. The winners of the contest were selected for outstanding applications of the new Hyper Card software for the Apple Macintosh Computer. Fuller's entry was entitled "Guilty or Innocent?" and concerned the application of elementary mechanics principles to the analysis of an inelastic car collision. Witnesses to the collision give testimony, which students are prompted to analyze. Then the students go to court to give testimony as expert consultants. The contest and the winning entries are described in the November 1988 issue of *Macworld*.

Professor **Duane Jaacks** was awarded \$29,665 in Research Initiation Funds by UNL Vice Chancellor for Research John K. Yost for the purchase of a computer-based, multiparameter coincidence system. This system will decrease the time required to perform polarized photon-scattered particle coincidence measurements from about one year to about one month. Initial experiments are being performed to test the reflection symmetry of the electronic wave functions of He(3<sup>3</sup>P) in He<sup>+</sup> - H<sub>2</sub>/D<sub>2</sub> collisions. Up to eighteen scattering angles of He(3<sup>3</sup>P) can be measured simultaneously. The presence or absence of reflection symmetry will provide stringent tests of the validity of certain theoretical collision models.

Professor **Kam-Ching Leung** organized an exhibit of paintings by Chinese artist Li Shan, who emigrated to the U.S. in 1981 and is currently living in New York City. The exhibit was shown in UNL's Lentz Center for Asian Culture. Mr. Li has held many one-man exhibits in the U.S., including one at the Sheldon Memorial Art Gallery during his two-month stay in 1981 at UNL as an Artist in Residence. The paintings for this exhibit were borrowed by Leung and Professor **Robert Katz** from various private collectors in Lincoln.

Professor **M. Eugene Rudd** was granted \$30,400 by the University of Nebraska Foundation for the purchase of a Slevin atomic hydrogen source. This will provide the target atoms for the first measurements of the energy and angular distribution of electrons resulting from proton impact ionization of the hydrogen atom. This three-body interaction is the most fundamental "break-up" process and should be of great interest to atomic theorists. The measurements will provide in particular a direct test of the theoretical use of the Born approximation and its limits of applicability since for atomic hydrogen, unlike for other atoms, the target wave functions are known exactly.

Professor **James A.R. Samson** was awarded a \$15,000 Layman Fund Grant for a project entitled "Flourescence Studies of Atoms and Molecules." This grant award, together with \$6,000 from the Kositzky Memorial Equipment Fund, and \$3,000 from other Department sources is being used to purchase a state-of-the-art position-sensitive fluorescence radiation detector. Samson and his students are studying electron correlation effects by looking at photoionization processes in which the target is left in an excited state. In the subsequent decay, a photon is emitted. Because these fluorescence signals are weak, it generally requires up to one whole day to accumulate data at a given wavelength. With the position-sensitive detector, as many as 100 wavelengths can be measured simultaneously, thus making it possible for his students to take the data at the Synchrotron Radiation Facility in Wisconsin within the run time allotted.

Professor **David J. Sellmyer** was awarded \$10,000 in Research Initiation Funds by Vice Chancellor for Research John K. Yost for the purchase of equipment to initiate investigations on magneto-optical effects. This equipment is being used to study nano-structured, multilayered thin films, which may have applications as magneto-optic data storage materials. Professor **Roger D. Kirby**, Research Associate **Jian-Xiang Shen**, and Sellmyer are using this apparatus to carry out a new collaborative project supported by both the U.S. National Science Foundation and the Chinese Academy of Sciences.

## International Meeting on Pulsating Stars Held at UNL

From August 15th to 17th, 1988, sixty-five astronomers from seventeen countries gathered in Lincoln to discuss the contribution of variable stars to our understanding of various problems in astronomy. Variable or pulsating stars change their light output over periods as short as an hour or as long as several years due to internal instabilities. The nature of the variations can provide clues to conditions within stars. Some types of variables have proved useful in studies of the properties of stars in various parts of our Milky Way galaxy as well as in other galaxies. Thus, the meeting attracted not only researchers specializing in the study of variable stars, but also astronomers working in such diverse fields as stellar interiors, the structure of the Milky Way galaxy, globular star clusters, and other galaxies.

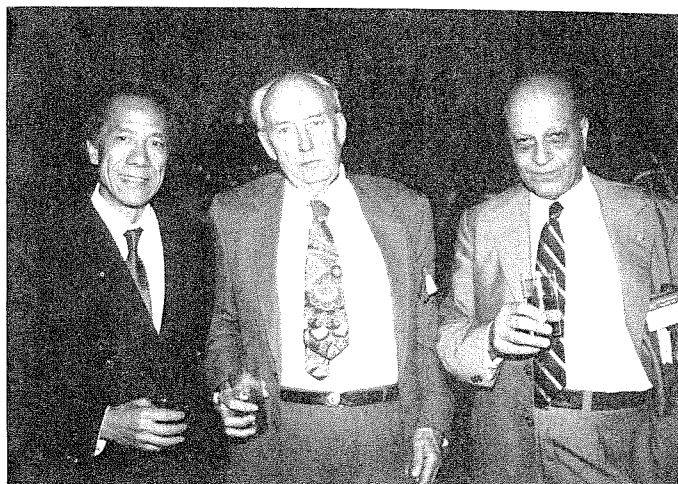
The meeting, entitled "Pulsating Stars and Fundamental Problems in Astronomy," continues a series of meetings which have been held in alternate years since 1974 at various institutions. Although this is the first time it has been in Lincoln, it constitutes an appropriate recognition of the fact that variable stars have been the main focus of astronomical research at the University of Nebraska for some years. The meeting was designated as IAU Colloquium 111 by the International Astronomical Union, which sponsored it jointly with the National Science Foundation and the University of Nebraska. Prof **Norman R. Simon** headed the Scientific Organizing Committee, which selected the topics to be included and invited the speakers, while Prof **Edward G. Schmidt** chaired the local organizing committee.

Thirteen invited speakers reviewed the role of these stars in research on stellar interiors, the structure of the Milky Way Galaxy, and the nature of other galaxies. There were an additional 30 poster papers, which presented recent results in this area. The proceedings of this meeting are being edited by Professor Schmidt and will be published by Cambridge University Press in the spring of 1989.

## Minnich Telescope and Astronomical Computing Center Dedicated

In last year's *Spectrum* we told you about the construction of the 6-inch Minnich Telescope. It is now completed and has been installed in a window on the second floor of Ferguson Hall. On May 5 that telescope and the Minnich Astronomical Computing Center were dedicated. Approximately 50 guests attended the ceremonies, which began with a brief history of the telescope given by Professor **Don Taylor**. He told the story of the mysterious missing 12-inch lens and showed the large book of elaborate blue prints that had been drawn for the never-to-be-built 12-inch telescope. Included among the guests were many friends of astronomy and the Department, friends of the Minnichs, and of course **Commander** and **Mrs. Charles Minnich** themselves. Two of the guests, who were from London, England, timed their visit to Lincoln so they could attend the dedication. Professor **Edward Schmidt**, Director of the Minnich Astronomical Computing Center, presented Commander Minnich with one of the first publications to result from the use of the center. Presiding over the dedication was **Chancellor Martin Massengale**.

## Department Hosts MASUA Distinguished Foreign Scholar Jorge Sahade



*K.C. Leung, F.B. Wood, and J. Sahade*

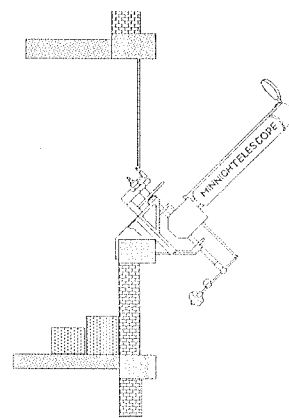
Professor **Jorge Sahade** of the National University of La Plata, Argentina, was selected as one of the five MASUA Distinguished Foreign Scholars for the 1988-89 academic year. He was nominated by Professor **Kam-Ching Leung**. Professor Sahade obtained his Ph.D. from the National University of La Plata in 1943. He is a prominent astrophysicist in the area of interacting binary stars and in stellar spectroscopy. He is a frequent visitor to the United States. His first visit was in the early forties working with the late Professor Otto Struve at the Yerkes and McDonald Observatories of the University of Chicago. He has published about 170 papers and books and is extremely active in international organizations, especially the International Astronomical Union. He was a Past President of Commission 29 (Stellar Spectra) and received many honors from around the world. In the IAU General Assembly in New Delhi, India, in 1985, Professor Sahade was elected to the Presidency of the International Astronomical Union for a three year term. The photograph was taken during the General Assembly in New Delhi and shows J. Sahade, F. B. Wood, and K. C. Leung, all of whom are members of Commission 42 (Close Binaries). Wood is a Past President of the Commission and Leung is a member of the Organizing Committee of the Commission.

The Mid-America State Universities Association, MASUA, is a university consortium of mid-western states organized in 1958. At present it has 18 members, of which UNL is one. The association sponsors programs designed to stimulate interactions among the faculty and students of member institutions.

Professor Sahade is spending one month at UNL, the host institution, working with the faculty and students in the Department. During his visit to the midwest, he will also give colloquia and public talks at the following campuses: University of Oklahoma, University of Kansas, University of Missouri-St. Louis, Iowa State University, and University of Colorado.

There followed a ribbon cutting ceremony at the doors to the computing center and telescope, followed by viewing of sun spots and Venus (yes, the sun was still up) through the Minnich telescope. **Marilyn McDowell** made the arrangements for the dedication.

During the close opposition of Mars at the end of September, we had our first public viewing sessions with the telescope to which about 200 visitors came. One of the visitors was a relative of **Perceval Lowell**, who is famous for his theories about the Martian "canals".



*Diagram of the mounting of the Minnich Telescope*

## Center for Materials and Research and Analysis Established

With the strong backing of Governor Kay Orr, the State of Nebraska has implemented a State Research Initiative at the University of Nebraska with first year funding at \$4 million. After four years, the funding level is projected to grow to \$20 million. The four areas funded in the first year are Biotechnology, Engineering Research Centers, Water Quality, and Materials Science, with the last having significant Physics Department involvement. A Center for Materials Research and Analysis (CMRA) has been established under the direction of **Professor David Sellmyer** of our Department. The four major activities of CMRA are a) core support for facilities and operations, b) materials research for information and communications technologies, c) molecular design of advanced technological materials, and d) industrial materials research and analysis. These activities are carried out through the provision of state-of-the-art equipment, through seed money for young faculty members who need to get started rapidly, and through the encouragement of collaborative new interdisciplinary research by senior faculty members.

The facilities used for high quality sample preparation and characterization include equipment for helium liquifaction, x-ray materials characterization, scanning and transmission electron microscopy, metallurgical and mechanical characterization, and optical and magnetic resonance spectroscopy.

Already the funding of CMRA was essential in our recruitment of Assistant Professor **S.H. Liou**, who comes here from AT&T Bell Laboratories and John Hopkins University and will have a positive effect on our future faculty searches. The Center has also been able to hire several excellent graduate research assistants and undergraduate research aides.

The thrust areas that have been chosen are all of interest to high technology industries here in Nebraska as well as outside the state. Research links have already been established with Control Data in Minneapolis, CDS in Omaha, IBM, 3M, Dale Electronics in Norfolk, Xidex in Omaha, Addax, Brunswick, and others. Plans have been made to publish a brochure outlining the Center's research and analysis facilities and capabilities. This will be distributed to industrial firms and materials companies in the area. A Materials Research Seminar Series also will help publicize the center outside as well as inside the University.



## Braces Visit Brace

Brace Laboratory was named, as you know, after **DeWitt Bristol Brace**, the founder and first chairman of the Physics Department. After his death in 1905, his wife and two small children moved to the East Coast. On November 12, 1988, **Mr. Russell W. ("Rusty") Brace**, a grandson of D.B. Brace, came to the campus for a visit. Mr. Brace was accompanied by his wife and by **Mr. Daniel Hayes**, a business associate. Brace is the president of the Newcomen Society of the United States, a non-profit organization for the recognition of achievement in American business and the society it serves. It was on behalf of this society that he came to Omaha to bestow an honor on the Strategic Air Command. While in Nebraska he made a visit to the university where his grandfather worked a century ago.

A short program was presented to the visitors to acquaint them with the university, with the Department, with publications concerning D.B. Brace, and with plans for future publications concerning Brace's work. The Braces were especially pleased to see some early family photographs from our archives. They were also interested in the spectrographic and other apparatus used by his grandfather and in some plans for projects involving the research and teaching equipment purchased by him.

While we had not previously met Russell Brace, we had made contact with other descendants of D.B. Brace, namely with a son, the late **Lloyd DeWitt Brace**, who was a Boston banker, and with a granddaughter, the late **Anne Russell Brace Barnes**, who was a surgeon at the Harvard Medical School. Some years ago Lloyd Brace sent us a box of papers left by his father, which included the manuscripts of some of his papers on ether drift, his patents, and some letters. These will be a valuable resource for several historical projects we are working on.

## Brace Lecture Hall Renovated

Since Brace Laboratory was built in 1905, many generations of students have learned their physics in the large lecture hall, Brace 211. The room has resounded to the voices of lecturers down through the decades; **Almy**, **Marvin**, "**T-squared**" **Smith**, and **Jorgensen** are some of the teachers from the past who have taught in that room. Most of the writing tablets on the desks have been marked with tales of frustration and joy. In recent years visitors have remarked about the quaint Elizabethan quality the room had with its oak balustraded balcony. Some even suggested that it would be an ideal setting for a production of *Romeo and Juliet!*

But along with its quaintness and charm the room had some problems. The rows were too close together, making it difficult for students to reach their seats. The lighting, although improved about 10 years ago, was not very good. The risers and chairs squeaked badly, and the air handling system was noisy and uneven. And all who have taught there remember the heavy, clanky blackboard system.

Although the Department had suggested building a new lecture hall south of and connected to Brace Laboratory many years ago, it was never built. However, this year the Administration decided to proceed with a complete renovation of the lecture hall to bring it up to present-day standards. The work was done early last summer and the new room was already in use again for the second summer session.

The entire riser system was removed down to the beams, the seats discarded, and the old lights removed. New risers were built and screwed down to prevent squeaks. Carpet was installed on all of the risers and new, more comfortable seats with larger writing tablets were put in place. The air handling system was rebuilt to provide a much more even distribution of air, a dropped ceiling was built and new fluorescent fixtures were added. In order to satisfy the fire code, the spacing of the seats and the provision of exit lanes resulted in a slight reduction in the total number of seats, which is now 152.

A new blackboard system was to have been installed, but due to an error, the one we received was the wrong size. We are waiting for the replacement to be installed.

When the old seats were being discarded, we rescued No. 13, which is the seat that Ted Jorgensen had used when he was a student some 60 years ago. We planned to present it to him, but he said he had no room in his house for it so it resides instead in the accelerator laboratory.

Although the new plastic shell seats (with cushions, no less) are much more comfortable than the old desks, we predict that they will not last the 80+ years that the previous wooden ones did.



Physics 212 students in newly renovated lecture hall

## Pinkerton Discusses the Development of Supermagnets



Frederick E. Pinkerton

**Fredrick E. Pinkerton** (B.S. 1976), Senior Research Scientist at General Motors Research Laboratories in Warren, Michigan was the featured speaker at the Fourth Annual Recognition Luncheon for the Department's Bachelor's, Master's, and Doctoral degree recipients.

In his talk, entitled "The Quest for the Supermagnet," Pinkerton described his work on the development of rare earth-iron-boron magnets. In his research, Pinkerton combined rare-earth metals with iron and boron to form an amorphous (glass-like) material which is stable and which exhibits extremely high magnetic retention. The magnetic properties of these materials far exceeded the properties of the best existing magnets (samarium-cobalt), making them ideally suited for a number of technological applications, including electric motors, magnetic actuators, and magnetic sensors. General Motors is now mass-producing these "supermagnets" under the name "MAG-NEQUENCH" for use in their automotive products. These amorphous magnetic alloys are produced by first melting them and then rapidly cooling them to room temperature in an oxygen-free atmosphere, using a process called melt-spinning. Pinkerton is credited with stabilizing the melt-spinning process, which was necessary if magnets were to be produced on a large scale. For his part in the development of these materials, General Motors Corporation awarded Pinkerton both the Charles L. McCuen Special Achievement Award and the Kettering Award.

While at the University of Nebraska-Lincoln, Pinkerton carried out original research on the response of nuclear emulsions to ionizing radiation under the direction of **Professor Robert Katz**. He subsequently attended Cornell University, where he studied valence fluctuations in rare-earth compounds, receiving his Ph.D. degree in 1981. His thesis advisor at Cornell was **Professor A. J. Sievers**, who was also **Professor Roger Kirby's** thesis advisor.

Also at the luncheon, the 1988 Departmental Distinguished Teaching Assistant Awards were presented to graduate students **William A. Brda** and **Brian W. Moudry**. **Professor Paul Burrow** was recognized for being elected a Fellow of the American Physical Society, and **Professor Emeritus Theodore Jorgensen, Jr.** was recognized as the recipient of the College of Arts & Sciences Alumni Achievement Award.

The luncheon concluded with the installation of the new officers of the Society for Physics Students. **Lisa Wiese** was named President, **Scott Wesely** Vice President, **Glenn Allen** Secretary, and **Jane Peterkin** Treasurer.



## More Awards for Stuart O. Nelson

In the *Spectrum* from two years ago there was an article reporting the award of the Founder's Gold Medal to **Stuart O. Nelson** (M.A. 1954) by the National Society of Professional Engineers. At that time he was honored as the 1985 Federal Engineer of the Year for his pioneering work in the field of dielectric heating applications for treatment of seeds. Last year we reported that he also received a Department of Agriculture Superior Service Award and was elected a Fellow of the American Society of Agricultural Engineers.

Last year he was recognized by the Organization of Professional Employees of the U.S. Department of Agriculture as the 1987 OPEDA Professional of the Year. This award, the highest given by that organization, was presented to Dr. Nelson at ceremonies in Arlington, VA for "his outstanding service to his profession, and his work to strengthen professionalism throughout USDA. His contributions as an engineer, citizen and neighbor serve as an inspiration to his co-workers and to other USDA associates." Also in 1987 he was recognized with a Professional Achievement Citation in Engineering by Iowa State University.

This year two more honors have been added to the list. The International Microwave Power Institute has elected him as a Fellow and he was named Engineer of the Year by the Georgia Section of the American Society of Agricultural Engineers. Congratulations, Dr. Nelson!

## Reminiscences from the 1930's: William Leavitt



William G. Leavitt

**William G. Leavitt** (A.B. 1937, M.A. 1938 Math/Physics) Emeritus Professor of Mathematics has written some descriptions of the University of Nebraska and the activities in astronomy and physics from the 1930's as well as his experiences after graduation. We want to share some of his observations with you.

In the 1926-27 academic year, when he was a student at Whittier Junior High in Lincoln, he attended some evening public lectures on astronomy given by **Professor Swezey** at the observatory which stood just south of Brace Laboratory. He says that these lectures were the source of his life-long interest in astronomy. Swezey had retired by 1933 when Leavitt enrolled at the University and **Oliver Collins** taught the elementary course. But when Leavitt took the course, Collins was on leave and **Dr. Carl Rust** was the instructor. At one point Rust did some astronomical research using a 12" mirror in an observatory on what is now called the East Campus. At that time, the light pollution there was minimal but the mounting for the mirror was jerry-built and never worked properly.

Leavitt took his first physics course from **Professor Almy**, who was a rather shy man and not a very good lecturer. "**T-Squared**" **Smith** taught the course for engineers and was in constant trouble with the engineering people because he flunked too many of their students. Leavitt's lowest grades at the university came in two of Smith's electricity courses "because my lab work was so abysmal." The theoretical courses from **Professor Marvin** were more to his liking. "Professor Marvin was a kindly old gentleman and I never saw anyone who loved to talk more than he." When he tried to leave Marvin's office, "... he'd follow me to the door of his office, then pretty soon I'd go down the hall to the front door of Brace with him still coming along, still talking, and maybe even out on the sidewalk in front ... Marvin had good relations with some of the German universities, such as Goettingen, so that when he recommended a student, he was always accepted."

Leavitt's honors thesis was on the calculation of celestial orbits by the method of Gauss and Olbers. He says that **Charles Minnich** was in his university class and that they played in two bands together. By the time Leavitt left the university he had taken all of the courses offered in physics and mathematics and had written a master's thesis on "Planetary Orbits in General Relativity."

Astronomy had been a part of the Mathematics Department, but by 1960 it had disappeared from the curriculum and what equipment was left was badly deteriorated. In 1962 the name "Astronomy" was dropped from Math and the subject was transferred to the Physics Department.

Although Leavitt thought he knew a lot of physics when he left Nebraska, he got a rude shock when he went to Princeton. Evidently Marvin's atomic theory course was a generation behind, as he found out when he took quantum mechanics from **John Wheeler**. He was petrified when he went in for his examination before a committee headed by **Eugene Wigner** and failed to qualify for the senior fellowship he needed to stay at Princeton. Instead he went to Wisconsin and did his work there entirely in mathematics. While at Princeton, he saw a lot of famous people besides Wheeler and Wigner, such as **Hermann Weyl**, **Hans Bethe**, **Henry Norris Russell**, **S. Lefschetz**, **Kurt Goedel**, and **John von Neumann**. Von Neumann, he said, "could always be counted on to make a cogent comment, whatever was being discussed." Leavitt even went one time to ask **Albert Einstein** to autograph a book.

## Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 October 1987-30 September 1988. 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 might be considering a 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 by sending a check payable to the University of Nebraska Foundation and indicating for which account the money is intended. Those contributors whose employers have a matching gift program should indicate this. Checks may be mailed to the University of Nebraska Foundation, P.O. Box 82555, Lincoln, NE 68501-2555

**Mohammed Ahmed** (M.S. 1970, Ph.D. 1974)  
**Richard C. Altrock** (B.S. 1962 Physics/Mathematics)  
**Anonymous**  
**William A. Barrett, Jr.** (B.S. 1952, M.S. 1953)  
**Thomas H. Bedwell** (Ph.D. 1966 Secondary Education/Physics)  
**Bell Communications Research, Inc.**  
**Roger D. Bengston**  
**Bradley S. Bickford** (B.A. 1984)  
**Thomas E. Bullock** (M.S. 1979)  
**Louis J. Caplan** (M.S. 1964, Ph.D. 1975)  
**Mr. & Mrs. James C. Coe**  
**David H. Crandall** (M.S. 1967, Ph.D. 1970)  
**Robert D. DuBois** (B.S. 1970, M.S. 1972, Ph.D. 1975)  
**Paul J. Edwardson** (M.S. 1981, Ph.D. 1986)  
**Robert G. Fuller**  
**Thomas E. Furtak** (B.S. 1971)  
**John S. Gallagher**  
**Richard J. Gleeson** (B.S. 1967)  
**Donald L. Hagrman** (B.S. 1962)  
**Alan J. Heeger** (B.S. 1957)  
**Howard L. Heinisch, Jr.** (M.S. 1968, Ph.D. 1972)  
**Walter W. Heinze** (B.S. 1954, M.S. 1956)  
**International Business Machines Corp.**  
**Howard S. Izawa** (M.A. 1964 Physics/Math)  
**Robert Katz**  
**Richard W. Lee** (M.A. 1939)  
**Paul J. Marquard** (M.S. 1986)  
**Ronald W. Mayle** (M.S. 1979)  
**Charles B. Minnich** (B.Sc. E.E. 1937)  
**Prem N. Pareek** (M.S. 1980, Ph.D. 1983)  
**Mr. & Mrs. Joseph L. Parker** (Ph.D. 1940 Chemistry/Physics)  
**Gail R. Quackenbush** (B.S. 1972)  
**Mohammed H. Rashid** (Ph.D. 1983)  
**Kent E. Reinhard** (B.S. 1985)  
**Rebecca R. Richards-Kortum** (B.S. 1985)  
**Rockwell International**  
**Jerry E. Ruckman** (B.S. 1962)  
**M. Eugene Rudd** (Ph.D. 1962)  
**James A.R. Samson**  
**James J. Schmidt** (B.S. 1956, M.S. 1957)  
**Donald P. Schneider** (B.S. 1976)  
**David J. Sellmyer**  
**Roy F. Simperman** (M.S. 1965)  
**Charles E. Skov** (Ph.D. 1963 Physics/Math)  
**Stanley J. Sramek**  
**Anthony F. Starace**  
**Texaco Philanthropic Foundation Inc.**  
**Bruce Waggoner** (B.S. 1984)  
**Rebecca Willman**

## We Heard From . . .

**Ahmed, Mohammed** (M.S. 1970, Ph.D. 1974) Thapar Corporate R & D Centre, P.O. Box 68, Patiala-147001, India. Is a Visiting Associate, in the Mechanics and Computers Division of Thapar Corporate R & D Centre. "Thank you for sending *Spectrum*. Enjoyed reading it immensely."

**Baumert, William J.** (B.S. 1974) 5830 West 96th St. Apt. #2, Los Angeles, CA 90045. Is a Staff Engineer at Hughes Aircraft Company. Was promoted to Staff Engineer in 1987. Is working in Nuclear Hardening and Survivability.

**Bolorizadeh, Mohammad A.** (M.S. 1979, Ph.D. 1984) Shahid Bahonar University, Kerman, Iran. Has served as Dean of Science, Dean of Students, and for a year and a half as Vice-Chancellor for Education and Research. He says his university is growing rapidly and that they have the best mathematics department in Iran. He is working on a proposal for a research center for physics which would cover atomic, molecular, and optical physics. They are presently doing laser research and plan to obtain a 2-MeV accelerator. He and his wife added a daughter, Mojdeh, to their family a year ago.

**Boyer, Larry L.** (M.S. 1968, Ph.D. 1970) Condensed Matter and Radiation Sciences Division, Naval Research Laboratory, Code 6682, Washington, D.C. 20375. Was awarded the 34th Annual NRL - Sigma Xi Award in Pure Science by the NRL Chapter of Sigma Xi. He was cited "for pioneering work in condensed matter theory developing ab initio electronic structure models and applying them to calculations of equations of state and lattice instabilities in ionically bonded solids."

**Bullock, Thomas E.** (M.S. 1979) 1260 South 20th St., Lincoln, NE 68502. "Would pay \$40 for a History of the Department book!"

**Byrne, Eric J.** (B.S. 1983) 350 N. 16th St., Apt. #2, Manhattan, KS 66502. Is a Senior Analyst with Amperif. "It's always interesting to hear how the department is doing. As for myself, I am finishing up my M.S. in Computer Science at Kansas State this spring. Then I will go on and do something. The question is, What?"

**David C. Doerr** (B.S. 1987) and **Julie M. Doerr** (B.S. 1987) 731 Fendick Circle, Ridgecrest, CA 93555. Both are Physicists in the Junior Professional Program at the Naval Weapons Center.

**Doerr, Phillip T.** (B.S. 1986) 2713 S. 17th St., Omaha, NE 68108. Is an Assistant Programmer/Analyst at Planning Research Corporation.

**Egbert, Gary T.** (Ph.D. 1974) RR 1, Box 29, Byron, MN 55920. Is a Staff Engineer with IBM Corporation. "I enjoy receiving the newsletter *Spectrum* each year. The interests of the Physics Department are many and varied and provide students with a wide range of opportunities. Keep up the good work. I continue to work in the advanced development area of digital magnetic recording with particular interest in recording heads."

**Gallagher, John S. III** (Former Staff) Mars Hill Rd., 1400 W., Flagstaff, AZ 86001. Is Director of Lowell Observatory.

**Gruzalski, Greg R.** (Ph.D. 1977) 118 Monticello Road, Oak Ridge, TN 37830. Is on the research staff at ORNL. "I want to thank Tony Starace, David Sellmyer, and everyone else who had something to do with inviting me to speak at last year's luncheon for the '87 graduates. I also am grateful for having had the opportunity of seeing persons I hadn't seen in so many years, and for the warmth and hospitality shown by all. I hope to be able to visit again soon (maybe during the football season?)."

**Hagrman, Donald L.** (B.S. 1962) 1895 Carmel Drive, Idaho Falls, ID 83402. Is a Scientific Specialist with EG&G Idaho (Idaho National Engineering Lab).

**Heeger, Alan J.** (B.S. 1957) 1042 Las Alturas Rd., Santa Barbara, CA 93103. Is Professor of Physics and Director of the Institute for Polymers and Organic Solids at the University of California at Santa Barbara.

**Kim, Kisik** (M.S. 1983) 901 University Park, Rochester, NY 14620. "It is always good to remember somebody and to be remembered by somebody. I finished my Ph.D. last fall and am in a postdoctoral position in the Chemistry Department at the University of Rochester."





- Kruecken, Thomas**, (M.S. 1983) Schleissheimer Str. 124/5, D-8000 Muenchen 40, West Germany. "I am working at the Max-Planck-Institut fuer Plasmaphysik at Garching near Munich on my PhD thesis, which concerns the numerical simulation of ion cyclotron resonance heating in Tokamak plasmas. It is quite interesting and I am happy that I moved to Munich, a city which has many things to offer. I should be finished with my studies this summer and I do not know yet if I shall switch to a (better paying) industrial job then. At least I am writing applications."
- Marquard, Paul J.** (M.S. 1986) 611 Andrea Ln, Apt #16, Casper, WY 82609. Is an instructor at Casper College. "I just started an astronomy class here for the first time in several years. It's been quite popular. They found out I can teach Math, so they put me to it. Next on my agenda of unexpected courses are Engineering courses in statics, dynamics, fluids, and thermodynamics. Special thanks to all my instructors at Nebraska. It took a while, but I think I've got it."
- Miller, Donald L.** (Former Staff) 17 Pheasant Run Drive, Export, PA 15632. "We now have six wonderful children, one girl and five boys. . . . [I am] currently working for Powerex in Youngwood, PA. The plant used to be owned by Westinghouse, but now is owned by Westinghouse, GE, and Mitsubishi."
- Molskness, Debra J.** (B.S. 1988) 1717 Florine Blvd., St. Charles, MO 63303. Is working for McDonnell Douglas in St. Louis in the Materials and Process Development Department. Her job concerns carbon/epoxy composite laminates and the use of ultrasonics and other means of non-destructive testing. Is enjoying her work.
- Newman, Richard** (B.S. 1985, M.S. 1987) Dynamics Technology, Inc., 21311 Hawthorne Blvd., Suite 300, Torrance, CA 90503.
- Reinhard, Kent E.** (B.S. 1985) 253 Forest Park, Apt. E-3, Durham, NH 03824. Research Assistant at the Space Science Center. "I have been working on NASA's GRO (Gamma Ray Observatory) satellite over the last couple years. I am doing the calibration for the detector system on the Compton Telescope portion of GRO. This new design in telescopes is used to detect gamma rays in the 1-30 MeV range. I am also director of the University Observatory and I write a monthly astronomy column for New Hampshire's largest newspaper."
- Sazama, Franklin Jed** (M.S. 1962) 7820 Whiterim Terrace, Potomac, MD 20854. Stopped by in August while taking care of business concerned with his father's estate. He lives in Washington, DC where he works at the Department of Energy in the office of the Deputy Assistant Secretary of Military Application. "My, how this lab has grown!"
- Schuster, Sanford L.** (B.S. 1960, M.S. 1963, Ph.D. 1969) 225 Pfau St., Mankato, MN 56001. Is Chairman of the Department of Physics at Mankato State University. "I have been at Mankato for 20 yrs. The Department of Physics grew into a School of Physics, Engineering, and Technology, in which the "new" Department of Physics is now one of four departments in the school. My niece Julie Schult Doerr obtained her BS in physics from UNL in May 1987. I remember well the Picker diffractometer which is being replaced. I designed a pre-monochromator for it as part of my Ph.D. thesis project."
- Schuck, Elmer Eugene** (B.S. 1961) 20 Vince Circle, Whitesboro, NY 13492. Is a Sub-Section Manager with General Electric Corp.
- Sramek, Stanley J.** (Former Staff) 9550 Ella Lee Lane, Apt. #1158, Houston, TX 77063. Is a Geophysicist with Texaco, Inc.
- Theilmann, Michael T.** (M.S. 1988) 5348 Beachside Drive, Minnetonka, MN 55343. Is a consultant with Towers, Perrin, Foster, and Crosby in Minneapolis.
- Underhill, Glen M.** (M.A. 1957, Ph.D. 1963) P.O. Box 70, Riverdale, NE 68870. Is a Professor of Physics at Kearney State College.
- Waligorski, Michael P.R.** (Former Staff) Brookhaven National Lab, DNE, Bldg 703 M, Upton, NY 11973. Is a Visiting Scientist (April 1988-April 1989) at Brookhaven National Laboratory. "After leaving Lincoln in 1986 for my home institution (Institute of Nuclear Physics, Krakow, Poland), I am now back in the US for 1 year to study applications of track structure theory in radiation protection. Best wishes to all at Behlen from Agata (who is here with me) and myself."
- Webster, Gary L.** (Ph.D. 1981) 13949 Barrymore St., San Diego, CA 92129. Is an Engineering Specialist in the Guidance and Control Group at the Convair Division of General Dynamics Corp.

## No Known Address:

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

- Malvyn P. Bailey** (M.S. 1962)  
**Robin L. Collins** (B.A. 1979)  
**Duane A. Courter** (M.S. 1960)  
**Jeffrey J. Darland** (B.S. 1974 Bus.Admin/Physics)  
**Richard V. Denton** (B.S. 1965)  
**Clarence M. DeYoung** (B.S. 1958)  
**James A. Eder** (M.S. 1966)  
**Jimmie D. Gordon** (B.S. 1960)  
**George W. Graft** (B.S. 1963)  
**Walter F. Gutschow** (B.S. 1958, M.A. 1960 Math/Astronomy)  
**Mehdi Homayoonfar** (M.S. 1971, Ph.D. 1971)  
**King-Chung Ip** (B.S. 1980)  
**Bruce W. Jones** (M.S. 1976, Ph.D. 1979)  
**Ki Tae Kim** (M.S. 1967)  
**Roy B. Kreigh** (M.A. 1950 Math/Physics)  
**Sharon L. Lackey** (M.S. 1974)  
**Mei Lin Lin** (M.S. 1962 Physics/Math)  
**Edward E. Moreland** (M.A. 1954)  
**Albert C. Mueller** (Ph.D. 1943 Chemistry/Physics)  
**Winfred P. Pikelis** (B.S. 1980)  
**Frank P. Ross** (B.A. 1958)  
**Akhavi H. Sadate** (M.S. 1980)  
**Leroy G. Schulz** (M.S. 1941)  
**Bruce E. Steele** (B.S. 1985)  
**Ter-Hsin Tsai** (Ph.D. 1978)  
**Robert K. Weimer** (B.A. 1977)  
**Richard J. Welch** (B.S. 1978)  
**Robert A. Worsing** (M.A. 1949 Math/Physics)  
**Albert O. Yeye-Odu** (B.A. 1975 Physics/Math)



# THE RECORD

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

No. 4 Fall 1988

Anthony F. Starace, Editor

## 1987-88 Degree Recipients

### *Bachelor of Arts*

**Thomas E. Beardsley** (May 1988). Is a Special Agent for Prudential Insurance in Lincoln.

### *Bachelor of Science*

**Ryne Hobbs** (December 1987). Has enrolled in the graduate physics program at Oklahoma State University.

**Lonnie L. Mulder** (December 1987). Is applying to graduate schools.

**Mark O. Schlegel** (December 1987). Has enrolled in the graduate physics program at the University of Colorado at Boulder.

**Kayvan Aflatooni** (May 1988). Is applying to graduate schools.

**David Lloyd Brown** (May 1988). Has enrolled in the graduate astronomy program at New Mexico State University in Las Cruces.

**Edward J. Carter** (May 1988). Has enrolled in the graduate physics program at UNL.

**Vincent D. Harmon** (May 1988). Has enrolled in the mechanical engineering program at UNL.

**Kyle W. Hollman** (May 1988). Has enrolled in the graduate physics program at Washington University in St. Louis.

**Eric R. Jatzten** (Astronomy, May 1988). Is job hunting.

**Theresa G. Jeane** (May 1988). Is a Communications Manager with the Nebraska Air National Guard in Lincoln.

**Jonathan C. Long** (May 1988). Has enrolled in the graduate physics program at UNL.

**Debra J. Molskness** (May 1988.) Has joined the Technical Staff of the Physical Science Group at Hughes Aircraft Co. in Aurora, Colorado.

**Ralph E. Cofield** (August 1988). Is applying to graduate schools.

**Charles G. Loomis** (Astronomy, August 1988). Is job hunting.

**Joseph R. Steele** (August 1988). Has enrolled in the graduate physics program at the University of Wisconsin-Madison.

### *Master of Science*

**Ding Liu** (December 1987). Is engaged in doctoral research with Professor John R. Hardy.

**Xueying Shi** (December 1987). Is engaged in doctoral research with Professor Paul D. Barrow.

**Enmin Xia** (December 1987). Has enrolled in the graduate physics program at Louisiana State University.

**Jaegwon Yoo** (December 1987). Is engaged in doctoral research with Professor William B. Campbell.

**Dominic Calabrese** (May 1988). Is engaged in doctoral research with Professor Duane H. Jaacks.

**Huazhe Cao** (May 1988). Is engaged in doctoral research with Professor John R. Hardy.

**Shuhong Chen** (May 1988). Has enrolled in the graduate computer science program at Texas A&M University.

**Guorong Huang** (May 1988). Has enrolled in the graduate electrical engineering program at UNL.

**George W. Kerby** (May 1988). Is engaged in doctoral research with Professor M. Eugene Rudd.

**Michael T. Teilman** (May 1988). Is working as a consultant with Towers, Perrin, Forster, and Crosby in Minneapolis, MN.

### *Doctor of Philosophy*

**David P. Billesbach** (December 1987). Is a postdoctoral research associate with Professors John R. Hardy and Frank G. Ullman.

**Suraiya Nafis** (December 1987). Is a postdoctoral research associate in the Physics Department at Kansas State University.

**Kenneth L. Stricklett** (December 1987). Is a postdoctoral research associate at Battelle Pacific NW Laboratories in Richland, WA.

**Michael A. Engelhardt** (May 1988). Is a postdoctoral research associate at the University of Wisconsin Synchrotron Radiation Center in Stoughton, WI.

**Chih-Ray Liu** (August 1988). Is a postdoctoral research associate with Professor Anthony F. Starace.

**Thomas M. Stephen** (August 1988). Is working for ICR Research Associates, Inc., in Lincoln.

**Zheng Zhen** (August 1988). Is a postdoctoral research associate at Oak Ridge National Laboratory.

# HONORS

## *1987-88 Fellows*

<b>Bo Gao</b>	Maude Hammond Fling Fellow
<b>Brian Moudry</b>	Avery Teaching Fellow
<b>Zhengsheng Shan</b>	Bukey Memorial Fellow
<b>Xueyin Shi</b>	Maude Hammond Fling Fellow
<b>Michael Theilmann</b>	Parker Teaching Fellow

## *1978-88 Scholarships*

<b>Tamara Minnick</b>	U.S. Harkson Scholarship
<b>Kurt W. Meyer</b>	U.S. Harkson Scholarship
<b>Kayla L. Kadlec</b>	U.S. Harkson Scholarship
<b>Jeffrey D. Mills</b>	U.S. Harkson Scholarship
<b>Mark O. Schlegal</b>	Henry H. Marvin Scholarship
<b>Lisa M. Wiese</b>	John E. Almy Scholarship
<b>Kathryn H. Wiese</b>	John E. Almy Scholarship
<b>Tracie C. Keup</b>	Joel Stebbins Scholarship
<b>Jeffrey D. Kreuger</b>	Joel Stebbins Scholarship
<b>Roger W. Price</b>	Joel Stebbins Scholarship
<b>Debra J. Cleveland</b>	Physics & Astronomy Scholarship

## *1988 Departmental Distinguished Teaching Assistant Awards*

**William A. Brda**

**Brian W. Moudry**

## *1988 Fellow of the American Physical Society*

**Paul D. Burrow**

## *1988 College of Arts & Sciences Alumni Achievement Award*

**Theodore Jorgensen, Jr.**

## *1987-88 Society for Physics Students Officers*

**Glenn Allen**, President

**David Fox**, Vice President

**Jane Peterkin**, Secretary

**Kevin Bailey**, Treasurer

## Faculty Professional Activities

In addition to service on Departmental, College, and University-wide committees, for 1988-89 a number of the faculty are active in national and international professional activities, as follows:

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

**William B. Campbell:** Member, Western SSC Coalition; Organizing Committee, Western Education, Science, and Technology Association (WESTA).

**Robert G. Fuller:** Author, Ask the Medium Column, AAPT Announcer; Editor, AAPT Instructional Materials Center; Member, AAPT Publications Committee; Member, Journal of College Science Teaching, Editorial Review Board.

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

**Duane H. Jaecks:** Local Committee for ISAC Conference — Summer 1989, Kansas State; NRC Graduate Fellowship Evaluation Panel for Physics and Astronomy.

**Robert Katz:** Editorial Board, *Nuclear Tracks*.

**Kam-Ching Leung:** Advisory Board, *Chinese Astronomy and Astrophysics Journal*; Chrétién International Research Grants Committee of the A.A.S.; Organizing Committee, Commission 38 (Exchange of Astronomers), I.A.U.; Organizing Committee, Commission 42 (Close Binary Stars), I.A.U.; Planning Committee (Co-Chair), I.A.U. Symposium/Colloquium on Close Binary Stars, Argentina, 1991; Board of Directors, Lentz Center for Asian Culture.

**M. E. Rudd:** Organizational Committee, Conference on the Application of Accelerators in Research and Industry; Chairman, Fellowship Committee, APS Division of Atomic, Molecular and Optical Physics; Member, Local Committee for ISAC Conference; Chairman, Committee on Secondary-Electron Spectra of the International Commission on Radiation Units and Measurements.

**James A.R. Samson:** Accelerator and Fusion Research Division Review Committee, Lawrence Berkeley Laboratory; Nominating and Program Committees, APS Division of Atomic, Molecular, & Optical Physics; X-Ray and Ultraviolet Techniques Committee, Optical Society of America.

**Leo Sartori:** Consultant, Arms Control and Disarmament Agency.

**David J. Sellmyer:** Program Committee, Magnetism & Magnetic Materials Conference; Board of Directors, Michigan State University, Physics and Astronomy Alumni Assn.

**Anthony F. Starace:** NRC Committee on Atomic, Molecular, and Optical Science (CAMOS); Theoretical Atomic, Molecular, and Optical Physics Community (Chairman).

**John W. Weymouth:** Consultant, NATO Science for Stability Program, Geophysical/Archaeology Project in Greece; Scientific Committee, 1st Hellenic Geophysical Congress, Athens, April 1989.

## 1988-89 Visiting Staff Members

Visiting our Department in Fall 1988 as a MASUA Distinguished Foreign Scholar is **Jorge Sahade** (Ph.D. 1943, La Plata, Argentina), who is the current President of the International Astronomical Union and Professor of Astronomy at the University of La Plata.

On our staff as Visiting Professors this year are experimental atomic physicist **Sam J. Cipolla** (Ph.D. 1969, Purdue) from Creighton University; astronomer **Mohammad T. Edalati** (Ph.D. 1978, Manchester) from the University of Mashad (Iran); experimental condensed matter physicist **Hasan Erdogan** (Ph.D. 1976, Ankara Nuclear Research Center) from Ataturk University in Erzurum, Turkey; condensed matter theorist **John Flocken** (Ph.D. 1969, Nebraska) from the University of Nebraska-Omaha; astronomical historian **Liu Yao-Han** (Ph.D. 1947, Academia Sinica, Beijing), who is the Director of the Yi Culture Research Institute of China in Chuxiong, Yunnan; and astronomical historian **Lu Yang** (Ph.D. 1956, Nanjing, China), from the Center for the Study of Chinese Thinkers at Nanjing University.

Visiting Associate Professor this year is track physicist **Luo Daling** (Ph.D. 1959, Beijing University) from Zhongshan University.

Visiting Assistant Professors this year are experimental condensed matter physicist **Charles G. Robbins** (Ph.D. 1969, Illinois), and elementary particle theorist and computational physicist **Glenn A. Sowell** (Ph.D. 1982, Florida State) from the Superconductor Computations Research Institute at Florida State.

In our Department as Postdoctoral Research Associates this year are experimental atomic physicist **Gordon Angel** (Ph.D. 1973, Queens University, Belfast), working with Professor Samson; experimental condensed matter physicist **David Billesbach** (Ph.D. 1987, Nebraska), working with Professors J. Hardy and Ullman; theoretical atomic physicist **Michael Cavagnero** (Ph.D. 1987, Chicago), working with Professor Starace; experimental atomic physicist **Mark Gealy** (Ph.D. 1987, Denver), working with Professor Rudd; theoretical atomic physicist **Chih-Ray Liu** (Ph.D. 1988, Nebraska), working with Professor Starace; theoretical condensed matter physicist **Lu Hsiao-Ming** (Ph.D. 1988, Arizona State), working with Professor J. Hardy; 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 **Jian Xiang Shen** (Ph.D. 1984, Lanzhou University, China), working with Professor Sellmyer; and experimental atomic physicist **Orhan Yenen** (Ph.D. 1986, Nebraska), working with Professor Jaecks.

## 1987 Fall Semester Colloquia

- September 3  
Professor Michel Tronc, Université Pierre & Marie Curie, Paris  
**"Resonant Vibrational Excitation in Polyatomic Molecules"**
- September 10  
Professor Ronald F. Webbink, University of Illinois-Urbana  
**"Formation and Evolution of Symbiotic Stars"**
- September 17  
Professor Joseph Ford, Georgia Institute of Technology  
**"What Is Chaos That We Should Be Mindful Of It?"**
- September 24  
Professor Wai-Ning Mei, MASUA Honor Lecturer, University of Nebraska-Omaha  
**"Surface Structure Study Using Low Energy Electron and Photoelectron Diffraction Spectroscopy"**
- October 8  
Professor Chia-Ling Chien, Johns Hopkins University  
**"Superlattices and Modulated Solids"**
- October 15  
Professor Alex Lusnikov, University of Nebraska-Omaha  
**"Ion-Beam Modification of Surface Properties of Solids"**
- October 22  
*The Jerry E. Ruckman Lecture*  
Professor John S. Risley, North Carolina State University-Raleigh  
**"Incorporating Educational Software Into a Physics Classroom"**
- October 29  
Daniel Kleppner, Lester Wolfe Professor of Physics, The Massachusetts Institute of Technology  
**"Eigenstates of Chaos"**
- November 5  
Professor David B. Wilson, Iowa State University  
**"Aether Or? The Significance of an Obsolete Concept"**
- November 12  
Professor Larry Spruch, New York University  
**"The Beta Decay of Rhenium 187: An Interface of Atomic and Nuclear Physics and Cosmochronology"**
- November 19  
Professor John R. Clem, Iowa State University  
**"The New High Temperature Superconductors"**
- December 3  
Professor Sitaram S. Jaswal, University of Nebraska-Lincoln  
**"The Games Electrons Play in the Macroscopic World of Condensed Matter"**
- December 7  
Dr. Dominic Ryan, McGill University, Canada  
**"Is Amorphous Iron Magnetic?"**
- December 10  
Dr. Sy-Hwang Liou, AT&T Bell Laboratories  
**"Composite Materials and High-T<sub>c</sub> Superconductors by Vapor Deposition"**
- December 17  
Dr. James Kakalios, Xerox Palo Alto Research Center  
**"Novel Transport Phenomena in Amorphous Semiconductors"**

## 1988 Spring Semester Colloquia

- January 11  
Dr. Arjun Yodh, AT&T Bell Laboratories, Holmdel, N.J.  
**"Optical Excitation of Muonium"**
- January 19  
Dr. Philip Arcuni, University of Notre Dame  
**"Collisionally Created Autoionization States: Excitation and Decay"**
- January 21  
Dr. Wallace L. Glab, Argonne National Laboratory  
**"Experimental Studies of the Spectroscopy and Dynamics of Rydberg States of Molecular Hydrogen"**
- February 4  
Dr. S.W.S. McKeever, MASUA Honor Lecturer, Oklahoma State University  
**"The Measurement of Absorbed Radiation Dose by the Method of Thermoluminescence"**
- February 11  
Dr. Paul D. Lett, National Bureau of Standards  
**"Associative Ionization of Ultra-Cold Laser-Trapped Sodium Atoms"**
- March 3  
Dr. Clifford Bettis, University of Nebraska-Lincoln  
**"Twinkle, Twinkle, Supernova"**
- March 10  
Dr. Jay N. Marx, Lawrence Berkeley Laboratory  
**"Synchrotron Radiation: A Bright Source of UV and X-Rays for Basic and Applied Science"**
- March 17  
Dr. Peter Zoller, Innsbruck University, Austria  
**"Rydberg States in Laser Fields"**
- March 31  
Professor Henry J. Lubatti, University of Washington  
**"To the Heart of Matter: The Superconducting Supercollider"**
- April 7  
Dr. Jan F. Herbst, General Motors Research Laboratories  
**"The New Supermagnet: Neodymium-Iron-Boron"**
- April 14  
Professor John Stachel, Boston University  
**"What a Physicist Can Learn from the Origins of General Relativity"**
- April 21  
Dr. Deidre Hunter, Lowell Observatory  
**"Star Formation in Irregular Galaxies"**
- April 28  
Dr. Gordon Dunn, University of Colorado-Boulder  
**"Dielectronic Processes in Electron-Ion Collision"**
- May 16  
Dr. David W. Duquette, Harvard College Observatory  
**"Radiative Lifetime Measurements in an Ion Trap"**
- July 25  
Professor J. Hafner, Technical University, Vienna, Austria  
**"Interplay between Atomic and Electronic Structures in Liquid and Amorphous Metals and Alloys"**

# 1987 Faculty Publications

## ASTRONOMY AND ASTROPHYSICS

- Y.F. Li and K.C. Leung, "Analysis of the Evolved System V367 Cygni," *Astrophysical Journal* **313**, 801-807 (1987).
- Y.F. Li and K.C. Leung, "New Analysis of Two Algol System: TX CET and RR TrA," *Astronomical Journal* **93**, 678-682 (1987).
- H.C. Harris, D.L. Welch, R.P. Kraft, E.G. Schmidt, "The Binary Cepheid DL Cas and the Open Cluster NGC 129," *Astronomical Journal* **94**, 403 (1987).
- N.R. Simon, "Cepheids: Problems and Possibilities," in *Stellar Pulsation: A Memorial to John P. Cox*, Edited by A. N. Cox et al. (Springer-Verlag, Berlin, 1987), p. 148.
- T. Aikawa, E. Antonello and N.R. Simon, "Hydrodynamic Models for the Short-Period Classical Cepheid, SU Cas," *Astronomy and Astrophysics* **181**, 25 (1987).
- N.R. Simon, "On the Inversion of the Baade-Wesselink Technique," *Publications of the Astronomical Society of the Pacific* **99**, 868 (1987).

## ATOMIC, MOLECULAR AND OPTICAL PHYSICS

- P.D. Burrow, J.A. Michejda and K.D. Jordan, "Electron Transmission Study of the Temporary Negative Ion States of Selected Benzenoid and Conjugated Aromatic Hydrocarbons," *Journal of Chemical Physics* **86**, 9 (1987).
- P.D. Burrow and K.D. Jordan, "Temporary Anion States of Polyatomic Hydrocarbons," *Chemical Reviews* **87**, 557 (1987).
- P.D. Burrow, K.L. Stricklett and D.J. Burns, "Magnetically Induced Circular Polarization," *Physical Review A* **36**, 5280 (1987).
- D.W. Duquette, E.A. Den Hartog and J.E. Lawler, "Absolute Transition Probabilities in TaI and WI," *Journal of the Optical Society of America B* **4**, 48 (1987).
- O. Yenen, D.H. Jaecks, and P.J. Martin, "Quasidiatomic Study of Ly -  $\alpha$  - Producing  $H_2^+$  - Ne Collisions at KeV Energies," *Physical Review A* **35**, 1517 (1987).
- J.H. Miller, W.E. Wilson, S.T. Manson, and M.E. Rudd, "Differential Cross Sections for Ionization of Water Vapor by High-Velocity Bare Ions and Electrons," *Journal of Chemical Physics* **86**, 157 (1987).
- M.E. Rudd, "Single Differential Cross-Sections for Producing Secondary Electrons from Hydrogen Gas by KeV to MeV Proton Collisions," *Radiation Research* **109**, 1 (1987).
- A. Itoh and M.E. Rudd, "Recoil-Ion Production from Zero-Impact-Parameter  $H^+$  - Ar and  $H^+$  - Kr Collisions at 20-70 KeV," *Physical Review A* **35**, 66 (1987).
- A. Itoh and M.E. Rudd, "Recoil Ions from Close 20-KeV Collisions with  $O_2$ , CO,  $CO_2$  and Ne," *Physical Review A* **35**, 1937 (1987).
- J.A.R. Samson, and G.C. Angel, "The Photoionization Cross Sections of Molecular Chlorine," *Journal of Chemical Physics* **86**, 1814 (1987).
- J.A.R. Samson, T. Masuoka, P.N. Pareek and G.C. Angel, "Total and Dissociative Photoionization Cross Sections of  $N_2$  Between 115 and 800 Å," *Journal of Chemical Physics* **86**, 6128 (1987).
- J.A.R. Samson, D.L. Kilcoyne, and G.N. Haddad, "Total and Dissociative Photoionization Cross Sections of  $NH_3$  from 80 to 1120 Å," *Journal of Chemical Physics* **87**, 6416 (1987).
- K.A. Jerjian and J. Macek, "Hyperspherical Treatment of Three-Body Molecular States," *Physical Review A* **36**, 2667 (1987).
- J. Macek, "New Features of Secondary Electron Spectra in Ion-Atom Collisions," *Nuclear Instruments and Methods* **B24**, 248 (1987).
- C.D. Lin and J. Macek, "Theory of Anisotropy Transfer and Calculations of Alignment of np States Populated in Electron Capture by Highly Charged Ions," *Physical Review A* **35**, 5005 (1987).
- A.F. Starace and J.H. Macek, Comment on "Molecular Description of Two-Electron Atoms," *Physical Review Letters* **58**, 2385 (1987).
- C.-R. Liu and A.F. Starace, "Atomic Hydrogen in a Uniform Magnetic Field: Low-Lying Energy Levels for Fields Above  $10^9$  G," *Physical Review A* **35**, 647 (1987).
- A.F. Starace, "Electron Correlation Effects in Nonresonant Multiphoton Ionization Processes," *Physica Scripta* **T17**, 221 (1987).
- A.F. Starace and T.-F. Jiang, "Transition-Matrix Theory for Two-Photon Ionization of Rare-Gas Atoms and Isoelectronic Ions with Application to Argon," *Physical Review A* **36**, 1705 (1987).
- B. Gao and A.F. Starace, "Numerical Methods for Free-Free Radiative Transition Matrix Elements," *Computers in Physics* **1**, 70 (1987).

## CONDENSED MATTER PHYSICS

- P.J. Edwardson, V. Katkanant, and J.R. Hardy, "Simulation of Normal  $Rb_2ZnCl_4$  Near the Incommensurate Transition," *Physical Review B* **35**, 8470 (1987).
- P.J. Edwardson, V. Katkanant, J.R. Hardy, and L.L. Boyer, "Theory of Incommensurate Behavior in  $BaMnF_4$ ," *Solid State Communications* **64**, 625 (1987).
- R.J. Hardy and M.A. Day, "Correlated Particles Expansion Applied to the Hard Sphere Solid," *Journal of Chemical Physics* **86**, 7089 (1987).
- S.H. Liou and C.L. Chien, "Concentration Range of Binary Amorphous Alloys," *Physical Review B* **35**, 2443 (1987).
- S.H. Liou, Gang Xiao, C.L. Chen and K.M. Unruh, "Multilayer Fe/Cu Films," In *Interfaces, Superlattices and Thin Films*, MRS Symposia Proceedings Vol. 77, Edited by J.D. Dow and I.K. Schuller (Materials Research Society, Pittsburgh, PA 1987) p. 697.
- C.L. Chien and S.H. Liou, "Modulated Amorphous Alloy Films," in *Interfaces, Superlattices and Thin Films*, MRS Symposia Proceedings Vol. 77, Edited by J.D. Dow and I.K. Schuller (Materials Research Society, Pittsburgh, PA 1987) p. 387.
- C.L. Chien, S.H. Liou, Gang Xiao, S.H. Ge and M.A. Gatzke, "Magnetic Percolation in New Crystalline BCC Fe-Mo and FCC Fe-Cu Alloys," in *Science and Technology of Rapidly Quenched Alloys*, MRS Symposia Proceedings Vol. 80, Edited by M. Tenhover, L.E. Tanner and W.L. Johnson (Materials Research Society, Pittsburgh, PA, 1987), p. 395.
- S.H. Liou and C.L. Chien, "Atomic Size Effects on the Composition Range of Amorphous Alloys," in *Science and Technology of Rapidly Quenched Alloys*, MRS Symposia Proceedings Vol. 80, Edited by M. Tenhover, L.E. Tanner and W.L. Johnson (Materials Research Society, Pittsburgh, PA 1987), p. 145.
- S.H. Liou, S.H. Ge, J.N. Taylor and C.L. Chien, "Enhanced Magnetism in Amorphous Fe-Based Alloys," *Journal of Applied Physics* **61**, 3243 (1987).
- C.L. Chien, Gang Xiao, S.H. Liou, J.N. Taylor and A. Levy, "Granular Magnetic Fe-SiO<sub>2</sub> Solids," *Journal of Applied Physics* **61**, 3311 (1987).
- K. Bridger, J. Watts, M. Tadros, Gang Xiao, S.H. Liou and C.L. Chien, "Magnetic Characteristics of Ultrafine Fe Particles Reduced From Uniform Iron Oxide Particles," *Journal of Applied Physics* **61**, 3323 (1987).
- M. Abe, S.H. Liou, C.L. Chien, N.C. Koon, B.N. Das and E. Callen, "Mossbauer Study of Spin Reorientation in  $Y_{1.8}Er_{0.2}Fe_{14}B$ ," *Journal of Applied Physics* **61**, 3568 (1987).
- C.H. Chen, D.J. Werder, S.H. Liou, J.R. Kwo and M. Hong, "Antiphase Domain Boundaries in the Superconducting Phase of Y-Ba-Cu-O System," *Physical Review B* **35**, 8767 (1987).
- J. Moreland, J.W. Ekwin, L.F. Goodrich, T.E. Capobianco, A.F. Clark, J. Kwo, M. Hong, and S.H. Liou, "Break-Junction Tunneling Measurements of the High  $T_c$  Superconductor  $YBa_2Cu_3O_{9-x}$ ," *Physical Review B* **35**, 8856 (1987).
- M. Hong, S.H. Liou, J. Kwo, and B.A. Davidson, "Superconducting Y-Ba-Cu-O Oxide Films by Sputtering," *Applied Physics Letters* **51**, 694 (1987).
- K.B. Lyons, S.H. Liou, M. Hong, H.S. Chen, J. Kwo, and T.J. Negran, "Roman Detection of Superconducting Gap in Ba-Y-Cu-O Superconductor," *Physical Review B* **36**, 5592 (1987).
- J. Kwo, T.C. Hsieh, R.M. Fleming, M. Hong, S.H. Liou, B.A. Davidson, and L.C. Feldman, "Structural and Superconducting Properties of Single Crystal Oxide Films Prepared by Molecular Beam Epitaxy," *Physical Review B* **36**, 4039 (1987).
- S.S. Jaswal, D.J. Sellmyer, M. Engelhardt, Z. Zhao, A.J. Arko, and K. Xie, "Electronic Structure, Photoemission and Magnetism in  $Gd_2Co$  and  $Er_2Co$  Glasses," *Physical Review B* **35**, 996 (1987).
- D.J. Sellmyer, G. Muench, and M.J. O'shea, "Magnetic Properties, Phase Transitions, and Microstructural Effects in Mixed GdLa-Based Glasses," *Journal of Magnetism and Magnetic Materials* **65**, 93 (1987).
- Z.S. Shan, Z.R. Zhao, J.G. Zhao, and D.J. Sellmyer, "Magnetism and Microstructure of Compositionally-Modulated Disordered Fe/Ta Films, M<sup>3</sup>-86," *Journal of Applied Physics* **61**, 4320 (1987).
- D.J. Sellmyer, Z.R. Zhao, Z.S. Shan, and S. Nafis, "Magnetic Properties of Fe/Nd Multilayer Films, M<sup>3</sup>-86," *Journal of Applied Physics* **61**, 4323 (1987).

- K.M. Lee, M.J. O'Shea and **D.J. Sellmyer**, "Magnetic Transition and Scaling in Anisotropic Rare-Earth Glasses, M<sup>3</sup>-86," *Journal of Applied Physics* **61**, 3616 (1987).
- J.A. Woollam, H. Chang, S. Nafis, and **D.J. Sellmyer**, "Temperature Dependence (4K to 300K) of the Electrical Resistivity of Methane Grown Carbon Fibers," *Applied Physics Communications* **7**, 9 (1987).
- D.J. Sellmyer**, "Random Magnetism and Phase Transitions in Homogeneous and Multilayered Amorphous Systems," in *Magnetic Properties of Amorphous Metals*, Edited by A. Hernando (Elsevier Science Publishers, Amsterdam, 1987), p. 98.
- D.J. Sellmyer** and S. Jafarey, "Phase Transitions," *McGraw-Hill Encyclopedia of Science and Technology*, Sixth Edition, Edited by S. Parker (McGraw Hill, New York, 1987).

## ELEMENTARY PARTICLES AND FIELDS

- G.S. Hall, Z. Perjés and **T. Morgan**, "Three Dimensional Space-Times," *Journal of General Relativity and Gravitation* **19**, 1137 (1987).

## INTERDISCIPLINARY PHYSICS

### (a) Archaeometry

- J.W. Weymouth**, "A Magnetic Survey of Mount Dardon," Appendix D, Chapter 3, in *Regional Dynamics, Burgundian Landscapes in Historical Perspective*, Edited by C.L. Crumley and W.H. Marquardt (Academic Press, New York, 1987), pp 94-102.

### (b) History of Science

- M.E. Rudd**, "Three Early American Compasses," *Rittenhouse, Journal of the American Scientific Instrument Enterprise* **1**, 76 (1987).

### (c) Physics Education

- C. Bettis**, "Demons," a data base program for physics demonstrations (1987).
- C. Bettis**, "Safety and Crookes Type Cathode Ray Tubes," *The Physics Support Newsletter* Vol 3, No 1 (1987).
- R.G. Fuller**, "Applications Software Transforms Science Teaching," *Journal of College Science Teaching* **16**(4), 239 and 412-415 (1987).
- R.G. Fuller**, "Setting up an Interactive Videodisc Project," in *Interactive Media: Working Methods and Practical Applications*, Edited by D. Laurillard (Ellis Horwood, Ltd., Chichester, United Kingdom, 1987), Chapter 1.
- R.G. Fuller**, "The Use of Interactive Videodiscs for Teaching Physics," in *The Computer Revolution in Education: New Technologies for Distance Teaching*, Edited by A. Jones, E. Scanlon, and T. O'Shea (The Harvester Press, Sussex, United Kingdom, 1987), Chapter 10.
- R.E. Swanson and **R.G. Fuller**, "Skylab Physics," (U.S. Air Force Academy, Colorado Springs, CO, 1987), a videodisc.

### (d) Track Physics

- M.P.R. Waligorski, G.L. Sinclair, and **R. Katz**, "Inactivation of Dry Enzymes and Viruses by Energetic Heavy Ions," *Radiation Physics and Chemistry* **30**, 201 (1987).
- M.P.R. Waligorski, G.L. Sinclair and **R. Katz**, "Radiosensitivity Parameters for Neoplastic Transformation in C3H11OT1/2 Cells," *Radiation Research* **111**, 424 (1987).

## New Research Grants and Contracts

During the period 1 November 1987—31 October 1988 the following new and renewal external grants and contracts were received by our faculty:

Principal Investigator	Title (Source of Funds)	Amount (\$ Thousands)
<b>P.D. Burrow</b>	Electron Scattering Studies of Temporary Anion Formation in Hydrocarbons (NSF)	\$ 74.0
<b>R.G. Fuller</b>	High School Physics Demonstration/Laboratory Summer Institute (NE Coord. Comm. for Postsecondary Education)	\$ 31.0
<b>J.R. Hardy</b>	Dielectric Properties of Ferroelectrics (ONR)	\$109.4
<b>J.R. Hardy/ F.G. Ullman</b>	Incommensurate Phases and Superlattice Production (ARO)	\$130.0
<b>D. Jaecks</b>	Experimental Tests of Excitation Mechanisms for keV Ion-Molecule Collisions (NATO)	\$ 6.7
<b>D. Jaecks/ M.E. Rudd</b>	Inelastic Processes in Atomic Collisions (NSF)	\$321.0
<b>R. Katz</b>	Theory of Relative Biological Effectiveness (DOE)	\$ 54.0
<b>K.C. Leung</b>	Far UV Study of Supergiant Semidetached and Contact Systems (NASA)	\$ 12.0
<b>K.C. Leung</b>	Contact and Semidetached Systems of Case B Mass Exchange (NSF)	\$ 14.0
<b>J. Macek</b>	Theory of Atomic Collisions (NSF)	\$ 77.5
<b>J.A.R. Samson</b>	Interaction of Radiation with Planetary Gases (NASA)	\$ 28.2
<b>J.A.R. Samson</b>	Ultraviolet and X-ray Bombardment of Planetary Atmosphere (NSF)	\$ 65.0
<b>J.A.R. Samson</b>	Photoionization Studies of Atoms (NSF)	\$ 50.0
<b>E.G. Schmidt/ D.J. Taylor</b>	A Panoramic Stellar Photometer (NSF)	\$ 40.0
<b>D.J. Sellmyer</b>	Magnetic Properties and Anisotropy in Rare Earth Metal Multilayered Films (NSF)	\$ 47.7
<b>D.J. Sellmyer</b>	Magnetic Characterization of Particulate Coatings (CDC)	\$ 60.0
<b>D.J. Sellmyer</b>	Magnetic Studies of Iron-Rare Earth Metalloid Alloys (DOE)	\$ 56.8
<b>D.J. Sellmyer/ J.A. Woolman</b>	Compositionally-Modulated Disordered Magnetic Films (NSF)	\$ 55.5
<b>N. Simon</b>	Conference on Pulsating Stars and Fundamental Problems in Astronomy (NSF)	\$ 3.5
<b>A.F. Starace</b>	Conference on Track Physics (DOE)	\$ 6.5
<b>A.F. Starace</b>	Dynamics of Collision Processes (DOE)	\$ 60.0
<b>A.F. Starace</b>	Theory of Electron Correlation in Atomic Processes (NSF)	\$ 18.2
<b>J.W. Weymouth</b>	Magnetic Survey Maps of Ft. Union, North Dakota (National Park Service)	\$ 3.6
TOTAL		\$1,324.6