

# u SPECTRUM

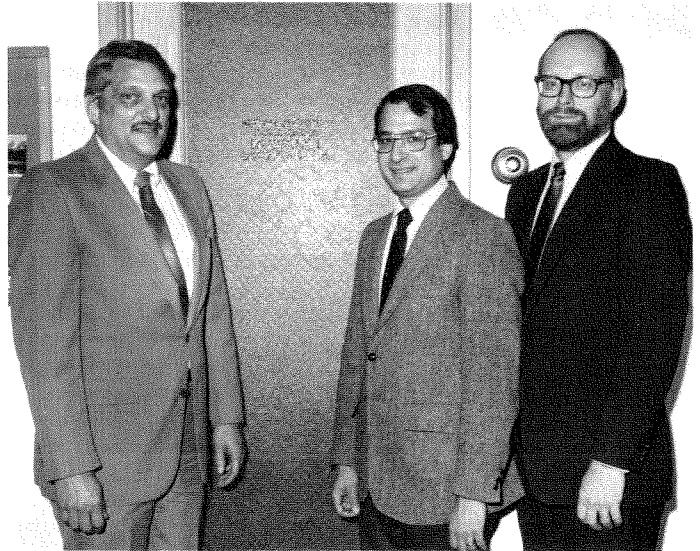
A Newsletter for Alumni and Friends of the Department of Physics and Astronomy of the University of Nebraska—Lincoln

No. 8 Fall 1987

M. Eugene Rudd, Spectrum Editor

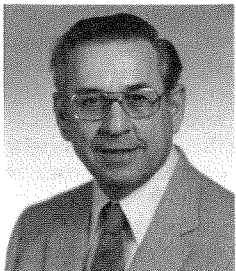
## Fuller Named to New AAPT Editorial Position

Professor **Robert G. Fuller** has been selected as the Editor of the new Instructional Materials Center which the American Association of Physics Teachers (AAPT) has established at the University of Nebraska. The purpose of this center is to serve the physics teaching community by providing access to and information about all types of instructional materials. These materials include such media as computer software, film, video tapes, video disks, etc. The Center is located in Fuller's suite in Ferguson Hall. **Marilyn McDowell**, secretary for the ADAPT program, has increased her employment from half-time to full-time in order to take on the additional job of secretary for the new Center. Fuller was formally installed as Editor at a ribbon-cutting ceremony on March 27th presided over by Professor Howard G. Voss (of Arizona State University), the Secretary of AAPT.



Howard G. Voss, Anthony F. Starace, and Robert G. Fuller

## Outstanding Research Award to Samson



James A. R. Samson

Charles Mach Professor of Physics **James A. R. Samson** has been selected as one of two recipients of the 1986-87 University of Nebraska Outstanding Research and Creativity (ORCA) Awards. The ORCA award is the highest recognition offered by the University to those faculty whose attainments merit national and international acclaim. Samson was selected "for his innovative uses of fluorescence spectroscopy for pioneering experimental measurements of vacuum-ultraviolet radiation-induced atomic and molecular processes."

He is a fellow of both the American Physical Society and the Optical Society of America. In 1976 he was awarded a Regents Professorship at UNL. He has held six invited visiting professorships, published over 100 research articles, presented over 40 invited talks at scientific meetings, and has been granted over \$2 million in external research grants.

Samson has disproved the charge that active researchers are not good teachers by winning UNL's Distinguished Teaching Award in 1985. His service record is likewise extensive. He has served as an Associate Editor of the Journal of the Optical Society of America and has been a member of several scientific society program committees. Recently he was appointed to the Review Committee for the Accelerator and Fusion Research Division of Lawrence Berkeley Laboratory.

## Sellmyer Named Distinguished Professor



David J. Sellmyer

**David J. Sellmyer** was named George Holmes Professor of Physics by the Board of Regents at their October 1987 meeting. He is one of seven UNL faculty who are new recipients of University-Wide Distinguished Professorships. He joins **Joseph H. Macek** and **James A. R. Samson** as the third member of this Department's faculty to be so honored. Sellmyer, who received the BS degree from Illinois in 1960 and the PhD degree from Michigan State in 1965, was a faculty member at MIT before joining UNL in 1972. From 1978-84 he served as Chairman of this Department. He has written over 100 articles in refereed scientific journals and in addition has written six major review articles on metallic compounds, rare earth glasses, and amorphous magnetism. Currently he is beginning a book on "Electronic Structure of Solids," to be published by Academic Press. He has been awarded over \$1.7 million in external grants in support of his research, not only by federal funding agencies but also by major industrial corporations. Recently Sellmyer was appointed Chairman of UNL's Materials Research Planning Council, which is preparing recommendations for the establishment here of a Center for Materials Research and Analysis.

## Chairman's Letter

Dear Alumni and Friends,



Anthony F. Starace

The news this year in physics and astronomy has been filled with superlatives describing all the events regarding superconductors, superclusters, supernovas, supercolliders, and superstrings. The discovery of high temperature superconductors in particular has stimulated physicists everywhere, including here at UNL where our graduate students have been making these novel materials for the past several months. The potential applications of these materials have already led to new Presidential funding initiatives. But there are also lessons to be learned from the story of the discovery of these materials. Remarkably, this major advance was made by only a *few* individuals with *modest* resources who were pursuing an *unfashionable* idea. Clearly this discovery underlines the wisdom of continued *broad* support of science as a whole and a *balance* between big science and small science as well as between programmatic research and basic research.

This year has also been a stimulating one for the Department in several additional ways. Firstly, all of the major experimental groups have been adding equipment to enhance their research capabilities. Thus there is the installation of the new CCD camera at Behlen Observatory, the establishment of the astronomy group's computing facility as well as the condensed matter group's new x-ray materials characterization facility, and the upgrading of the atomic collision group's ion accelerator. Secondly, our physical facilities are slated for substantial renovations in the coming year, including the move of our research library annex to the first floor of Brace, the remodelling of Brace Lab Auditorium, and the stringing of Ethernet backbone cables throughout Ferguson, Brace, and Behlen [to enable our faculty and student to log on to any of a host of computer networks]. Thirdly, this year, as in previous years, our faculty, staff, and students have won a number of awards and honors for teaching, research, and service. Finally, our Department is now the host institution for the AAPT's new Instructional Materials Center. This new issue of *Spectrum* describes these developments, activities, and achievements and the people associated with them.

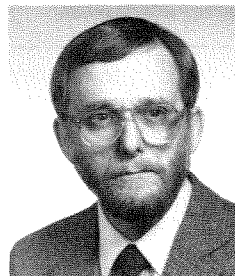
Speaking for all our faculty, staff, and students, I want to express our gratitude to you—our alumni and friends—for the continued and increasing support you have provided for our many and varied activities. These private funds give us the flexibility to respond to various needs—ranging from the enhancement of our teaching and research programs with state-of-the-art laboratory equipment to support of the activities of our Society of Physics Students—for which state and federal support is either insufficient or else not appropriate. We shall continue to work diligently to earn your continued support.

Finally, you should know that we are all truly delighted to hear from you and to learn of your activities. Enclosed is a post card to inform us of your current address and recent activities. If you wish to write more, please send us a letter. We are also very happy to see you when you happen to be in Lincoln. Best wishes until next year.

Sincerely,

Anthony F. Starace  
Professor & Chairman

## Campbell Receives Distinguished Teaching Award



William B. Campbell

teaching.

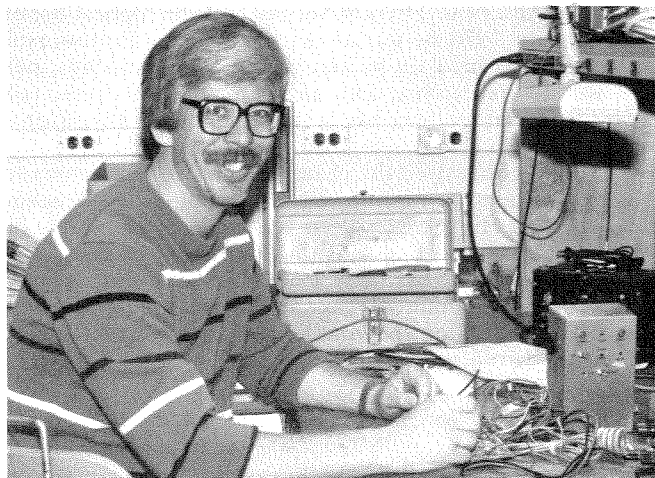
Professor **William B. Campbell** received a College of Arts and Sciences Award for Distinguished Teaching at the April 10th UNL Honors Convocation. Campbell was cited for his "clear, well-organized, and enthusiastic lectures" and for "the personal attention and individual help" he provides to his students. His award marks the twelfth one received by Department faculty. Nine of the Department's current 27 regular faculty have received this recognition for excellence in

## Macek Appointed to Department of Energy Advisory Committee

George Holmes Professor of Physics **Joseph H. Macek** has been appointed by the Secretary of Energy, John S. Herrington, to serve as a charter member of the Department of Energy's Basic Energy Sciences Advisory Committee. This committee reports to Herrington through the Director of the Office of Energy Research and advises him on the scientific aspects of a range of important matters relating to the Basic Energy Sciences Program. The committee comprises 16 scientists from the fields of physics, chemistry, geology, and engineering who represent universities, government laboratories, and industry. Macek will serve a one-year term and may be reappointed for up to four additional years.

## Kelty Wins Sigma Xi Support-of-Research Award

Electronics Shop Supervisor **John R. Kelty** received the 1987 Support-of-Research Award of the Society of Sigma Xi, the scientific honorary society, at its Initiation and Awards Banquet on April 15th. He was cited for his familiarity "with the general needs of most research programs" which enables him to "suggest, design, and construct sophisticated electronic systems . . . that have allowed investigations to be made that would otherwise have been impossible." He was cited not only for his work in this Department but also for his work for the Polar Ice Core Program, which has required electronic systems designed to fit inside a borehole survey tool and to withstand the extremely low temperatures of the ice fields in Greenland and the Antarctic. Kelty will spend about a month at the Byrd Station this winter.



John R. Kelty

## Minnich Telescope and Astronomical Computing Center Near Completion

The Minnich telescope built with a gift of \$10,000 by **Charles B. Minnich** and the 6-inch aperture lens polished by his grandfather Charles S. Minnich, has been completed and the first few brief looks at the sun and terrestrial objects have been very promising. The telescope is a coudé refractor (meaning that it has an elbow bend in the light path and tube) that will be mounted in the south-facing window of the Astronomy Resource Center on the second floor of Ferguson Hall. There it will be able to view any object in the southern half of the sky—which generally includes the sun, moon, and planets. The observer will be in shirt-sleeve comfort looking into an eyepiece which is fixed in position at a comfortable angle—much like looking through a microscope. The elbow-like bend makes this possible no matter where in the sky the object is situated. Objects are located by means of “setting circles” and a clock drive then automatically tracks the object.

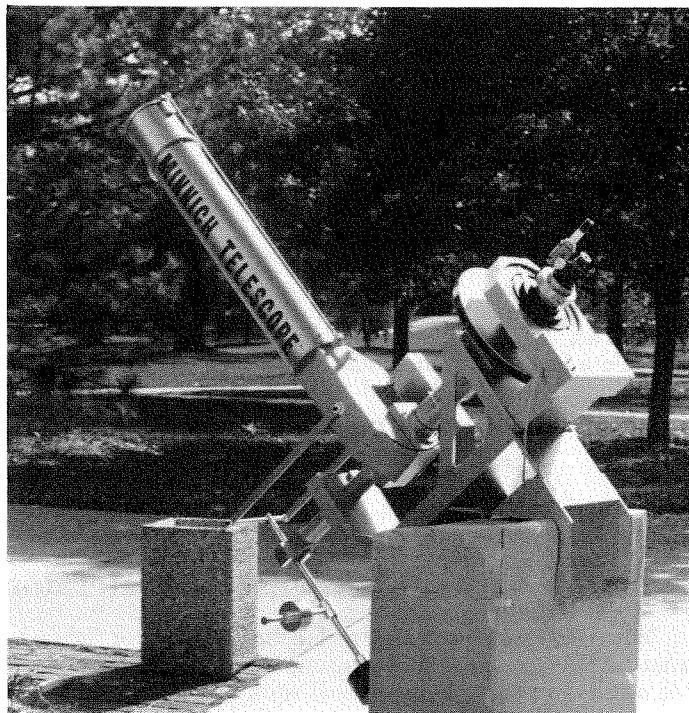
During the daytime the telescope will track the sun, and the telescope will project (via a flat mirror) a two foot image of the sun onto a white screen. Students glancing into the Resource Center as they pass by will see this shimmering image of the sun and the more curious will find they can see sun spots in detail if they look at the image close up.

A feature unique to this telescope is the counter-weight system, which uses a parallel linkage to transfer the counter-balancing torque from counter-weights that are located about two feet remote from the telescope tube they balance. This was necessary so that the weights would not run into the building.

The telescope, which was designed by Associate Professor **Don Taylor** and fabricated by **Gerry Moore** of the Physics and Astronomy machine shop, looks very elegant. With its gold anodized finish it looks like the gleaming brass finish of a 19th century engine of science. **Don Fuehring**, shop manager, and **Al Evelyn**, business manager, have also been instrumental in bringing this telescope into existence.



*Charles B. Minnich*



*Minnich telescope in recent test.*

All that remains is to install the telescope in the window and complete the carpentry necessary to seal the window around the telescope. As soon as it is ready, a dedication will be planned.

The Minnich Astronomical Computing Center, also provided by a gift from **Charles B. Minnich**, has been in operation since the beginning of the summer. It provides the Department's astronomy research group and students with enough computing power to analyze the image data obtained with their new CCD solid state camera. The center, which was planned and is directed by Professor **Edward Schmidt**, Director of Behlen Observatory, has a Micro-VAX II computer, eight terminals, four printers, and both disk and cassette tape storage of data. It also has an IBM PC compatible American XT computer that allows Micro-VAX data to be put into an IBM PC compatible format for those users who have that kind of equipment. The center already has wiring which enables staff and students to use the computer from terminals in their offices and soon the connection to ETHERNET will make it possible for the center to communicate with other computers around the campus, or country. **John Kelty**, electronics shop supervisor, and **Brian Farleigh**, electronics technician, and **Al Evelyn**, business manager, provided much of the support that brought this computer center into existence.

The center looks quite smart with its gray, black, and wood-grained color scheme for furnishings and room. The dedication will take place at the same time as the telescope dedication.

## The Largest Binary Star System?

Two astronomers at the University of Nebraska have shown that a binary star studied in 1933 by Christie may be the most massive binary system known. Professor **Kam-Ching Leung** and Visiting Professor **Zong-Yun Li** from Nanjing University in China have studied the system known as 5 Ceti by an extensive computer analysis. This analysis combines Christie's spectroscopic Doppler shift measurements with the 1981 photometer meas-

urements of Lines and Hall. This system is an eclipsing binary with the unusually long period of 96 days. Most other systems of this type have periods ranging from  $\frac{1}{4}$  to 20 days. Leung and Li's results indicate that 5 Ceti is a contact system, i.e. the two components of the binary are joined, and that the two components have masses of about 15 and 90 solar masses. The largest previously discovered binary system has a mass of 60 solar masses. Further study of this unusual system is being continued at UNL.

## \$1.2 Million Grant in Atomic Collisions

A 3½-year grant totalling \$1,198,000 was awarded by the National Science Foundation for atomic collisions research proposed by principal investigators **M. Eugene Rudd** and **Duane H. Jaecks**. **Donal Burns**, now in the systems office of the University and **Sam Cipolla** of Creighton University in Omaha are faculty associates on the grant. The grant is the latest update of a series of grants dating back to 1966, shortly after Rudd joined the faculty. His and Jaecks' 1967 NSF grant were merged in 1969 and have been renewed continuously ever since. In fact, this is one of the longest running grants in the Atomic Physics Section at NSF.

Nine experimental projects are covered by the grant in the general area of ion-atom collision cross section measurements. Funds are included in the grant to make a major overhaul (see article on this) of the 350-keV accelerator, one of the four accelerators used in this work.

\* \* \* \* \*

## Rebuilding of the Jorgensen Accelerator

When **Ted Jorgensen** returned to the University of Nebraska after his work at Los Alamos during World War II, he built an ion accelerator to do experimental work on the relation of the range of high energy ions in matter to their energy. This accelerator, which has been in continuous use ever since, is now undergoing a major renovation. With funds from the National Science Foundation, the entire ion source along with the accelerating column will be replaced with commercial models. In addition, the old brass drift tube will be replaced by one being built in our shop from stainless steel.

The original accelerator and the Atomic Energy Commission contracts that it brought were the backbone of the Ph.D. program in the department in the early years. Dozens of students have written Ph.D. and master's theses on work done on the accelerator.

There have been modifications in the accelerator over the years. In 1964 when it was moved from its place in the old heat laboratory in Brace to the subbasement of Behlen, a new power supply was purchased which was far more convenient than the voltage quadrupler built from an x-ray machine donated by a local doctor. A complex voltage regulating system originally had a d'Arsonval galvanometer in the feedback network. That has long since been replaced by an electronically regulated supply. And from time to time, the gas supply system and the electronics running the ion source have been rebuilt.

The new accelerating column, being built by a company in England, will have many metal electrodes sealed to glass insulators and will be surrounded by corona rings smaller than the ones presently in place. The ion source will still be the RF type, but will be commercially built. The total upgrade will cost about five times the original cost of the entire accelerator!

We were somewhat worried about what Ted's reaction would be when told about the extensive changes to be made on his accelerator. However, his hearty endorsement of the project ended our concerns. His handiwork has already enjoyed a long and useful lifetime as scientific equipment goes and we hope the changes will extend its usefulness well into the future.

\* \* \* \* \*

## Weymouth Consults for NATO

Professor **John W. Weymouth** has been asked by NATO's Science for Stability (SFS) Program to act as an outside consultant to a project in Greece which they have approved. The SFS program supports, on a matching basis, programs in Greece, Portugal, and Turkey that strengthen the science and/or industrial sectors of these countries. Programs must receive partial support from their home countries. NATO also pays for an outside consultant to aid in proposal development and in the subsequent evaluation.

The project for which Weymouth has been asked to serve as an outside consultant is entitled "Geophysical Surveys in Sites with Archaeological Interest and the Solution of Their Wider Agricultural, Industrial, and Town Expansion Problems." It is headed up by a geophysicist at the University of Patras and includes also two additional geophysicists, a chemist, a remote sensing specialist, a computer specialist, and a representative from the Hellenic Archaeological Society. The Greek government is represented by the Minister of Industry, who is a physicist. Weymouth describes the goals of the project as follows:

"The modern needs of industrial, urban and agricultural development have resulted in ever more rapid expansion into previously unoccupied land. When such expansion encounters unexpected archaeological remains, the result can be a costly suspension of such development. There is, therefore, a strong need for advance planning utilizing cost effective, non-invasive geophysical methods which can obtain information about subsurface archaeological content. The purpose of this project is to develop a group of experts which combines all the applicable geophysical and remote sensing techniques, field test the methods on representative sites, and develop methods of analysis. The group will demonstrate to the Greek nation the effectiveness of such an approach in protecting and exploring archaeological resources and in benefiting commercial interests which might otherwise inadvertently threaten such resources."

Weymouth has already traveled in August to Athens to consult with the group on the final draft of the proposal. In October he flew to Brussels to consult with NATO on the proposal at which time it was approved for funding. Weymouth will make periodic visits to Athens during the project funding period.

## Sartori Testifies Before Congress

Professor **Leo Sartori** participated in a year-long study of U.S. and Soviet compliance with arms control treaties, sponsored by the Stanford Center for International Security and Arms Control. Other members of the study group included Stanford physicists Sidney Drell and Wolfgang Panofsky, as well as political scientists, legal experts, and former government officials.

The group produced a 437-page report which was released at a press conference in Washington on February 12, 1987, and attracted considerable notice in the press. Professor Sartori was one of four authors of the report, writing the sections on alleged Soviet violations of the SALT II Treaty. The report will be issued as a book by Ballinger Press.

On March 12 the House Foreign Affairs Committee held a hearing on treaty compliance, stimulated by the Stanford report. Testifying were Professors Sartori and Drell; Philip Farley, former deputy director of the Arms Control and Disarmament Agency; and Gloria Duffy, a Soviet specialist who directed the project. Testifying for the government were Kenneth Adelman, director of ACDA, and Richard Perle, assistant secretary of defense.



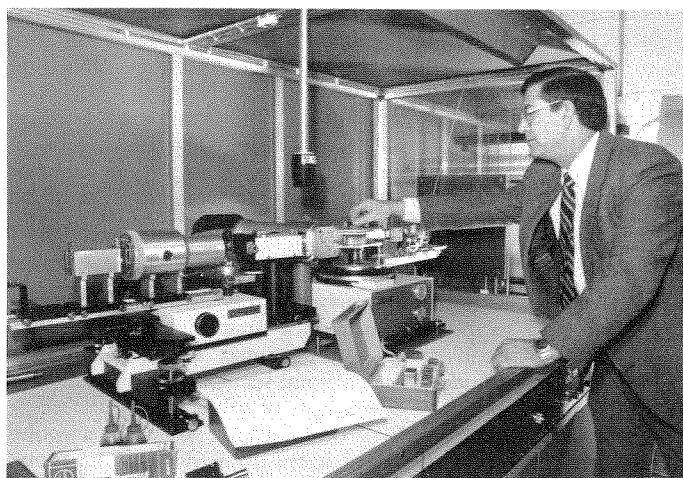
## Condensed Matter Group Installs Coe X-Ray Facility

The condensed matter research group has recently substantially upgraded its support facilities with the addition of two complete systems for x-ray analysis. An x-ray fluorescence spectrometer and an x-ray diffraction system were purchased with funding from a number of sources, including the National Science Foundation, the Kositzky Memorial Equipment Fund, The University of Nebraska Foundation, the Research Council, Department of Physics and Astronomy funds, the Layman Fund, and major contributions of cost-share funds from both the College and the University. The total cost of the two instruments was over \$200,000. This facility is being named the "James C. and Jessie B. Coe X-Ray Materials Characterization Facility", in honor of the Coe's major gift to the department, the Kositzky Memorial Fund, for support of experimental equipment.

The x-ray fluorescence system was purchased from KEVEX Corporation, and it will be used for compositional analysis of a wide variety of samples produced in our department. An x-ray tube in the spectrometer is used to irradiate the sample with x-rays, which excite the core electrons of the atoms in the sample. When outer-shell electrons fall into the empty state, a K-shell or L-shell x-ray is emitted. The energies of these x-rays are characteristic of the atoms from which they are emitted. By measuring the energies and emission rates of the emitted x-rays, the amount of the element present in the sample can be determined. (This involves considerable analysis using a sophisticated on-line computer.) The instrument can detect all elements heavier than neon, and can be used to measure trace elements (down to the ppm range in favorable cases) as well as bulk constituents. It is expected that the instrument will be extensively used by the condensed matter research group, as well as by other research groups on campus.

The x-ray fluorescence instrument was installed during the month of August, with the KEVEX systems installer training **Kevin Aylesworth** (graduate student) and **Nicola Pfeffer** (exchange student from Bonn, West Germany) in its use. Ms. Pfeffer has since returned to Germany, but during her stay here she made a major contribution to our understanding of the spectrometer's use and capabilities.

The x-ray diffraction system was purchased from Rigaku, a Japanese company, and it will replace the Picker diffractometer



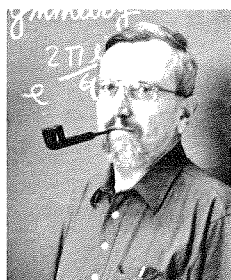
Roger Kirby with the new x-ray diffraction system

which had served Professor Weymouth for twenty-five years. The new instrument is quite sophisticated, with an on-line DEC computer, and associated color graphics terminals and hardcopy devices. The new diffractometer will be used for crystal structure determinations, crystallographic alignment of single crystals for optical studies, and the determination of the structure of intermetallic glasses. One unusual option purchased was a small-angle goniometer, which will allow us to measure crystals with very large lattice constants (up to several hundred angstroms). This capability will be important since one major thrust of our research is now the investigation of artificially-structured, multilayered materials. These materials are deposited layer by layer in a multiple-gun sputtering system, with repeat distances ranging from about 1 to 20 nm.

The new facility has already given a tremendous boost to the teaching and research programs of Professors David Sellmyer, Roger Kirby, John Hardy, Frank Ullman, and John Woollam. It will also be available for other materials research groups on campus.

## Theoretical Studies on Ionic Molecular Crystals at UNL

[Editor's Note: We've noted that Professor **John R. Hardy** has been collaborating with several alumni in recent years. At our request he describes the research they have been doing.]



John Hardy

Materials such as silicon, probably today the one most familiar to the layman, are made up of a regularly repeating array of atoms. However, practically the whole range of solid materials studied by inorganic chemistry—i.e. most of the remaining "real world" materials—are generally much more complex. Typically they can be viewed as regular arrays of structural units ("molecular ions"), containing several individual atoms (usually not the same), carrying an electrical charge and

held together by a "glue" of oppositely charged units, which, in the simpler systems, are single charged atoms (or "ions"). This can create a situation whose unusual nature we are only beginning to explore in depth theoretically. It has a very simple origin: there can be a conflict between the way the molecular ions would "like" to arrange themselves, and the overall requirement that a crystal has to repeat regularly in space.

Around 1980, Dr. Larry Boyer and I more or less "stumbled" into this area when we started to extend a theory developed for simple ionic solids to the more complex "perovskite" structures, where the molecular ions are octahedral units. Much to our surprise, we found that we could actually *predict* the temperatures at which subtle structural rearrangements ("phase transitions") took place in certain of these systems. We found the predictions to agree with experiment to within 10-20%, and this from a theory which only required the "natural constants," electron charge, velocity of light, etc.

As far as we know, this was a scientific "first" and from it has burgeoned a whole body of studies involving past students and postdoctoral researchers including **Larry Boyer** (MS 1968, Ph.D. 1970) at the Naval Research Laboratory (NRL); **Paul J. Edwardson** (MS 1981, Ph.D. 1986), now working with Boyer at the NRL; **John W. Flocken** (MS 1964, Ph.D. 1969) at the University of Nebraska—Omaha, and **Vanvilai Katkanant** (MS 1979, Ph.D. 1983), now at California State University—Fresno.

Currently because of the resources and expertise we have developed, we have been able to move in on the high temperature superconductor systems, which, most surprisingly, are complex ionic molecular crystals.

## Senator Exon Speaks on Science Policy

The Honorable **J. James Exon**, senior U.S. Senator from Nebraska, presented a Departmental Colloquium talk on "Science, Technology, and Public Policy" on 4 December 1986. Senator Exon, a former two-term Governor of Nebraska, currently sits on two major Senate Committees (The Commerce, Science, and Transportation Committee, and the Armed Services Committee) which deal with science and technology policy and/or funding issues. Below are some excerpts from the text of his talk:

### *On Federal Support of Research and Development:*

"As I see it, there are three main reasons for federally-funded and supported R&D. The first is that the Federal Government itself is a major customer for R&D and the knowledge it provides for national security, weather prediction, air traffic control and a host of other things.

Second, the strength of our nation rests upon a sound economy, this in turn, is dependent upon vigorous R&D and a rapid application of new technology. While capital, education, overall application of available resources, and economies of scale all influence our level of productivity, the application of new technology seems to be the single most influential factor. In short, applying new technology faster than our economic competitors is essential to economic well-being. Our competitors, especially Japan and other Asian nations, recognize this and are posing a real challenge to us for world markets.

Third, we should pursue an affordable level of R&D simply for its intellectual value and to maintain our nation's status as a leader in basic science. With no immediate pay-off resulting from this type of research, this is not an attractive area for federal spending, especially in today's climate of reduced spending and necessary deficit reduction. Nonetheless, the Federal Government should assist these efforts."

### *On Peer Review:*

There have long been many criticisms of this process, most notably that it has evolved into an "old boy" network relying more upon "who you know" than "what you offer." As a result, some universities have taken their scientists' requests direct to the floor of the Congress, bypassing entirely the peer review. The danger in using "pork barrel" tactics is that science then becomes reduced to just another special interest lobby. Other complaints are that the peer review forces scientists to become bureaucrats, takes too long for a decision to be made, and creates instability and discontinuity in research.

These are real concerns that need to be addressed. However, the alternatives are not, in my opinion, all that attractive. One proposal has been to provide block grants to Universities rather than providing project specific funding. I see many problems with this as campus politics would enter.

Others have proposed using past performance as a measure of potential. The obvious drawback to this is that it would deny funding to younger scientists with sound original ideas. In essence, it, too, would be an "old boy" network.

Another alternative would be to concentrate the decision-making of the peer review [process] in government-wide program officers rather than leaving the peer review in the hands of the individual government agencies such as the National Science Foundation, NASA, or Department of Energy. The flaw with this is that most scientists would prefer the decision to be left to those they are professionally associated with rather than distant, possibly unknown, civil servants.

Still another alternative is an equally applied formula for universities, taking into account such factors as the number of graduate and doctoral degrees, the number of papers appearing in journals, and so on. But I believe this approach is also flawed as it places too much emphasis on quantity and not enough on quality.

In the end, the peer review concept seems to offer the best and most fair approach to this complex problem."

### *On SDI:*

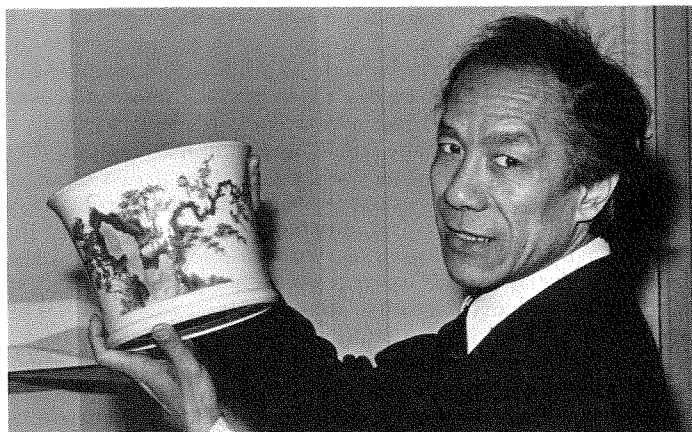
"From the numerous briefings I have received in the Senate, as well as from my discussions with our arms control negotiators in Geneva, I am convinced that the strategic defense initiative represents the major reason for the Soviets' return to arms reduction talks. Indeed, the negotiating leverage provided by SDI is the real value of the program. If we can use the leverage provided by SDI to reduce offensive forces, then we may never need to deploy a costly system that could encourage a new round of arms competition between ourselves and the Soviets. Until we can achieve such an agreement, I support SDI research, but do not think that SDI should be our only hope for future peace and security . . ."

## Faculty Display Varied Interests

It has been said that physicists, to a greater extent than other scientists, have a range of interests which reach far outside their speciality. Two examples of these interests among our department faculty have resulted in recent public exhibitions.

In February **Kam-Ching Leung** showed that he doesn't think exclusively about astronomy by exhibiting his collection of early Chinese ceramics and recent Chinese paintings at the Lentz Center for Asian Culture in Morrill Hall. His collection of ceramics spans the periods from the Chin Dynasty (211-206 B.C.) to the Quing Dynasty (1644-1912) and, in addition to vases, includes an unusually large teapot from the Ming period (1368-1644). His paintings are by young contemporary Chinese artists although Kam says that a "young" artist in China means one under the age of 50 or 60. University of Nebraska President Ronald Roskens spoke at the opening of the exhibit.

"Light and Color. An Exhibition of Notable Books from the History of Optics" was the title of a display held in Brace Laboratory in March and in Love Library in April. The 30 historic books shown were from the collections of department faculty members **Eugene Rudd** and **Duane Jaecks** and from the Special Collections of Love Library. Books and journals from the 16th up to the 20th centuries were shown including original works by Descartes, Kepler, Huygens, Newton, Maxwell and others. Euclid's book "Perspectiva", the first treatise ever written on optics was there in a 1546 edition published in Basel. A descriptive brochure of the exhibition, written by Rudd, was distributed widely to libraries and science historians. A few copies are still available for anyone interested.



*Kam-Ching Leung with a brush holder from the Quing dynasty period 1662-1722.*

## Risley Demonstrates Uses of Computers in Physics Education

The fourth annual Departmental get-together with Lincoln and Omaha area high school physics teachers on October 22nd featured Professor **John S. Risley**, of the Physics Department at North Carolina State University (NSCU), who presented the Jerry E. Ruckman lecture on "Incorporating Educational Software into a Physics Classroom." Risley, who was a Visiting Assistant Professor of Physics at UNL in the Spring 1976 semester, is Director of the Physics Courseware Laboratory at NCSU. He is also editor of the Courseware Review column in the *Physics Teacher* and is the newly-named editor of the Physics Academic Software Project, which is funded by a grant from IBM and administered by the American Institute of Physics.

Risley pointed to at least three major uses of computers in physics instruction. First is the use of computers to analyze data in real time during a classroom lecture demonstration. As an example, he used a "sonic ranger" to measure the distance of a swinging pendulum. The computer then provided graphics displays of instantaneous distance, velocity, and acceleration curves. Second is the use of computers to do simulations of physical phenomena difficult to demonstrate directly. An example of this [demonstrated in one of the workshops led by Risley] involved changing the acceleration of gravity and observing on the computer screen the change in the density distribution as a function of height of a gas confined in a box. Third is the use of computers as tutors in large enrollment lecture classes using newly written interactive software for the first year of an elementary physics course. Demand for tutoring routinely exceeds the capabilities of most physics departments and the computer represents a potential solution for some students.

This fourth get-together with high school physics teachers was the most successful yet, drawing 16 teachers. Risley provided them with a mini-workshop on physics software in the evening after dinner. On October 24th Risley led a full day workshop on physics courseware for college and university faculty. This drew 14 participants from the staffs of Creighton University, Doane College, Hastings College, Iowa State, Kansas State, Kearney State, Nebraska Wesleyan, UNL, and UNO.

## UNL Involved in Supercomputer Net

Brace and Behlen Laboratories will soon be wired with a "backbone cable" to which anyone can connect a computer and be in contact with computers elsewhere on campus and with a heirarchy of networks that spreads nationwide. MIDnet is a regional network in Nebraska, Iowa, Missouri, Kansas, Oklahoma, and Arkansas with a "node" at the University of Illinois. The Illinois supercomputer is one of five in the country which are part of the NSFnet which has been in operation for about a year. Funded by the National Science Foundation for four years, MIDnet is the first of several proposed regional networks.

UNL has taken a leadership role in the creation of national computer networks to support research and development. Dr. **Douglas Gale**, Director of Computing and Associate Professor of Physics and Computer Science, is the author and principal investigator of the NSF-funded MIDnet projects and has been one of the leaders in the creation of NSFnet. According to Gale, the Lincoln/Omaha area is ideally located to support regional and national networking activities because of its central location and because of the excellent telecommunications infrastructure associated with the Strategic Air Command base near Omaha. The network will involve fiber optic, copper, microwave, and satellite communication systems.

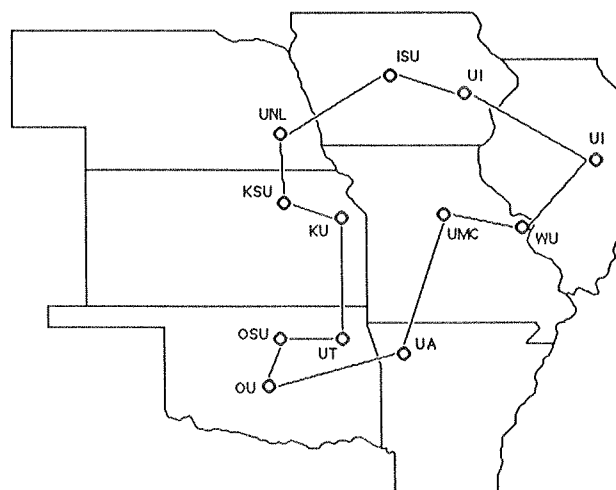
## Saturday Science Class Turns on Grade Schoolers

Next spring Dr. **Cliff Bettis** of our department will take over direction of the Saturday Science Class now in its 13th year of operation. In this program fifth and sixth grade students from the Lincoln Public Schools come to Brace Laboratory on five consecutive Saturdays to see demonstrations and do laboratory work in physics. Two sections, morning and afternoon, accommodate 45 students each and there have always been more applications than could be accepted. The \$25 charge is used to pay a small stipend to the professors who give the lectures and to the graduate students who oversee the laboratory. It also pays for supplies, as during each session the student makes something which he can take home. When they study light they each make a spectroscope out of a cardboard tube and a replica diffraction grating. During their study of electricity they make electroscopes and electromagnets.

The program was started in 1974 by Professor **Duane Jaecks** who felt that his son was not receiving adequate exposure to scientific ideas in his fourth grade class in school. In the first year of the program, Jaecks gave all of the lectures himself but had the help of **Menno Fast, Fred Nehring, Siamak Shahabi, Nasser Maleki** and others in setting up demonstrations and running the laboratory. He remembers the students being amazed when he cooked hot dogs by running an electrical current through them. When talking about sound, he had students bring their musical instruments so he could show them the waveforms on an oscilloscope.

Professor **Edward Schmidt** took his turn directing the class for a while and Professor **Roger Kirby** has had it for the past six years. Kirby's wife Sue has also participated in the registration and dealing with parents, as well as helping in the laboratory. Through the generosity of some of the department faculty members, scholarships are given to about 10% of the students, thus making the course available to all. The Lincoln Public Schools have cooperated by sending out notices to students through their teachers and also by taking care of administrative details. Kirby notes that some of the kids are really turned on by the course. He has had reports from parents who say that their kids talk about it all week and can hardly wait for the next Saturday. Some come back to take the course a second year. Who knows how many future scientists have received their first inspiration in this course.

Ultimately NSFnet will link approximately 150 institutions of higher education and also industrial and corporate facilities. Besides being able to access the supercomputers, UNL researchers will be able to communicate directly with other laboratories without the need for modems or the use of telephone lines.



The MIDnet computer network.

## Majors Participate in Internship Programs

Last summer, **Eric R. Jatzen**, senior physics major from Papillion, NE, spent two months at the Radio Astronomy Institute in Bonn as a trainee under the auspices of the German Academic Exchange Service (DAAD). At the same time, **Nicola Pfeffer**, a physics major from Bonn University, spent two and one half months here working for Professor **Roger Kirby**. She helped with the installation of the condensed matter group's new x-ray diffraction and x-ray fluorescence equipment.

This is the second year that the Department has participated in this DAAD program. In 1986 Professor **Norman Simon** hosted **Manuela Raith**, a computer science major from Braunschweig University, who helped adapt Simon's programs for use on the Minnesota Cray II supercomputer. Senior physics major **John Stormberg** was offered a corresponding position in Germany, but he chose to take instead an internship at Oak Ridge National Laboratory in a condensed matter group.

This fall, **Theodore J. Tipton**, junior physics major from Chester, NE, is working as an intern at Argonne National Lab. His duties include preparation of oxidation films on metallic surfaces as well as collecting Raman spectral data. In summer 1986, **Michelle Garwood** was an intern at Argonne in a health physics group.

## Physics Department History Project

It was in the fall of 1887 that **DeWitt Bristol Brace** came to the University of Nebraska to build up the almost non-existent physics department. In the relatively short period before his untimely death in 1905 he purchased equipment, enlarged the staff, planned what is now Brace Laboratory, and carried out forefront research that brought him international notice. Since this is now the 100th anniversary of his appointment, it is appropriate to think back on the history of the department.

It has been proposed that we publish a book with photographs and stories from the century past. While this would not be a full-scale history of the department, it might serve the purpose of providing a record of some events and people and perhaps of bringing back memories of fellow students and faculty to our alumni who worked with them.

We have a collection of photographs in our archives which we could share with you in this way. However, the collection is far from complete. We would like to ask your help to enlarge this collection. If you have photographs of staff members or students, apparatus, special events in the department, or whatever, we would appreciate receiving them. In addition, please send us stories and anecdotes about particular people.

Since such a publication will entail a considerable expense, we also need to ask you about the extent of your interest in buying this book. Would you be willing to pay \$10 or \$25 or \$40 for such a book? Clearly, the more photographs and stories included, the greater the cost. It would help us decide on how large a book to aim for if you would return the enclosed card with some indication of your interest. It would also be helpful if some of you would consider making a larger donation to the Physics History Project.

## Gruzalski Speaks at 1987 Recognition Luncheon



*Greg R. Gruzalski*

**Greg R. Gruzalski** (Ph.D. 1977), Research Physicist in the Solid State Division at Oak Ridge National Laboratory, was the featured speaker at the Third Annual Recognition Luncheon for the Department's B.S., M.S., and Ph.D. graduates.

Gruzalski shared with faculty and students some of his experiences while doing his doctoral research here under the guidance of Professor **David J. Sellmyer**. He then spoke on the topic, "What is a Surface?" Especially emphasized were structural aspects of surfaces and some experiments on reconstruction. Low-energy electron diffraction and scanning tunneling microscopy photographs were shown as examples of recent advances in surface science. Greg's talk and his visit in general were well received by both students and faculty alike.

## Barrett Recalls Physics at Nebraska ca. 1950

We received a long, interesting letter from **William A. Barrett** (B.S. 1952, M.S. 1953) describing his experiences as a physics student here in the late 40's and early 50's. We don't have room for all of it, but want to share portions of it with you.

Barrett started out in electrical engineering in 1948 but soon transferred to physics. "I wanted to know why all those engineering formulas had odd coefficients and were expressed in a mixture of units, and the instructor told me never mind—just use them." His first physics professor was **Herbert Jehle**. "Most students disliked Jehle, because of his thick accent, but he was the most learned and patient man I've ever known." Barrett later became an assistant to **Ted Jorgensen** and worked on the Cockcroft-Walton accelerator (see article on this accelerator) with **Charles Cook**, **Emerson Jones**, and **Art Meyerott**. "I had the pleasure of enjoying [Jorgensen's] Chinese cooking years ago at his home . . . Ted was very good to me, and I'm not sure I ever really thanked him."

Barrett has taught at Muhlenberg College and Lehigh University and worked at Hewlett-Packard. He is now involved in founding a new company named Lasa Industries where they are "designing a new kind of semiconductor machine that involves laser optics, special mechanical and electronic systems, a sophisticated computer control system, and some chemicals." His work in the optical systems "hearkens back to the days at Brace Lab when **Art Meyerott** and I had free reign of the optical facilities. My physics and math has meant a lot to me over the years."

In one of their laboratory courses they measured the charge on the electron and discovered a small discrepancy. "A couple of years later, **Ted Jorgensen** read a recent paper in which the value was corrected by someone else, bringing it into line with ours." Barrett helped Cook design a high voltage regulator for the accelerator which involved "a servo loop using the potentiometer-galvanometer combination with a rectangular light source focused on a pair of vacuum photocells. It was a Rube Goldberg contraption but it worked and Cook wrote a paper on it." [Editor's note: That "contraption" was used by the editor and many others up to 1964 when a new commercial power supply was installed.]

After his M.S. at Nebraska, Barrett received a Ph.D. in physics and mathematics at the University of Utah. In addition to his many other activities, he authored a textbook on compiler construction which was used, among other places, at UNO. His present address is 1164 Hyde Ave., San Jose, CA 95129. Thank you, Dr. Barrett, for your letter.



## Acknowledgements

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 October 1986–30 September 1987. 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.

**Toshiki Aikawa**

**Richard C. Altrock** (B.S. 1962 Physics/Mathematics)

**Anonymous**

**Baltimore Gas & Electric Company**

**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. Bengtson**

**Boeing Corporation**

**Marvin E. Bowman** (B.S. 1969)

**Thomas E. Bullock** (M.S. 1979)

**Columbia Broadcasting System, Inc.**

**Richard A. Cerny** (B.S. 1968)

**Mr. and Mrs. James C. Coe**

**Eldon C. Cornish** (B.S. 1959)

**Geoffrey B. Crooks** (B.S. 1965, M.S. 1967, Ph.D. 1972)

**Robert D. Dubois** (B.S. 1970, M.S. 1972, Ph.D. 1975)

**Paul J. Edwardson** (M.S. 1981, Ph.D. 1986)

**Robert G. Fuller**

**John S. Gallagher**

**C. Fred Gayton**

**Richard Gleeson** (B.S. 1967)

**David M. Gray** (B.S. 1977)

**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 Corporation**

**Loyd D. Jacobs** (M.S. 1958 Physics/Mathematics)

**Robert Katz**

**Joseph H. Macek**

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

**Paul Marquard** (M.S. 1986)

**Robert R. Matulka** (B.S. 1973)

**Ronald W. Mayle** (M.S. 1979)

**Charles B. Minnich** (B.Sc. E.E. 1937)

**Mr. and Mrs. Burton E. Moore**

**Mr. and Mrs. Joseph L. Parker** (Ph.D. 1940 Chemistry/Physics)

**Kevin D. Reilly** (M.S. 1962 Physics/Mathematics)

**Kenneth W. Reitan** (M.S. 1975)

**Rockwell International**

**Jerry E. Ruckman** (B.S. 1962)

**M. Eugene Rudd** (Ph.D. 1962)

**James A. R. Samson**

**Franklin J. Sazama** (M.S. 1962)

**James J. Schmidt** (B.S. 1956, M.S. 1957)

**Donald P. Schneider** (B.S. 1976)

**David J. Sellmyer**

**Charles E. Skov** (Ph.D. 1963 Physics/Mathematics)

**Andrew N. Smith** (A.B. 1947 Physics/Mathematics)

**Stanley J. Sramek**

**Anthony F. Starace**

**Texaco Philanthropic Foundation, Inc.**

**Daniel H. Weitzel** (M.S. 1952)

**Westinghouse Educational Foundation**

**Maurice H. Witten** (M.A. 1960)

## We Heard From These Alumni:

**Alston, Steven G.** (M.S. 1979, Ph.D. 1982). Department of Physics, Pennsylvania State University, Wilkes-Barre Campus, Lehman, PA 18627. Has joined Penn. State-Wilkes Barre as an Assistant Professor.

**Anderson, Milo V.** (M.A. 1955) Box 417, Angwin, CA 94508. "Retired Dec. 31, 1986 after Teaching Physics for 36 years, the last 22 years at Pacific Union College, Angwin, CA 94508. It was good to see the piece about Professor Jorgensen in the last *Spectrum*."

**Anderson, Richard D.** (B.S. 1956) 5046 Park West Ave., San Diego, CA 92117. Senior Scientist at the Naval Ocean Systems Center. "Working in Electro-optics on the satellite laser communications program. Wide field, narrow bandwidth, large aperture pre-detection optical filters using electronic transitions in gases is my major interest."

**Baumert, William J.** (B.S. 1974) 5830 West 96th St. #2, Los Angeles, CA 90045. Member of the technical staff at Hughes Aircraft Co. Received MS in Physics in 1982 from Florida Institute of Technology. Working in Nuclear Hardening and Survivability—Military program.

**Brown, Robert H.** (M.S. 1942) 12420 Birch St., Yucaipa, CA 92399. Retired, but semi-employed as Senior Research Scientist by the Geoscience Research Institute. "See *Radiocarbon*, Vol 28, No 2A, 1986, pp. 350-357 for a sample of my activities."

**Bruegman, Otto W.** (M.S. 1987) NASA/Goddard Space Flight Center, IUE Observatory/CSC, Building 21, Code 684.9, Greenbelt, MD 20771. "I was hired by the Computer Sciences Corporation and work under the official title of Associate Technical Specialist. What I actually do is work as a telescope operator at NASA/Goddard Space Flight center in the IUE Observatory. IUE stands for International Ultraviolet Explorer. The IUE telescope I operate is on board a satellite in a geosynchronous orbit over the Atlantic ocean. It is used to study stars in the ultraviolet spectrum of light and is currently the only operational U.S. astronomy satellite in the sky. When it was launched in 1978 the expected life of the spacecraft was 3 to 5 years. Now it is expected to live till about 1994."

**Burmester, William L.** (M.S. 1975; Ph.D. 1982) 71 Blanchett, Marlboro, MA 01752.

**Dairiki, Setsuo** (M.S. 1945 Physics/Math) 625 Hale, Palo Alto, CA 94301.

**Eddy, Stephen M.** (B.S. 1978) 2019 Snowbird Drive, Harvey, Louisiana 70058. Operations Manager at Schlumberger Offshore Services. "Married Texan by name of Elizabeth. We live in the swamp with Malachi the cockatoo and Ivan the wolfdog. Riding out th' earl glut."

**Edwards, Alan** (M.S. 1964, Ph.D. 1968) Department of Physics, University of Georgia, Athens, GA 30602. Associate Professor at the University of Georgia. "My promotion to Professor has been approved."

**Edwardson, Paul J.** (M.S. 1981, Ph.D. 1986) Plasma Physics Division, Code 2610, 4555 Overlook Avenue, S.W., Washington, D.C. 20375-5000.

**Gallagher, John S. III**, Mars Hill Rd., 1400 W, Flagstaff, AZ 86001. Director of Lowell Observatory.

**Gray, David M.** (B.S. 1977) 909 South 5th Street, Apartment 357, Champaign, IL 61820.

**Hall, Tom** (B.S. 1984 Physics/Math) 408 Robinson Avenue, Bellevue, NE 68005. Associate Programmer Analyst for Planning Research Corporation.

**Heeger, Alan J.** (B.S. 1957) Institute for Polymers and Organic Solids, University of California, Santa Barbara, Santa Barbara, California 93106.

- Jacobs, Loyd D.** (M.S. 1958 Physics/Math) 2004 128th Ave. SE, Bellevue, WA 98005. Principal Engineer at the Boeing Company. "I enjoy receiving *Spectrum*. I recently received an award as the Engineering Department's Employee of the month for an intense two month noise reduction effort on the 757 airplane resulting in the selection of an engine vibration isolation system. The system is now undergoing in-service evaluation. The Renton Engineering Division has in excess of 200 engineers."
- Katkanant, Vanvilai** (M.S. 1979, Ph.D. 1983) Is an Associate Professor at the Department of Physics, California State University, Fresno, CA 93740.
- Losee, Jon R.** (Former Staff) Code 524 Naval Ocean Systems Center, San Diego, CA 92152. Physicist DP-III with the Naval Ocean Systems Center. Currently working on the Statistics of Marine Bioluminescence.
- McCarthy, James** (B.S. 1985) 2250 Manchester Avenue, Cardiff, CA 92007.
- MacMillian, Richard D.** (M.S. 1970) 4426 Sussex Rd., R#8, Joliet, IL 60436. Group Leader-Economics and Data Processing for Amoco Chemicals Company. "Fate has directed me into computers and both scientific and commercial applications. Although remote from the Physics I learned at Nebraska, the logical thought processes physics taught me are invaluable. By the way, a contemporary alum, Curt Hieggelke (M.S. 1966) also lives in the Joliet area."
- Nelson, Stuart O.** (M.A. 1954) USDA, ARS, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, GA 30613. Received a USDA Superior Service Award from Secretary of Agriculture Richard E. Lyng for pioneering research on dielectric properties of agricultural products and potential uses of electromagnetic energy for pest control, product conditioning, and seed treatment. He was also elected a Fellow of the American Society of Agricultural Engineers.
- Pareek, Prem** (Ph.D. 1983) 2504 Panorama Place, Birmingham, AL 35216.
- Park, Chang-Hwan** (Ph.D. 1984) 42 Sherwood Avenue, Wheeling, West Virginia 26003. Has finished Medical Physics Fellowship program at Yale University and is now a Medical Physicist in the Radiation Oncology Department at the Ohio Valley Medical Center in Wheeling, WV 26003.
- Rashid, Harun** (Ph.D. 1983) 88 Washington St., Apt. 27, Brighton, MA 02135. Employed at the Joint Center for Radiation Therapy, Harvard University, 44 Binney St., Boston, MA 02115.
- Richards-Kortum, Rebecca** (B.S. 1985) MIT Room 6-014, 77 Mass. Ave., Cambridge, MA 02139. She recently passed her qualifying examinations at MIT. She is working on a project to develop an optical fiber catheter to treat arteriosclerosis. This involves fluorescence spectroscopy to detect the obstruction and a high power laser to remove it. Her husband is an engineer at Raytheon.
- Rosman, Ronald L.** (B.S. 1979) University of Illinois at Chicago, Laboratory for Atomic, Molecular and Radiation Physics (M/C 273), Department of Physics, College of Liberal Arts and Sciences, Box 4348, Chicago, IL 60680. "I recently finished graduate school after an extended but pleasant stay at the University of Chicago. My thesis work was in chemical physics with Professor Stuart Rice. The experiments involved measurements of intramolecular vibrational energy transfer in deuterobenzene-helium van der Waals complexes and measurements of intersystem crossing in benzene. Currently I have a post-doctoral position at the University of Illinois in Professor Charles Rhodes' group. Work here aims toward development of a laboratory-scale x-ray laser. One of its main applications would be holography of biological systems. In the process I'm learning a lot about laser technology, plasma physics, and the nonlinear response of atomic systems to intense laser pulses."
- Rudd, Eric** (B.S. 1977) 5506 Landmark Circle, Mounds View, MN 55112. Received Ph.D. in electrical engineering at the University of Minnesota and is now doing postdoctoral research on a laser-acoustic microscope.
- Sautter, Chester A.** (M.A. 1958, Ph.D. 1964 Physics/Math) Concordia College, Moorhead, MN 56560. Associate Professor of Physics at Concordia College. "Enjoy learning of current activities of colleagues from graduate school days. Even found address of former Math Professor (undergraduate) in *Spectrum*. Hope to participate in research at Argonne West (Idaho Falls) during summer of 1987."
- Sazama, Franklin J.** (M.S. 1963) 7820 Whiterim Terrace, Potomac, MD 20854. Physicist, Office of Military Application, US Department of Energy, Germantown, Maryland. "I have a challenging new position in the Office of Military Application with the US Department of Energy and I have been admitted to the Graduate School at Georgetown University in their National Security Studies Program."
- Shermer, Russell D.** (B.S. 1984, Physics/Math M.S. 1986) 805 W. Green, Apt. A37, Urbana, IL 61801.
- Simperman, Roy F.** (M.S. 1965) 5609 80th Ave. SE, Mercer Island, WA 98040. Chairman and Chief Executive Officer at Electronic Engineering and Manufacturing Inc. Company designs and manufactures signal processors, analyzers, and equalizers under brand name of AudioControl.
- Skolil, Lester L.** (M.A. 1937) Department of Physics, San Diego State University, San Diego, CA 92182.
- Smith, Andrew N.** (A.B. 1947, Physics/Math) Rt. 1, Box 33, Eldridge, MO 65463-9602. Consulting Engineering Physicist currently contracting through Electrospace Systems Inc., Richardson, TX for NAVLEXENGCN, Portsmouth, VA.; and through J.D. Glenn & Assoc., Norfolk, VA., for NAVFACENGCN OICC Madrid. Is in general area of VLF and LF high power antenna systems design, development, testing, evaluation, and upgrading for naval communications. "We don't accelerate anything but airborne dust. My dad, T.T. Smith, taught in Brace Laboratory 1921-1953. Charlie Ackerman, do you remember the 150 logging operation at Allenspark?"
- Sramek, Stanley** 9550 Ella Lee Lane #1158, Houston, TX 77063. Geophysicist with Texaco Inc.
- Teays, Terry** (Ph.D. 1986) IUE Observatory, Code 684.9, Goddard Space Flight Center, Greenbelt, MD 20771. "Will be starting March 2 as a Resident Astronomer at the IUE Observatory (IUE, the International Ultraviolet Explorer, is an ultraviolet astronomy satellite) at NASA's Goddard Space Flight Center in Greenbelt, Maryland."
- Udupa, Srikrishna** (M.S. 1984) 1904 Sheridan Rd., San Bernardino, CA 92407.
- Waggoner, Bruce** (B.S. 1984) 5230 Pizzo Ranch Rd., La Canada, CA 91011. Science Sequence Engineer for Project Voyager and UVS and PPR Science Coordinator for Project Galileo at the Jet Propulsion Laboratory.
- Wade, Ted** (M.A. 1962) 5580 Stanley Dr., Auburn, CA 95603. Self employed. "Thanks for the newsletters. It might be interesting to know where all the staff are that were there in the past. I returned to UN in the education area and received my Ph.D. in 1970. Lots has happened. I'm now writing and publishing. Area: home schools. I have a book of children's poetry (collection) now in press. Greetings to Dr. T. Jorgensen."
- Webster, Gary L.** (Ph.D. 1981) 13949 Barrymore, San Diego, CA 92129. Senior Engineer at General Dynamics.
- Xing, Lei** (M.S. 1987) Is a Ph.D. Graduate Student at Johns Hopkins University. "Wish to express appreciation to you for your kindly help in every aspect during my stay in the University of Nebraska, and wish you success in everything."

# THE RECORD

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

Issue No. 3

Fall 1987

## 1986-87 Degree Recipients

### Bachelor of Science

**Robert S. Sneddon** (December 1986). Is in Boston, Massachusetts.

**John J. Stormberg** (December 1986). Is living in Chapel Hill, NC, and working in an electronics company (Melodyne) in Raleigh.

**Suriyati B. Yusoff** (December 1986). Has enrolled in our graduate physics program.

**Rashidah Zachariah** (December 1986). Has enrolled in our graduate physics program.

**David C. Doerr** (May 1987). Is working for Hughes Aircraft in Los Angeles.

**Julie M. Schuldt Doerr** (May 1987). Is working for Hughes Aircraft in Los Angeles.

**Semih Sukru Kumru** (May 1987). Has enrolled in the graduate physics program at Creighton University in Omaha.

**Keith W. Ray** (May 1987). Is a physicist with the Naval Weapons Center at China Lake, CA.

**Louis E. Farho** (August 1987). Is in Omaha, NE.

**Kurt R. Vosburg** (August 1987). Is in Holdrege, NE.

### Master of Science

**Kevin D. Aylesworth** (December 1986). Is engaged in doctoral research with Professor David J. Sellmyer.

**Yang-Soo Chung** (December 1986). Is engaged in doctoral research with Professor M. Eugene Rudd.

**Heidi E. Scheel Fencel** (December 1986). Has enrolled in the doctoral astronomy program at Ohio State University in Columbus.

**Otto W. Bruegman** (May 1987). Is an Associate Technical Specialist with the IUE Observatory at NASA/Goddard Space Flight Center.

**Lei Xing** (May 1987). Has enrolled in the doctoral physics program at Johns Hopkins University in Baltimore.

**Richard L. Newman** (August 1987). Is job hunting.

**Simonne M. Nolin** (August 1987). Is job hunting.

### Doctor of Philosophy

**Chiiling Wang** (December 1986). Is a postdoctoral research associate with Professor Joseph H. Macek.

**Orhan Yenen** (December 1986). Is a postdoctoral research associate with Professor Duane H. Jaacks.

**Cathy L. Engelhardt** (August 1987). Is a postdoctoral research associate with Professor Duane H. Jaacks.

## HONORS

### 1986-87 Fellows

<b>Shuhong Chen</b>	Avery Teaching Fellow
<b>Ding Liu</b>	Avery Teaching Fellow
<b>Zheng-sheng Shan</b>	Maude Hammond Fling Fellow
<b>Xue-yin Shi</b>	Avery Teaching Fellow
<b>Michael Theilmann</b>	Parker Teaching Fellow
<b>Venugopal Turlapaty</b>	Avery Teaching Fellow
<b>Zhen Zheng</b>	Maude Hammond Fling Fellow and Donald Walters Miller Fellow

### 1986-87 Scholarships

<b>Debra J. Cleveland</b>	U.S. Harkson Scholarship
<b>Michelle M. Garwood</b>	U.S. Harkson Scholarship
<b>Kyle W. Hollman</b>	Physics and Astronomy Alumni Scholarship
<b>Bradley W. Jacobsen</b>	Joel Stebbins Scholarship
<b>Kayla L. Kadlec</b>	U.S. Harkson Scholarship
<b>Stuart L. Malone</b>	Joel Stebbins Scholarship
<b>Kurt W. Meyer</b>	Henry H. Marvin Scholarship
<b>Jay R. Pralle</b>	John E. Almy Scholarship
<b>Mark O. Schlegel</b>	John E. Almy Scholarship
<b>Joseph R. Steele</b>	U.S. Harkson Scholarship
<b>John J. Stormberg</b>	U.S. Harkson Scholarship
<b>Kathryn H. Wiese</b>	Physics and Astronomy Alumni Scholarship

### 1987 Departmental Distinguished Teaching Assistant Awards

Heidi S. Fencel      Simonne M. Nolin      Julie M. Schuldt

### 1987 Sigma Xi Support of Research Award

John R. Kelty

### 1987 Distinguished Teaching Award

William B. Campbell

### 1986 Fulbright Fellow (Vienna, Austria)

Sitaram S. Jaswal

### 1987 Outstanding Research and Creativity Award

James A. R. Samson

### 1986-87 Society for Physics Students Officers

Julie M. Schuldt, *President*      Joseph D. Maciarz, *Vice President*  
David C. Doerr, *Secretary*      Kyle W. Hollmann, *Treasurer*

## New Research Grants and Contracts

During the period 1 October 1986—30 September 1987 the following new and renewal grants and contracts were received by our faculty:

Principal Investigator(s)	Title (Source of Funds)	Amount (\$ Thousands)
<b>P.D. Burrow</b>	Study of Vibrationally Excited Molecules by Low Energy Electron Scattering (NSF)	\$ 35.0
<b>P.D. Burrow</b>	Electron Scattering Studies of Temporary Anion Formation in Hydrocarbons (NSF)	\$103.0
<b>R.G. Fuller</b>	High School Physics Demonstration/Laboratory Summer Institute (NE Coord. Comm. for Postsecondary Education)	\$ 21.0
<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)	\$ 65.0
<b>D. Jaecks/ M.E. Rudd</b>	Inelastic Processes in Atomic Collisions (NSF)	\$235.0
<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)	\$ 26.0
<b>J. Macek/ A.F. Starace</b>	Hyperspherical Coordinate Theory of Two-Electron Atomic Processes (DOE)	\$ 69.0
<b>J.A.R. Samson</b>	Interaction of Radiation with Planetary Gases (NASA)	\$ 27.4
<b>J.A.R. Samson</b>	Ultraviolet and X-ray Bombardment of Planetary Atmospheres (NSF)	\$ 57.4
<b>J.A.R. Samson</b>	Photoionization Studies of Atoms (NSF)	\$ 95.0
<b>E.G. Schmidt/ D.J. Taylor</b>	A Panoramic Stellar Photometer (NSF)	\$ 44.0
<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)	\$ 54.1
<b>D.J. Sellmyer/ R.D. Kirby</b>	X-Ray Diffraction Equipment	\$ 75.0
<b>D.J. Sellmyer/ J.A. Woollam</b>	Compositionally-Modulated Disordered Magnetic Films (NSF)	\$ 50.0
<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		\$1,214.1

## Faculty Professional Activities

In addition to service on Departmental, College, and University-wide committees, for 1987-88 a number of the faculty are active in national and international professional activities, as follows:

**Clifford L. Bettis:** Apparatus Committee and Physics Support Staff Group of the American Association of Physics Teachers.

**Robert G. Fuller:** Editor, Instructional Materials Center, American Association of Physics Teachers; Consultant, Student-Centered Computer Education Project, Independent Colleges of Nebraska; Editorial Review Board for Physics Courses, Lower Division Engineering Curriculum Project, Control Data Corporation.

**John R. Hardy:** Consultant for Lawrence Livermore Laboratory and the U.S. Naval Research Laboratory.

**Robert J. Hardy:** Consultant for Lawrence Livermore Laboratory.

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

**Kam-Ching Leung:** Chrétien International Research Grant Committee of the American Astronomical Society; Organizing Committees, Commissions 38 (Exchange of Astronomers) and 42 (Close Binary Stars) of the International Astronomical Union; Scientific Organizing Committee, Joint Discussion, I.A.U. General Assembly.

**Joseph Macek:** Basic Energy Sciences Advisory Committee, Department of Energy; Editorial Boards, Physical Review A and Zeitschrift für Physik D.

**James A. R. Samson:** Accelerator and Fusion Research Division Review Committee, Lawrence Berkeley Laboratory; X-Ray and Ultraviolet Techniques Committee and Past Chairman, C.E.K. Mees Medal Committee for 1987, Optical Society of America; Program Committee, APS Division of Atomic, Molecular, & Optical Physics; Chairman, Program Committee, Conference on XUV Cross Section Data Bases, Calculations, and Measurements, SPIE; Technical Program Committee, First Topical Meeting on Free-Electron Laser Applications in the Ultraviolet.

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

**D. J. Sellmyer:** Advisor to International Center for Theoretical Physics, 1987-; Advisor and Consultant to State of Louisiana, University/Economic Development Program, 1987-.

**Norman R. Simon:** Chairman, Scientific Organizing Committee, International Stellar Pulsation Conference (Lincoln, NE, 1988).

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

**Donald J. Taylor:** Local Organizing Committee, American Astronomical Society Meeting in Kansas City (June 1988).

**John W. Weymouth:** Consultant, NATO Science for Stability Program, Geophysical/Archaeology Project in Greece; Nebraska Association of Professional Archaeologists.



## 1986 Faculty Publications

### ASTRONOMY AND ASTROPHYSICS

- Z. Y. Li and K. C. Leung, "Very Long Period Supergiant Semidetached and Contact Systems," in *IAU Highlights of Astronomy*, Vol. 7, ed. by J. P. Swing, (Dordrecht: D. Reidel, 1986), p. 217.
- G. Burki, E. G. Schmidt, A. Arellam Ferro, J. D. Fernie, D. Saselov, N. R. Simon, J. R. Percy and J. Szabados, "Intercontinental Simultaneous Survey of the Unique Cepheid HR 7308 in Photometry and Radial Velocity," *Astronomy and Astrophysics* **168**, 139 (1986).
- N. R. Simon and T. Aikawa, "Hydrodynamic Models of RR Lyrae Variables: Comparison of Observed and Theoretical Light Curves," *Astrophysical Journal* **304**, 249 (1986).
- N. R. Simon, "On the Short-Period Type II Cepheids," *Astrophysical Journal* **311**, 305 (1986).

\* \* \* \* \*

### ATOMIC AND MOLECULAR PHYSICS

- T. M. Stephen and P. D. Burrow, "Electron Transmission Studies in a Free Jet: Molecular Oxygen," *Journal of Physics B* **19**, 3167 (1986).
- K. L. Stricklett, S. C. Chu, and P. D. Burrow, "Dissociative Attachment in Vinyl and Allyl Chloride, Chlorobenzene and Benzyl Chloride," *Chemical Physics Letters* **131**, 279 (1986).
- K. L. Stricklett and P. D. Burrow, "Dissociative Attachment and Predissociation in Ammonia," *Journal of Physics B* **19**, 4241 (1986).
- P. D. Burrow, A. Modelli and K. D. Jordan, "Temporary Anion States of the Chlorobenzenes," *Chemical Physics Letters* **132**, 441 (1986).
- J. Macek and K. A. Jerjian, "Adiabatic Hyperspherical Treatment of HD<sup>+</sup>," *Physical Review A* **33**, 233 (1986).
- J. Macek, "Loosely Bound States of Three Particles," *Zeitschrift für Physik D* **3**, 31 (1986).
- W. Meckbach, P. J. Focke, A. R. Cerni, S. Suaraz, J. Macek, and M. Menendez, "Effects of the Wannier Ridge on Secondary-Electron Spectra in Proton-Helium Collisions," *Physical Review Letters* **57**, 1587 (1986).
- Z. Zhen and J. Macek, "Asymptotic Adiabatic Hyperspherical Potential Curves," *Physical Review A* **34**, 838 (1986).
- J. Macek, "Electron Capture Mechanisms," *Nuclear Instruments B* **13**, 573-577 (1986).
- C. Wang and J. Macek, "Theory of United Atom Rotational Coupling in H<sup>+</sup> + He Collisions," *Physical Review A* **34**, 1787-1792 (1986).
- M. A. Bolorizadeh and M. E. Rudd, "Angular and Energy Dependence of Cross Sections for Ejection of Electrons from Water Vapor: I. 50-2000 eV Proton Impact," *Physical Review A* **33**, 882 (1986).
- M. A. Bolorizadeh and M. E. Rudd, "Angular and Energy Dependence of Cross Sections for Ejection of Electrons from Water Vapor: II. 15-150keV Proton Impact," *Physical Review A* **33**, 888 (1986).
- M. A. Bolorizadeh and M. E. Rudd, "Angular and Energy Dependence of Cross Sections for Ejection of Electrons from Water Vapor: III. 20-150keV Neutral-Hydrogen Impact," *Physical Review A* **33**, 893 (1986).
- J. A. R. Samson and G. N. Haddad, "Total Absorption and Photoionization Cross Sections of Water Vapor," *Journal of Chemical Physics* **84**, 6623 (1986).
- J. A. R. Samson, Y. Shefer, and G. C. Angel, "A Critical Test of Many-Body Theory: The Photoionization Cross Section of Cl as an Example of an Open Shell Atom," *Physical Review Letters* **56**, 2020 (1986).
- G. C. Angel, J. A. R. Samson, and G. Williams, "The Relative Fluorescence Efficiency of Sodium Sulfacilate Between 90 and 800 eV," *Applied Optics* **25**, 3312 (1986).
- C. H. Parks, A. F. Starace, J. Tan and C. D. Lin, "Electric Dipole Matrix Element Formulas in Hyperspherical Coordinates with Applications to H<sup>-</sup> and He," *Physical Review A* **33**, 1000 (1986).
- S. Shahabi and A. F. Starace, "Photoelectron Angular Distributions for Atomic Chlorine," *Physical Review A* **33**, 2111 (1986).

\* \* \* \* \*

### CONDENSED MATTER PHYSICS

- J. W. Flocken, R. A. Guenther, J. R. Hardy, and L. L. Boyer, "A Priori Predictions of Phase Transitions in KCaF<sub>3</sub> and RbCaF<sub>3</sub>: Existence of a New Ground State," *Physical Review Letters* **56**, 1738 (1986).
- V. Katkanant, P. J. Edwardson, J. R. Hardy, and L. L. Boyer, "First Principles Theoretical Explanation of Incommensurate Behavior in Rb<sub>2</sub>ZnCl<sub>4</sub>," *Physical Review Letters* **57**, 2033 (1986).
- A. M. Karo and J. R. Hardy, "Energy Flux in Shocked Molecular Systems," *International Journal of Quantum Chemistry* **20**, 763-765 (1986).
- S. S. Jaswal, "Electronic Structure and Properties of Transition-Metal Glasses: Ni<sub>1-x</sub>P<sub>x</sub>," *Physical Review B* **34**, 8937 (1986).
- S. S. Jaswal, D. J. Sellmyer, M. A. Engelhardt and A. J. Arko, "Electronic Structure and Photoemission of VNi<sub>3</sub>," *Solid State Communications* **57**, 223 (1986).
- D. J. Sellmyer and S. Nafis, "Phase Transition in the Random Anisotropy System: a-DyFeB," *Journal of Magnetism and Magnetic Materials* **54-57**, 113 (1986).
- D. J. Sellmyer and S. Nafis, "Phase-Transition Behavior in a Random-Anisotropy System," *Physical Review Letters* **57**, 1173 (1986).
- J. E. Oh, J. A. Woollam, K. D. Aylesworth, D. J. Sellmyer, and J. J. Pouch, "Thermal and Structural Stability of Co-Sputtered Amorphous Ta<sub>x</sub>Cu<sub>1-x</sub> Alloy Thin Films on GaAs," *Journal Applied Physics* **60**, 4281 (1986).

\* \* \* \* \*

### INTERDISCIPLINARY PHYSICS

#### (a) Physics Education

- C. Bettis, "VDTEST: a computer program that controls a videodisk player," (1986).
- R. G. Fuller, "Resource Letter CPE-1: Computers in Physics Education," *American Journal of Physics* **54**, 782-786 (1986).

#### (b) Track Physics

- W. Hofmann, R. Katz, and Zhang Chunxiang, "Lung Cancer Risk at Low Doses of Alpha Particles," *Health Physics* **51**, 457-468 (1986).
- R. Katz, D. E. Dunn and G. L. Sinclair, "Thindown," *Nuclear Tracks and Radiation Measurement* **12**, 21-24 (1986).
- R. Katz, "Biological Effects of Heavy Ions from the Standpoint of Target Theory," *Advances in Space Research* **6**, 191-198 (1986).
- R. Katz, G. L. Sinclair, and M. P. R. Waligorski, "The Fricke Dosimeter as a 1-hit Detector," *Nuclear Tracks and Radiation Measurement* **11**, 301-307 (1986).
- M. P. R. Waligorski, R. N. Hamm and R. Katz, "The Radial Distribution of Dose Around the Path of a Heavy Ion in Liquid Water," *Nuclear Tracks and Radiation Measurement* **11**, 309-319 (1986).

#### (c) Archaeometry

- J. W. Weymouth, "Geophysical Methods of Archaeological Site Surveying," in *Advances in Archaeological Method and Theory*, Vol 9, Edited by M. B. Schiffer (New York: Academic Press, 1986), pp 311-395.
- J. W. Weymouth, "Archaeological Site Surveying Program at the University of Nebraska," *Geophysics* **51**, 538-552 (1986).
- J. W. Weymouth and Y. A. Lessard, "Simulation Studies of Diurnal Corrections for Magnetic Prospection," *Prospesioni Archeologiche* **10**, 36-47 (1986).
- J. W. Weymouth and C. Bennett, "Final Report of Magnetic Surveys of Ridges Basin Archaeological Sites in the Animus-Laplata Project, Colorado," in *The Cultural Resources of Ridges Basin and the Upper Wildcat Canyon*, Edited by J. Winter, J. Ware and P. Arnold, (Albuquerque: Office of Contract Archaeology, University of New Mexico, September 1986), Appendix E.

#### (d) History of Physics

- D. H. Jaecks, "Developments in 18th Century Optics and Early Instrumentation," in *The History and Preservation of Chemical Instrumentation*, Edited by J. T. Stock and M. V. Orna (Dordrecht: D. Reidel, 1986), pp 51-65.
- M. E. Rudd, "D. B. Brace's Measurement of Double Refraction Due to Ether Drift," in *The History and Preservation of Chemical Instrumentation*, Edited by J. T. Stock and M. V. Orna, (Dordrecht: D. Reidel, 1986), p. 41.

---

## 1987-88 Visiting Staff Members

On our staff as Visiting Professors this year are experimental atomic physicist **Sam J. Cipolla** (Ph.D. 1969, Purdue) from Creighton University and condensed matter theorist **John Flocken** (Ph.D. 1969, Nebraska) from the University of Nebraska-Omaha. Visiting Associate Professors this year are experimental atomic physicist **Cheng Wen-qin** (Ph.D. 1961, Nankai Univ.) from the Institute of Physics, Academia Sinica in Beijing; theoretical condensed matter physicist **Moshe Fibich** (Ph.D. 1964, Maryland) from Technion-Israel Institute of Technology in Haifa; experimental condensed matter physicist **Zhao Zhongren** (Ph.D. 1962, Qing Hua Univ.) from the Institute of Physics, Academia Sinica in Beijing; and astronomer **Zhou Hong-nan** (Ph.D. 1964, Nanjing Univ.) from Nanjing 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 Supercomputer Computations Research Institute at Florida State. In our Department as Post-doctoral Research Associates this year are experimental atomic physicist **Gordon Angel** (Ph.D. 1973, Queens Univ., Belfast), working with Professor Samson; theoretical atomic physicist **Michael Cavagnero** (Ph.D. 1987, Chicago), working with Professors Macek and Starace; experimental atomic physicist **Cathy L. Engelhardt** (Ph.D. 1987, Nebraska), working with Professor Jaecks; experimental atomic physicist **Mark Gealy** (Ph.D. 1987, Denver), working with Professor Rudd; astronomer **Yan-feng Li** (Ph.D. 1986, Nebraska), working with Professor Leung; theoretical atomic physicist **Chiling Wang** (Ph.D. 1986, Nebraska), working with Professor Macek; experimental atomic physicist **Orhan Yenen** (Ph.D. 1986, Nebraska), working with Professor Jaecks; and experimental atomic physicist **Yin Lifeng** (Ph.D. 1985, Academia Sinica, Shanghai), working with Professor Samson.

---

### 1986 Fall Semester Colloquia

September 4

Professor Anthony F. Starace, Department of Physics and Astronomy, The University of Nebraska  
"High Intensity Laser-Atom Interactions"

September 11

Dr. Harvel Wright, Oak Ridge National Laboratory  
"Physical and Chemical Evolution of Charged Particle Tracks in Liquid Water"

September 18

Dr. Robert Kargon, Willis K. Shepard Professor of the History of Science, The Johns Hopkins University  
"Uneasy Partnership: Science and Politics in 20th Century America"

September 25

Dr. Robert M. White, Vice President of Research, Control Data Corporation, Minneapolis  
"Data Storage Technologies for the Future"

October 2

Professor Burton Henke, The University of California-Berkeley  
"Absolute X-Ray Spectroscopy"

October 9

Dr. Geoffrey B. West, Theory Division, Los Alamos National Laboratory  
"Scale and Dimension—From Animals to Quarks"

October 16

Dr. Aloysius J. Arko, Argonne National Laboratory  
"Electron Spectroscopy in Heavy Fermion Systems"

October 30

Professor Lloyd Armstrong, Jr., The Johns Hopkins University  
"Above Threshold Ionization in High Intensity Multiphoton Processes"

November 6

Dr. Howard E. Bond, Space Telescope Science Institute  
"The Hubble Space Telescope—A New Era in Astronomy"

November 13

Professor Gerald Gabrielse, University of Washington  
"Capture of Anti-Protons in an Ion Trap"

November 20

*The Jerry E. Ruckman Lecture:*  
Professor Dean Zollman, Kansas State University  
"Physics and Sports: A Use of Interactive Video"

December 4

The Honorable J. James Exon, United States Senate  
"Science, Technology and Public Policy"

---

### 1987 Spring Semester Colloquia

January 15

Dr. Ron Kates, Max Planck Institut für Physik und Astrophysik, Munich  
"Formation of Galaxies"

January 22

Professor Kam-Ching Leung, The University of Nebraska  
"Evolution of Close Binary Systems—An Observational Approach"

January 29

Professor Gregory H. Paine, The University of Nebraska  
"Statistical Mechanics and Monte Carlo Methods for Peptide and Protein Structure"

February 5

Dr. Sheldon Datz, Oak Ridge National Laboratory  
"Radiation from Channeled Electrons and Positrons: Atomic and Molecular Physics in One and Two Dimensions"

February 19

Professor Richard F. Wallis, University of California-Irvine  
"Theory of Anharmonic Damping and Shifts of Raman Modes in Silicon"

February 26

Dr. Leonard M. Simmons, Los Alamos National Laboratory  
"Discrete-Time Quantum Mechanics"

March 5

Professor John R. Dickel, University of Illinois, Urbana-Champaign  
"What Happens to the Stars?"

March 12

Dr. Helmut A. Abt, Kitt Peak National Observatory  
"Kinematics and Duplicity of Emission-Line B-Stars"

April 2

Professor Brian DeFacio, University of Missouri  
"Inverse Scattering Problems in Physics and Mathematics"

April 9

Professor Herman Z. Cummins, City College of the CUNY  
"Non-Equilibrium Crystal-Melt Interface Dynamics"

April 16

Dr. Kenneth T. A. Taylor, Royal Holloway and Bedford New College, England  
"New Dynamical Features of Atoms in Strong Magnetic Fields"

April 23

Dr. Christine Jones, Harvard-Smithsonian Center for Astrophysics  
"Hot Gas in Galaxies"