SPECTRUM

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

No. 7 Fall 1986 M. Eugene Rudd, Spectrum Editor

Crandall Surveys Fusion Research at 1986 Recognition Luncheon

David H. Crandall

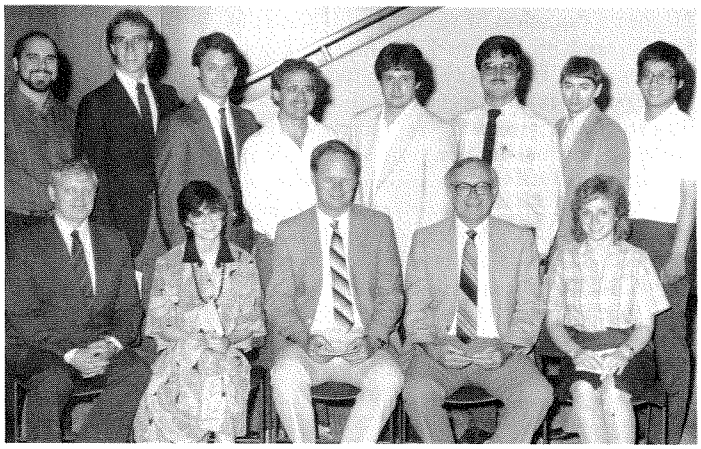
David H. Crandall (M.S. 1967, Ph.D. 1970), Branch Chief for Experimental Plasma Research in the Department of Energy's Office of Fusion Energy, was the featured speaker at the Second Annual Recognition Luncheon for the department's B.S., M.S., and Ph.D. graduates.

In his talk, Crandall recalled some of his experiences while doing research here under the guidance of Professor **Duane Jaecks,** who directed his Ph.D. thesis work. He went on to discuss recent progress and future prospects for fusion energy. During the past 15 years, Crandall noted, researchers have come to understand in much more detail the influences that impurities in fusion plasmas have on power losses from the plasma. In addition, a better understanding of the fluid dynamics of plasmas contained by magnetic fields is now possible through theoretical model calculations made possible by supercomputers. These advances have enabled currently operating Tokamaks to approach breakeven: the point at which the power extracted from the plasma equals the power needed to create and maintain the plasma.

Also at the luncheon, the 1986 Departmental Distinguished Teaching Assistant Awards were presented to graduate students Kevin Aylesworth and Thomas Freed. The luncheon concluded with the installation of fourteen new members into the physics honorary society, Sigma Pi Sigma: undergraduates **Gregory Bodtke, Robert Drucker, Michelle Garwood, Ryne Hobbs, Jennifer Rock, Mark Schlegel, Julie Schuldt,** graduate students **Kevin Aylesworth, David Fox, Chih-Ray Liu, Paul Marquard, Russel Shermer, Bruce Steele, Terry Teays,** and faculty members **C. Edward Jones** and **David J. Sellmyer.** Dr. **Robert W. Green** of the Physics Department at Morningside College in Sioux City, Iowa, performed the installation ceremony. Sigma Pi Sigma was founded at UNL in 1965. Its first member is listed as Professor **Edward J. Zimmerman;** member No. 17 is alumnus **Geoffrey B. Crooks** (B.S. 1965, M.S. 1967, Ph.D. 1972), who attended the luncheon.

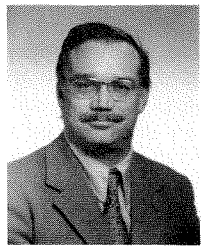
Seventy-one faculty, staff, alumni, and students attended the luncheon which was held in the new Wick Alumni Center. The event was organized by **Robert Fuller** and **Marilyn McDowell.**

Crandall speaking to students, faculty, and staff in the new Wick Alumni Center.



May 8, 1986 Induction of New Members, University of Nebraska–Lincoln Chapter of Sigma Pi Sigma: Standing (left to right): Paul Marquard, Gregory Bodtke, David Fox, Kevin Aylesworth, Ryne Hobbs, Russel Shermer, Terry Teays, Chih-Ray Liu; Seated (left to right): Dr. Robert W. Green, Michelle Garwood, Professor C. Edward Jones, Professor David J. Sellmyer, Julie Schuldt.

Macek Named Distinguished Professor



Joseph H. Macek

Professor **Joseph H. Macek** was named George Holmes Professor of Physics in March of this year. He was one of four UNL faculty members awarded Distinguished Professorships by Chancellor Martin Massengale at that time. He joins **James A. R. Samson,** who was the first member of this department to be so honored. Macek, who joined the faculty in 1968, was recommended for this award by the Committee on Distinguished Professorships. Macek's award was based on his internationally recognized research in theoretical atomic physics, his current appointments to the editorial boards of the three major international journals in atomic physics, and his service at the national level to the physics community.

Chairman's Letter

Dear Alumni and Friends,

The purpose of this newsletter is to inform you of developments in the Department and of the activities and achievements of the people associated with it. This year is special to us in that for the first time in ten years we are carrying out a search for a new tenure-track assistant professor. In these past ten years wholly new areas of inquiry in physics have sprung up, as reported so well in the decennial physics survey, *Physics Through the 1990s,* published by the National Research Council. The search for a new faculty member now—with additional hirings in the next few years likely—has stimulated the Department anew to plan strategically for its future.

These Departmental plans have been guided by external advice. The 1982 External Review Team—which included Robert B. Coleman (Virginia), Eugen Merzbacher (North Carolina), and Nobel Laureate Chen Ning Yang (Stony Brook)—recommended that the next few faculty hires be used to strengthen the Department's largest groups: atomic and molecular physics and condensed matter physics.

The Advisory Committee and the Department faculty as a whole have considered the recommendations of the External Review Team in the light of the recent physics survey and current Department needs and have decided to seek a condensed matter experimentalist at the Assistant Professor level in one of the areas of artificially-structured and novel materials, amorphous and disordered systems, interfaces and thin films, and particle-solid interactions, among others. The decision to seek an experimentalist is aimed to increase the number of our experimental groups in general and in the condensed matter area in particular. The decision to hire at the Assistant Professor level aims to redress the current imbalance in the Department: we have no Assistant Professors at present. The decision to target this new hire in the condensed matter area was made because we have only two experimental faculty in this area now and the trend in federal research funding in condensed matter physics is to support materials research groups.

While experimental condensed matter physics is probably the single most difficult area in physics in which to hire—due to the current high salaries offered by industrial laboratories and the expensive equipment needs of such research—I believe this Department, this University, and this city have a lot to offer a young faculty member wishing to embark on an academic career in science. To be very succinct, suffice it to say that a new faculty member would be joining a Department in which the quality of the faculty is well-known, as evidenced by the numerous honors, research grants, and responsibilities bestowed on our faculty in the past year and reported in these pages, and in which the quality of the support staff aiding the faculty in carrying out research and teaching is in many cases outstanding.

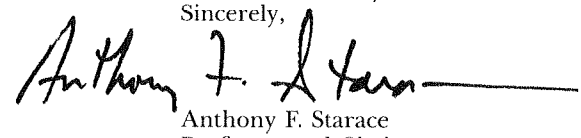
An additional strength of this Department is the support that you, our alumni and friends, have provided over the years. Let me give a few examples. The single most pressing need in physics departments everywhere, as has been documented in numerous reports and surveys, is for state-of-the-art equipment in both our teaching and our research laboratories. Federal research funding agencies have failed to provide support adequate to the needs, and universities, faced with budget cuts over the past several years, have been forced to give other needs higher priority. Mr. and Mrs. **James C. Coe** have made this Department fortunate indeed by designating a substantial part of the income from the Kositzky Memorial Equipment Fund for this Department's equipment needs. Although this fund has been in existence only a few years, its impact has already been substantial because we have chosen to use its income whenever possible to leverage large equipment purchases. Requests to federal funding agencies, or to any of several University programs, for expensive items of needed equipment are simply taken more seriously if Departmental funds are put up to share the costs. The Kositzky Fund greatly increases our ability to cost share in this way.

Another of our needs is for support of our Colloquium and Seminar series. The University Research Council provides support for a maximum of twelve speakers per year, based on competitive proposals. Out Colloquium series alone requires support for at least *two dozen* speakers per year, however. Now that we are searching for new faculty, it is more necessary than ever to bring faculty here from universities whose students and postdoctoral researchers we wish to hire in order to get good referrals. Secondly, the Colloquia and seminar series have always been an important component of our graduate teaching and research programs. Recently we have made efforts to involve undergraduates and the Society of Physics Students in selected colloquia. Thanks to your support over the past two years our Lecture Fund has grown to $2,000. But much more is needed.

I have outlined two needs. There are many others ranging from graduate fellowships and undergraduate scholarships to support of the Society of Physics Students. Enclosed with this letter is a pledge card and return envelope for tax-deductible contributions to one of our three accounts with the University of Nebraska Foundation. We are extremely grateful for the nearly $7,000 in new support you donated last year. I assure you that we shall continue to work to earn the confidence in us implied by this past generosity.

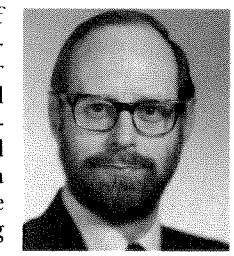
Finally, I urge you to keep in touch with us. Enclosed is a post card to inform us of your current address and recent activities. If you wish to write more, please send us a letter. We are always glad to visit with you whenever you are in Lincoln, and, given some advance notice, we will be happy to arrange a tour of our facilities. Best wishes until next year.

Sincerely,



Anthony F. Starace
Professor and Chairman

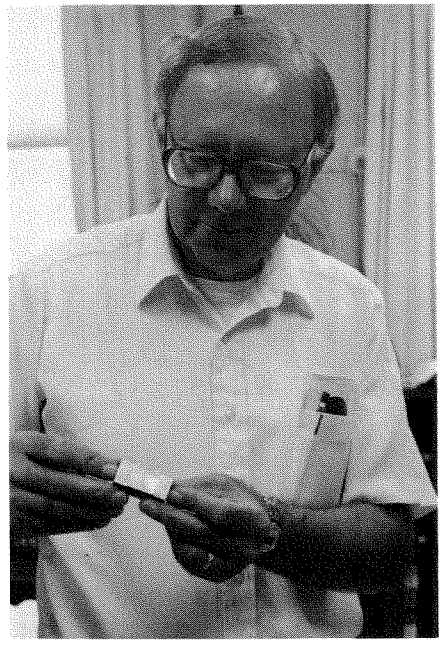
Robert Fuller Honored



Robert G. Fuller

Professor **Robert G. Fuller** was one of six faculty members in the country recognized by the American Association for Higher Education at their March National Conference on Higher Education in Washington, D.C. He was cited for "educational leadership extending beyond classroom teaching and research to . . . service in the cause of improving teaching and learning . . . service that involves taking responsibility for developing more effective forms of higher learning." Fuller was nominated by President Ronald Roskens for his internationally recognized development of Piagetian-based educational methods, his organization and Directorship of the ADAPT program at UNL, his creative activity at the forefront of educational technology with video discs and computers, and his substantial service, both local and national, in the cause of physics education.

Less than a month after receiving that award, Fuller received a 1986 College of Arts and Sciences Award for Distinguished Teaching, the second such award he has received. This award comprises a certificate, a medallion, and a $1000 check. Fuller is currently on leave at the Air Force Academy in Colorado Springs.



David Sellmyer with sample of magnetic material.

Magnetic Research of Hadjipanayis and Sellmyer Attracts $230,000 Grant

Pity the poor magnet. Few of us know as much about magnetism as we should. Turn the key in your car's ignition or press the switch on an electric can opener, hair dryer, or any other gadget around the house and you're putting magnetism to work. Whenever there's a small electric motor humming away, there's a magnet creating the electrical current that drives the motor.

David Sellmyer, University of Nebraska–Lincoln professor of physics, knows about magnetism. In fact, he was recently awarded a $230,000 grant from the U.S. Department of Energy to work with **George Hadjipanayis,** a Kansas State University physicist, and a newly-created material that makes the strongest permanent magnets known.

That's saying a lot, considering that the previous champion among magnets, developed for commercial use in the early 1970's, used a cobalt-samariam alloy that was about twice as strong as the best permanent magnet material known at the time.

Now, a new alloy being investigated by Sellmyer and Hadjipanayis combines the rare earth metal neodymium with iron and the element boron to create even stronger magnets.

"This alloy is very similar to one with extremely high magnetic retention that is already being developed commercially by General Motors," Sellmyer said. "GM plans to install crank motors with the new alloy in compact cars and light-duty trucks." The new crank motor, according to Sellmyer, will be about half the size of its predecessor.

Sellmyer suggested thinking of this new magnetic power in terms of its coercivity, the magnetic field required to overpower or demagnetize a magnet. Measured in a unit called oersteds, the earth's magnetic field is one-half an oersted. The new neodymium-iron-boron alloy is so strong, it would require a magnetic field of about 10,000 oersteds, or 20,000 times the earth's field, to demagnetize it, Sellmyer said. In addition to its powerfulness, the new alloy should also prove far less expensive to produce than cobalt alloys.

Hadjipanayis, who played a major role in discovering the new alloy, did postdoctoral work at UNL in 1980-81. He is largely credited with producing the first materials of this type in 1982. Another UNL researcher also played a key role in creating the new alloy-former graduate student **Steve Cornelison** (Ph.D. '82). Sellmyer said Cornelison found that he could produce certain iron-praseodymium-gallium alloys which had a plum pudding-like structure. Although the structure was amorphous—like a frozen liquid—it produced very intriguing permanent magnet properties at temperatures far below room temperature, he explained.

"Dr. Hadjipanayis then began experimenting with this alloy by changing the composition and, especially, by adding boron," Sellmyer said, noting that his laboratory had been using boron for years to promote the formation of amorphous alloys. After a heat treatment was added to the alloy containing boron, "out popped these wonderful new properties which were a complete surprise," Sellmyer said. But despite showing amazing properties as a powerful permanent magnet, the new alloy is still being perfected. Making it better is one of the purposes of the DOE grant.

He said the researchers will be investigating ways of altering the properties of rare earth alloy magnets in order to help them retain their magnetism at high temperatures.

Sellmyer said his role in the project will be to measure the alloy's magnetic properties. At Kansas State, Hadjipanayis's emphasis will be on looking at the alloy's unique microstructure. "We are trying to understand the fundamental physics of how this material develops its outstanding properties. Naturally, following understanding comes control of the properties," Sellmyer said.

The scientists already believe the new alloy is likely to result in a whole family of magnets; magnets of varying composition which will find many different applications such as in electric motors, hi-fi equipment, and medical scanners.

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The Principle of Latent Symmetry

[Editor's Note: Professor ***John R. Hardy*** *has been studying theoretically some novel material structures. At our request, he explains the essence of his work here in layman's terms.]*

For some seventy years it has been known that most common solid materials, such as common salt or the silicon used in a microchip, are built up in the way a brick building is built up: out of a regularly repeating array of "bricks." The difference here is that the "bricks" are small clusters of atoms. Subsequently it was discovered that the number of such distinct arrays that can exist has a finite and precise value (230) resulting from a conflict between the *local* symmetry about a specific atom in the array and the overall symmetry of the array as a whole, i.e., the regular repetition of identical "bricks."

Recent pioneering theoretical work at Nebraska on certain complex solids (having 28 atoms in each brick) has revealed for the first time what appears to be a new type of symmetry in these complex materials: a symmetry which is not perfect, but rather hidden, i.e., latent and imperfect. It stems from the existence in these solids of intertwined helical arrays of atomic groups. Because of the imperfection of these helices, their natural pitch (i.e., turns per unit distance) bears an arbitrary relationship to the natural repeat distance of the atomic building blocks. As a consequence of this, the helices are *open* rather than closed, as is the case for the "normally" symmetry-allowed helices which, hitherto, were *assumed* to be *required* to close. This assumption has now been revealed as fallacious.

The importance of this finding is that it essentially implies the existence of what could be regarded as a novel state of matter whose properties are determined by mathematical conditions completely different from those used for "normal" (i.e., periodic) systems. We are currently exploring the implications of our findings and are greatly encouraged by the manner in which they provide a natural and elegant explanation for a variety of observations which have hitherto been either inexplicable, or explicable only by increasingly implausible extensions of pre-existing theories.

Tandy Corp Grants Computers for Physics Resource Center

Professor **Robert Fuller** successfully applied to the Tandy TRS-80 Educational Grants Program for six Tandy 1000 EX computers with printers and software for our Physics Resource Center. The value of the grant is almost $10,000. The purpose of the grant is to begin the integration of computers into our physics and astronomy major program. For this purpose a working group comprising **Cliff Bettis, Robert Hardy, C. Edward Jones,** and **Anthony Starace** is putting together a trial 1-credit course for majors which would get them comfortable with word processing, spreadsheets, graphics, and other software and show them the utility of these for solving and understanding physics problems. A similar grant to the Apple Corp by the Computing Resource Center has also been approved and resulted in Ed Jones's getting a MacIntosh Plus computer and Imagewriter II printer on loan for this purpose. Eventually it is hoped to have both IBM-compatible computers and Apple MacIntosh Plus computers in the Physics Resource Center.

The Minnich Telescope

The Minnich telescope, which will provide students with a projected view of the sun all day long, and a view of the planets and stars from the comfort of an indoor environment on cold winter nights, is now being constructed in the Physics Department machine shop. Our machinist **Gerry Moore** has finished fabricating the base of the telescope, which will clamp to the window sill in the astronomy resource room in Ferguson Hall. The polar axis of the telescope will be aligned parallel to the earth's axis to provide automatic tracking of celestial objects. Gerry is now machining the polar axis and telescope tube so the instrument will soon be at a stage where it will start to look like a telescope. Commander **Charles B. Minnich** of Orlando, Florida donated the six-inch objective and also the funds for the construction of the telescope.

Jaecks Probes History of the Telescope

Most people studying history use books, newspapers and other documents as source material. Professor **Duane Jaecks** has been studying the history of the development of the achromatic telescope with equipment he mounts on an optical bench! In last year's *Spectrum* his plans to make measurements on 100 antique telescopes in the museums of Europe were reported. During the first six months of this year he pursued this project with support from the National Science Foundation and from the Oxford Museum of the History of Science.

With a point source of light, a 6″ concave mirror, a set of interference filters, and a micrometer-adjusted razor blade, he made knife-edge tests of the objectives of over 100 historically important telescopes in England, Holland, and Germany. This apparatus enabled him to make measurements of the spherical and chromatic aberration of the lenses. In addition, photographs were taken of the knife-edge images to record the striations in the glass and the non-uniformities of the surfaces.

At the Tyler Museum in Leiden, Holland, he was allowed to make these measurements on a 2-inch lens that Christian Huygens made and used in 1665 to discover Titan, the largest satellite of Saturn. At the same museum Jaecks was able to show unambiguously from his measurements that the objective lens in one of their prized telescopes was not original but, in fact, was a later replacement.

In May, Jaecks reported some of his preliminary work to the Scientific Instrument Society at Oxford, England and in October gave a paper on the subject before the International History of Science Society meeting in Florence, Italy.

Part of crowd waiting to look through the Behlen Observatory telescope.

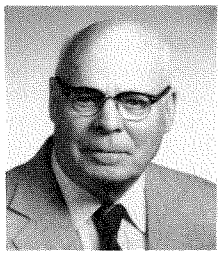
Behlen Observatory Crowds View Halley's Comet

Over twenty-five hundred people fulfilled a promise made to themselves to see Halley's comet during their lifetime with the help of the 0.76-meter telescope at Behlen Observatory about thirty-five miles from the campus. This required some twenty hours of viewing spread out over half a dozen sessions, including one from 3 AM to 6AM which drew 60 people! While a few people were disappointed at the faintness of the comet, most were quite satisfied just to be able to say that they had seen it. At its best, the appearance of the comet was probably best described by one farmer who said that it resembled a "yardlight in a snowstorm." To help relieve the waiting in long lines to reach the one and only eyepiece, the astronomy staff gave seemingly countless slide talks about the comet. One memorable moment came when one of the less patient souls burst into the talk to loudly admonish the speaker to lecture faster because there were 400 people waiting for the talk to finish so they could view the comet! Another demanded to be shown the comet at noon because he had mistakenly thought an early morning viewing session would continue after sunrise. In addition to the regular open nights, special groups came to the observatory on six other nights. These included clases from the Wahoo Public Schools, the Yutan Public Schools, and Creighton Prep. While the comet may not have been a fantastic sight, it brought the stars and a lot of people together for the first time.

Astronomy Group Acquires New Camera

The astronomy group has just acquired its new charge-coupled device (CCD) camera, a high performance relative of the common solid state video camera. The detector in the camera achieves great sensitivity by being cooled with liquid nitrogen, which suppresses the dark noise, allowing exposures of many minutes, instead of the 1/30 second exposure at room temperature that an ordinary camera uses. With it we will be able to make measurements that would previously have required the use of the Mt. Palomar telescope, the largest in the world, before it was similarly fitted with a CCD camera. The CCD will be used in conjunction with a triple automated filter slide, designed by Professor **Ed Schmidt,** that allows over twenty different filters to be quickly positioned in the beam of star light to the CCD. The CCD is now undergoing laboratory tests preparatory to its installation on the telescope at Behlen Observatory.

Jorgensen Teaches in New Honors Program



Theodore Jorgensen, Jr.

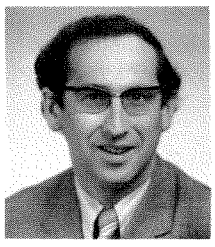
Emeritus Professor **Theodore Jorgensen, Jr.** (B.A. 1928, M.A. 1930), who retired in 1975, has taken up the harness again this fall and returned to teaching. Professor Donal Burns of our department was scheduled to teach a new honors course, but when he was appointed to an administrative position in August (see article about him) this left the course without a teacher. So Jorgensen, who turned 81 in November, was asked to take over the course for the fall semester.

Jorgensen was first employed at the university in 1924 when he worked for the library as an undergraduate. He was also a teaching assistant and a half-time instructor before his graduation in 1928. After receiving his Ph.D. degree at Harvard, he returned to UNL in 1938.

The Honors Program is a new program established at the university to meet the educational needs of highly capable and motivated students. In addition to his/her other courses, a student in this program takes specially designed courses and interdisciplinary seminars. The course Jorgensen teaches is called "Perceptions of the Natural World" and uses a textbook entitled "Einstein's Space and Van Gogh's Sky."

During his retirement Jorgensen has pursued his interest in the physics of golf. He has applied Lagrange's equations to the motion of the arm and golf club and has also studied the effect of varying the various moments of inertia of different kinds of golf clubs. More recently he has been investigating the foundations of quantum mechanics. But with a twinkle in his eye, he tells us that he especially enjoys his return to teaching.

Burns Assumes Administrative Position



Donal J. Burns

On August 18 Professor **Donal J. Burns** became the Assistant Executive Vice President and Provost in the Central Administration of the university. His office has the major responsibility for all of the academic programs on the three campuses of the University of Nebraska system.

Burns was born in Belfast, Ireland and received his Ph.D. in physics at Queen's University there. He came to Nebraska in 1968 as a postdoctoral research associate for Professor Rudd, and became a member of the faculty in the following year. He was Associate Dean of the College of Arts and Sciences from 1977 to 1982 and has been the Director of the University Studies Program since 1980. He won a Distinguished Teaching Award in 1972.

Physicists Use Videodiscs as Teaching Aid

Professors of physics **Robert Fuller,** University of Nebraska–Lincoln and Dean Zollman, Kansas State University have bridged the miles between their respective schools by collaborating on what they hope will be an ongoing series of videodiscs. The videodiscs, which range in subject from the now famous collapse of the Tacoma Narrows Bridge to the stresses involved in automobile collisions, are designed to assist physics students in learning and applying introductory physics concepts.

To date four discs have been produced by Zollman and Fuller, along with **Tom Campbell,** a former physics teacher who is now vice president of Illinois Central College. The first of these discs, **The Puzzle of the Tacoma Narrows Bridge Collapse,** was authored about three years ago. "The first seven and a half minutes were footage from the University of Washington archives of the collapse of that six million dollar bridge," explains Fuller. "Some of the film was taken by a cameraman who owns a camera shop in Tacoma, so it was that original newsreel-type film that served as the opening for the disc. The rest of the disc was material that we shot in the studio here at Nebraska; it's basically a physics experiment that sets up a model and explains how oscillations occur in objects."

After the introductory footage the disc leads the student into the main body of the lesson where a series of questions are posed involving fundamental physics concepts. The interactive nature of the material allows the student to pause the lesson at any point, although, says Fuller, the first handful of discs pressed by Pioneer Video did not offer the luxury of interactivity.

Part of the TNB disc involved constructing a model of the Tacoma Narrows Bridge on campus, and featured Campbell on camera—the only one of the disc's principal authors who appears on screen. "We set up a model of the bridge in which you had to blow on it with an electric fan," says Fuller. "To simulate the gusts of wind that were blowing on the bridge, somebody had to put a piece of cardboard out in front of the fan to make the gusts. Tom was the only one of the three of us who could do it properly (making) the bridge oscillate the way we wanted it to."

Energy Transformation features filmed footage of a person riding a bicycle along a road. Students are asked to watch the footage and then determine if the bicycle moves at a constant speed or not.

During a recent conference held in the Netherlands and attended by Zollman and Fuller, the **Energy Transformation** disc was a big hit. Fuller says the University is now exploring opportunities to collaborate with other countries to get the videodisc more quickly into the classroom. "We really think we can enhance the educational system with videodiscs," he postulates.

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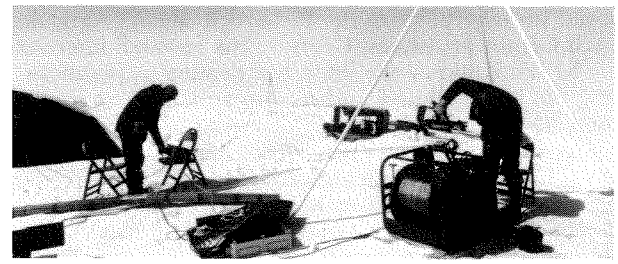

Site of the bore hole in Greenland

Electronics Shop Assists Polar Ice Core Project

Physics Department Electronics Technician **Brian Farleigh** accompanied and assisted Lyle Hansen of UNL's Polar Ice Coring Group in the logging of a deep borehole at Dye 3, Greenland in May and June. Both Brian and Electronics Shop Supervisor **John Kelty** have been upgrading and testing the electronics package for the Polar Ice Coring Office's borehole logging instrument. The trip to Greenland was a field test of the instrumentation, which is intended for use in an Antarctic expedition to the Byrd Station planned for December and January. Farleigh will be a member of that expedition.

Kelty points out that the microprocessor-based data acquisition system built for the polar project is virtually the same as ones already built by the electronics shop for use in several research laboratories in the department and in the advanced electronics course laboratory.

Jaswal Awarded Fulbright Grant

Professor **Sitaram Jaswal** has been awarded a Fulbright grant to lecture and perform research at the Technical University in Vienna, Austria during the fall 1986 semester. Jaswal is one of approximately 2500 Americans being sent abroad for the 1986-87 academic year under the Fulbright exchange program. Established in 1946 under congressional legislation introduced by former Senator J. William Fulbright of Arkansas, the program is designed "to increase mutual understanding between the people of the United States and the people of other countries." Grants are awarded to American graduate students, teachers, and professors to study, teach, lecture, and conduct research abroad, and to foreign nationals to engage in similar activities in the U.S. Individuals are selected by the presidentially-appointed Board of Foreign Scholarships on the basis of academic and professional qualifications, plus their ability and willingness to share ideas and experiences with people of diverse cultures.

Nelson Named 1985 Federal Engineer of the Year

Stuart O. Nelson

Stuart O. Nelson (M.A. 1954), an engineer for the Agricultural Research Service, U.S. Department of Agriculture, was awarded the Founder's Gold Medal by the National Society of Professional Engineers as the 1985 Federal Engineer of the Year. His selection for the honor from nominees of 36 federal agencies, was announced at the ceremonies in Washington during National Engineers Week on February 20, 1985.

Nelson earned his M.A. in physics at UNL in 1954 following the completion of B.S. and M.S. degrees at UNL in Agricultural Engineering. He later earned a Ph.D. in Engineering at Iowa State University. He led USDA research projects on electromagnetic radiation applications and was a member of the UNL Agricultural Engineering faculty from 1954 until 1976, when he moved his laboratory to the Richard B. Russel Agricultural Research Center at Athens, Georgia. His research interests included RF and microwave dielectric heating applications for stored-grain insect control and seed treatment to improve germination. He pioneered the field of dielectric properties measurements on grain and other agricultural materials and developed systems for such measurements spanning the range from audio frequencies to the microwave K band. He supervised the development of computer programs needed for some of these measurements that have found application in research laboratories on five continents. His work has also led to a better basic understanding of the behavior of particulate dielectrics.

Nelson credits the UNL Physics Department with giving him good basic background for work in electrical measurements and has always remembered a bit of advice offered by Professor **T. T. Smith:** "Always question your measurements, and you'll do good work." The experience of handling the Atomic Physics Laboratory under Professor **Theodore Jorgensen,** building electronics equipment for Professors **Don Moore** and **Robert Chasson,** and the machine shop tips learned from Mr. **Heiser** were all valuable in his later experimental work. His current studies involve the development of time-domain spectroscopic methods and other automated methods for the efficient wide-frequency-range measurement of dielectric properties of materials.

Through cooperative work at the University of Georgia, Nelson has become acquainted with Manuel Menendez, a former colleague of Dr. **Chris Kuyatt** (Ph.D. 1960) at the National Bureau of Standards and with Professor **Alan Edwards** (Ph.D. 1967). Menendez is the head of the Physics Department at Georgia and Edwards is the Graduate Program Coordinator.

"An Endangered Species: The High School Physics Teacher"—Lang

On October 31, 1985 Lincoln and Omaha area high school physics teachers and faculty from our Department got together to discuss educational issues. The focus of the event was the second annual **Jerry E. Ruckman** Lecture, given this year by Dr. **Charles Lang** of Omaha West Side High School. Lang is one of two Physics Teacher Resource Agents for the state of Nebraska during 1985-88. He recently helped edit the Annenberg Project video physics course, "The Mechanical Universe," developed at Cal Tech and shown on educational television stations. He has also just been named a 1986 Presidential Awardee for Outstanding Science Teaching.

Lang contrasted the success Omaha West Side has had in promoting physics education with the ominous trend of few young people entering the teaching profession with a solid training in physics. He said that 20 years ago only 30% of students at his high school studied physics and most of these were men. In the 1980's this percentage is up to 65% and there are about as many women as men students. Lang attributed these rises to increasing societal awareness of science and technology issues as well as to the women's liberation movement. However, Lang's oft-given advice to his students (that to be an educated person one needs some knowledge of physics) probably helped also, given that nationally the proportion of students studying physics has been declining. Lang also pointed to a serious need for experienced physics teachers to help other experienced teachers, trained in other fields, who are increasingly being asked to teach physics for the first time.

Discussions continued over dinner at the Nebraska Union. These discussions led Professor **Robert Fuller, Charles Lang, John Shetler** (Neligh H.S.), **John Skrocky** (Omaha Northwest H.S.), and **Doug Wilson** (Lincoln East H.S.) to submit a proposal to the Nebraska Coordinating Commission for Post Secondary Education (NCCPE) to fund a workshop on physics demonstrations for non-endorsed high school physics teachers. This proposal was funded at $38,000 and the workshop was held last summer. It was found by the participants to be extremely helpful and well-taught. These informal get-togethers between our faculty and area high school teachers will continue. They are supported financially by the Jerry E. Ruckman Endowment Fund.

We Heard From These Alumni:

Ackerman, Charles B. (M.A. 1950, Ph.D. 1954 Physics/Math) 6720 E Bluebird Lane, Paradise Valley, AZ 85253. Retired from Motorola. Regarding the Minnich Lens—33 years ago there was a box in the basement of Brace Laboratory that supposedly housed the lens. I cannot remember physically seeing it but the box was pointed out to me. Of course that is long ago and probably of little help. (The attic of Brace Laboratory was also used for storage).

Ahmed, Mohammed (M.S. 1970, Ph.D. 1974). Thapar Corporate Research and Development Centre, P.O. Box 68, Patiala 147 001, India. Writes "Thank you very much for sending me a copy of the newsletter 'Spectrum' for 1985. I am working as a Visiting Associate for two years (1985-87) in the Mechanics and Computer Division of Thapar. Presently I am involved with software projects in mathematical modelling for transformers and electrical machines. We are soon to acquire a computer system (like MicroVax II). The scientists (at Thapar) would appreciate an exchange of information with the UNL Physics Department. I am especially interested in doing some research in atomic collisions. Please say hello to Dr. Lipsky and Dr. S. C. Seth in the Computer Science Dept."

Altrock, Richard C. (B.S. 1962 Physics/Math) National Solar Observatory, Sunspot, NM 88349. Is an Astrophysicist at

the Air Force Geophysics Laboratory. Has been chosen for inclusion in the 1986 edition of *Who's Who in America.*

Anderson, Terry L. (M.S. 1971, Ph.D. 1975) 20 Woodward Lane, West Millington, NJ 07946. Member of the Technical Staff at AT&T Bell Laboratories. Now doing research on programming environments and tools.

Bade, William L. (B.S. 1949, M.A. 1951, Ph.D. 1954) 4 Bowser Rd., Lexington, MA 02173. Bill is unfortunately disabled and retired, due to an attack of meningitis about 10 years ago. He would be pleased to receive communications from those who remember him.

Bradley, Wendell G. (M.S. 61, Ph.D. 1970). Rt. 1 Box 150, Edgewood, IA 52042. Was Professor at Gustafus Adolphus College from 1969-1983. Now a self employed Farmer-Activist.

Bunch, James M. (M.S. 1963, Ph.D. 1967 Physics/Math) Los Alamos National Laboratory, MS G780 Los Alamos, NM 87545. Staff Member. He is back at Los Alamos after an interesting sojourn in the semiconductor industry.

Cerny, Richard A. (B.S. 1968) 12 Military Rd, Worcester, MA 01609. President and founder of Trellis Communications Corp. (Salem, NH). This is his second high-tech start-up in the field of fiber optic communications. Currently Trellis is working with a number of end users to implement fiber optic and wire data communications cabling systems in building and campus environments, creating structured, uniform communications as does AT&T and IBM. Was formerly founder and CEO of Artel Communications Corp. (Worcester, MA), manufacturer of fiber optic communications systems.

Davis, Robert H. (Former Staff) Physics Department, Florida State University. Professor at Florida State University, Tallahassee, FL 32306.

Edwards, Alan K. (M.S. 1964, Ph.D. 1968) Department of Physics, University of Georgia, Athens, GA 30602. Associate Professor at the University of Georgia. He writes, "Finally received NSF support, with colleagues Bob Wood and Tim Heil. Will study multiple ionization of simple molecules. Saw Larry Smalley at a meeting. Spent time reminiscing about our graduate school days at Nebraska."

Egbert, Gary T. (Ph.D. 1974). R1 Box 29, Byron MN 55920. Staff engineer (physicist!) at IBM in Rochester. "I enjoy hearing about the atomic collisions group and the department. Also about those who were there in the 69-72 timeframe. I work in a magnetic head development group for small hard files—an exciting, everchanging area."

Eskew, Mitchell A. (B.A. 1981) 180 Abbey St. Massapequa Park, NY 11762. Operations officer in the US Marine Corps.

Franz, Charles R. (MA 1969) 408 Vieux Carre Ct, Columbia, MO. Assistant Professor of Management at the University of Missouri–Columbia. Does teaching and research in Management Information Systems.

Gallagher, John S. (Former Staff). Lowell Observatory, P.O. Box 1269, Flagstaff, AZ 86002. Has been appointed the sixth director of Flagstaff's Lowell Observatory as of July 1st, 1986. Was formerly a Staff Astronomer at Kitt Peak National Observatory near Tucson.

Heeger, Alan J. (B.S. 1957) Department of Physics, University of California, Santa Barbara. Professor of Physics and Director, Institute for Polymers and Organic Solids at the University of California, Santa Barbara.

Jacobs, Loyd D. (M.S. 1958 Physics/Math) 2004 128th Ave SE, Bellevue, WA 98005. Principal Engineer at the Boeing Company. "I am working on the interior noise of a proposed new advanced technology commercial airplane."

Kummer, Donald D. (B.S. 1964) 843 W Howell St., Ridgecrest, CA 93555. Physicist at the Naval Weapons Center (NWC). Received M.S. degree in Physics from the University of Washington in 1966. Employed by NWC (1967-present) to develop applications of infrared optics, detectors, and materials to weapons systems.

Marquard, Paul (M.S. 1986) 611 Andrea Lane #16, Casper, Wy 82609. Teaching at Casper College. Writes "Faculty meetings started Tuesday morning. The new faculty members were gathered to sign all sorts of papers, mostly insurance and pension forms. I'm surprised I managed to stay awake. That afternoon I saw Anne off to the Natrona County *International* Airport. You can imagine the hassle we had to go through to find our gate at the "International" airport. They must have 4 gates. Truly an awesome sight at this booming metropolis. The university administration here is upset with the money cuts and the drop in enrollment. Their attitude is understandable, but they seem to be taking it out on the faculty."

Martin, Peter J. (M.S. 1970, Ph.D. 1975). Lecroy Research Systems, 700 South Main Street, Spring Valley, NY 10977. Called to say that his company is creating an Advanced Training Institute for engineers and technical sales personnel. The company is looking to hire 60 new people to go through the training program.

Maurer, Christopher (M.S. 1973) 4117-251 SW 20th Ave. Gainesville, FL 32607. Postdoctoral Associate in the Department of Anthropology at the University of Florida. "Am continuing research on extending thermoluminescent dating to heat-altered chert artifacts."

McKnight, Ronald H. (M.S. 1964, Ph.D. 1970) 8 Michele Ct., Gaithersburg, MD 20878. Physicist at the National Bureau of Standards. "Thanks for the newsletter. I'm doing more applied physics than physics, working on electro-optic methods of measuring transient high voltage electrical signals."

Pareek, Prem N. (M.S. 1980, Ph.D. 1983) Department of Radiation Oncology, University of Alabama, 619 South 19th Street, Birmingham, AL 35233. Assistant Professor, Department of Radiation Oncology at the University of Alabama. "Enjoyed reading the fall 85 issue of SPECTRUM, especially the article about Medical Physicists. I will try to meet all those alumni during the next meeting in Lexington in August 1986."

Patterson, James D. (Former Staff) Department of Physics and Space Science, Florida Institute of Technology, Melbourne, FL 32901. Professor of Physics and Space Sciences at Florida Institute of Technology.

Rodine, Edward T. (Ph.D. 1970) Manager, Development Engineering, Amperex Electronic Corp, Slatersville, RI 02876. Paid a visit to the Department as part of a visit to the midwest to see relatives in Minnesota and Omaha. Says New England economy is booming. His company is particularly involved in materials diagnostic and medical imaging equipment.

Sharma, Thaneshwer P. (Ph.D. 1973). Department of Physics, Institute of Advanced Studies, Meerut University, India. Presented a Condensed Matter Seminar here on September 9, 1986 titled "Thin Films for Solar Energy Devices." Writes "It gives me a great pleasure to visit my old department of Physics after a long span of thirteen years. I find that since I left there is a tremendous growth in experimental facilities and computers here. I wish that this department continues to progress."

Shermer, Russel (B.S. 1984 Physics/Math, M.S. 1986) 805 W. Green, Apt. 37, Urbana, IL 61801. Graduate Student at the University of Illinois (Urbana-Champaign). "Due to the solid education received at Nebraska, I was able to pass the Ph.D. qualifier during my first try. So, the pressure is off and I can enjoy my classes. I will not have to repeat any course work, though I have chosen to take a slightly more advanced class in statistical mechanics. I came in with 50 other students, most of them American. A lot of people are interested in non-linear dynamics here and I am taking an introductory course in that field. I hope all is well in the department and I thank you for the education you have granted me."

Spencer, Cary R. (B.S. 1971) 1234 Onyx Road, Livermore, CA 94550. Physicist in the Defense Sciences Department at Law-

rence Livermore National Laboratory. Received Ph.D. from Iowa State University in 1977. Was a Senior Physicist and Project Manager at Airco Superconductors, Murry Hill and Carteret, N.J. 1977-81. Currently physicist at LLNL since 1981.

Winder, Dale (M.A. 1954) 1430 W Oak St., Ft. Collins, CO 80521. Is working for Colorado State University and for himself. Was transitionally retired in 1984 to teach 1 semester. Consults on x-ray methods. Is a Graduate Gemologist.

IN MEMORIAM

Lauterborn, D. G. (Former Staff) is deceased.
Severence, Ralph H. (M.S. 1932) died July 18th, 1985.

NO KNOWN ADDRESS:

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

Malvyn P. Bailey (M.S. 1962)
Harvey E. Clark (B.S. 1968)
Duane A. Courter (M.S. 1960)
Setsuo Dairiki (M.S. 1945 Physics/Math)
Richard V. Denton (B.S. 1965)
Clarence DeYoung (B.S. 1958)
David B. Dunkin (M.A. 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)
Roy B. Kreigh (A.B. 1949, M.A. 1950 Math/Physics)
Albert S. F. Lee (B.S. 1979 Astronomy)
Mei Lin Lin (M.S. 1962 Physics/Math)
William H. Odell (B.S. 1965)
Winifred P. Pikelis (B.S. 1980)
Frank P. Ross (B.A. 1958)
LeRoy G. Schulz (M.S. 1941)
Kaveh Shamloo-Tehrani (B.S. 1983 Engr/Physics)
Lester L. Skolil (M.A. 1937)
Robert K. Weimer (B.A. 1977)
Robert A. Worsing (M.A. 1949 Math/Physics)
Albert Olatunji YeYe-Odu (B.A. 1975 Math/Physics)
Edward L. Zukowski (M.S. 1965)

Acknowledgements

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Thomas H. Bedwell (Ph.D. 1966 Secondary Education/Physics)
Bell Communications Research Inc.
Thomas E. Bullock (M.S. 1979)
Louis J. Caplan (M.S. 1964, Ph.D. 1975)
Mr. and Mrs. James C. Coe
Columbia Broadcasting System
David H. Crandall (M.S. 1967, Ph.D. 1970)
Robert D. Dubois (B.S. 1970, M.S. 1972, Ph.D. 1975)
Stephan M. Eddy (B.S. 1978)
John N. Gau (M.S. 1971, Ph.D. 1975)
Richard J. Gleeson (B.S. 1967)
Walter W. Heinze (B.S. 1954, M.S. 1956)
International Business Machines Corporation
Robert Katz
Joseph Macek
Kaichi Maeda (Ph.D. 1960 Physics/Mathematics)
Charles B. Minnich
Stuart O. Nelson (M.A. 1954)
Joseph L. Parker (Ph.D. 1940 Chemistry/Physics) and **Kathryn H. Parker**
Kevin D. Reilly (M.S. 1962 Physics/Mathematics)
Jerry E. Ruckman (B.S. 1962)
M. Eugene Rudd (Ph.D. 1962)
James A. R. Samson
Donald P. Schneider (B.S. 1976)
David J. Sellmyer
Anthony F. Starace
Daniel H. Weitzel (M.S. 1952)
Mrs. Rebecca Willman
Dale R. Winder (M.A. 1954)

Alumni Cited for Research in Private Undergraduate Institutions

The Council on Undergraduate Research (CUR), a nonprofit organization designed to encourage research in the undergraduate environment, has published a study entitled "Research in Physics and Astronomy at Private Undergraduate Institutions," edited by Brian Andreen (CUR, Tucson, May 1986), which includes descriptions of the research of two of our Department's alumni and one of our visiting staff members. The study surveys research in 60 institutions which collectively produced 9.1% of all physics and astronomy majors in the U.S. and 8.1% of all non-foreign graduate students during the five year period 1981-85. A main purpose of the study is to document "the belief that their policies of providing research opportunities for undergraduate students yield a high quality of scientific education."

Paul D. Schulze (M.S. 1966, Ph.D. 1970) is Department Chairman and Professor of Physics at Abilene Christian University, his undergraduate alma mater, in Abilene, Texas. Working currently with two undergraduates, he carries out research on adsorption of small gas molecules on transition metals and rare earths using Auger electron, x-ray photoelectron, and ultraviolet photoelectron spectroscopies. His research is currently support by the ACU Research Council.

Conley I. Stutz (Ph.D. 1968) is Professor of Physics at Bradley University in Peoria, Illinois. In his research, he studies the electronic and structural configurations in triazines and other nitrogen-containing compounds using nuclear quadrupole resonance spectroscopy. He is currently studying also the approach to equilibrium of quantized systems. His research is supported by both the National Science Foundation and the Bradley Board for Research and Creativity.

Sam J. Cipolla, a Visiting Professor in this Department, is Professor of Physics at Creighton University in Omaha. His research centers on the experimental and theoretical study of heavy ion - atom collisions, particularly those resulting in electron promotion through quasi-molecular orbitals formed during slow collisions. He has also studied ion - atom collisions in thick, solid targets, where multiple collision phenomena are important, as well as the efficiency response of Si(Li) detectors. His research has been supported by both the National Science Foundation and the Research Corporation.