

# Spectrum

*a Newsletter for Alumni and Friends of the Department of Physics and Astronomy at the University of Nebraska-Lincoln*

No. 17 Fall 1996

Anthony F. Starace, Editor

## Sellmyer Wins University Research Award



David J. Sellmyer

**David J. Sellmyer**, Director of the UNL Center for Materials Research and Analysis (CMRA) and George Holmes Professor of Physics, has been awarded the highest honor bestowed by the NU system, the University of Nebraska Outstanding Research and Creative Activity (ORCA) Award. The ORCA award, which includes a \$3500 stipend, is given to one or two system faculty members each year for "contributions to his or her field and to the University in the areas of

scholarship, research, or artistic achievement."

Sellmyer received his Bachelor's degree from the University of Illinois in 1960, and his Ph.D. from Michigan State in 1965. After teaching at M.I.T. in the Department of Metallurgy and Materials Science, he came to Nebraska. He served as Department Chairman for two terms, from 1978 to 1984, and was appointed George Holmes Distinguished Professor in 1987. He is a Fellow of the American Physical Society, and has published over 200 scholarly papers.

A primary focus of Sellmyer's research is the synthesis and understanding of nanostructured magnetic materials. Two of his group's success stories have been the development of light, extremely strong permanent magnets for use in airplane and automobile motors, and the pioneering work they have done in producing very high density magnetic storage devices that can be erased and written to at will. This latter project, done in collaboration with a federally-funded multi-university consortium, has succeeded in improving the density with which information can be stored on a magnetic medium by more than an order-of-magnitude over the previous state of the art.

(continued on page 3)

## Leslie-Pelecky, Claes Join Department



Diandra Leslie-Pelecky



Daniel Claes

Two new faculty have joined the Department at the beginning of the 1996-97 academic year with the rank of Assistant Professor. **Diandra Leslie-Pelecky** has joined the condensed matter and materials physics group and **Daniel Claes** has joined the high energy physics group. Both new faculty add strength to the Department's experimental research programs. Both also have significant experience and interest in physics education.

After obtaining bachelor's degrees in physics and philosophy, Dr. Leslie-Pelecky earned a Ph.D. in physics from Michigan State University. Her thesis work on the dynamic properties of multilayered spin glasses investigated the behavior of random and disordered materials as they make the transition from three dimensions to two dimensions. After a postdoctoral appointment, she became a Visiting Assistant Professor at Nebraska and later a Research Assistant Professor in Physics and the Center for Materials Research & Analysis.

Her research focuses on the magnetic properties of nanostructured materials, self-stabilized magnetic colloids and permanent-magnet nanocomposites. She gave an invited talk on nanoscale magnetism to a large audience at the 1996 March

(continued on page 4)

## Chairman's Letter

### *The Changing Face of Physics Research*

Another year has passed and the Department of Physics and Astronomy continues to evolve and hopefully become better. As detailed elsewhere in the *Spectrum*, the Department suffered a great loss with the retirement of *Charles Mach Distinguished Professor* Jim Samson last summer. (Fortunately for the Department Jim is continuing his research program as actively as ever.) This loss was mitigated by the addition of two new faculty this



Roger D. Kirby

Fall, who are strengthening our research programs in experimental high energy and condensed matter physics, and who are giving us some new blood to enhance our teaching and outreach efforts. Changes such as these will continue unabated for at least the next decade (assuming University resources permit it), as many of our current faculty are approaching retirement age. But the Department is also changing in some more subtle ways, especially in the nature of its ongoing research activity. Two or three decades ago, faculty in the Department had their own independent research laboratories and programs, and nearly all physics research at Nebraska was carried out locally, using our own instrumentation and computers. Collaborations with researchers at other institutions existed, but they were typically short-term and small scale. At that time, "big" science was largely limited to experimental particle, nuclear, and plasma physics, which were areas in which Nebraska had no research programs.

The "big" science areas of physics, especially experimental high-energy physics, require the development and construction of huge accelerators and detectors, and consequently involve very long-range planning and large numbers of scientific collaborators and graduate students. Most of the collaborators spend considerable time at the accelerator and away from their home institution. However, over the last two decades, other areas of physics research have been making a slow, but steady, transition to a "bigger" science way of doing things. This has been particularly evident in condensed matter physics and astrophysics, but similar changes are also occurring in experimental atomic physics. This transition is taking place for a variety of reasons including the fundamental changes in the way science is funded, the increasing complexity and expense of scientific apparatus, and the more complex and multifaceted problems which require interdisciplinary teams to search for solutions.

Of course, Nebraska now has an active research effort in

experimental high energy physics, and our plans call for an increase in the size of this group. The current faculty, Snow and Claes, are playing leadership roles in the D0 experiment at the Fermi National Accelerator Laboratory, and Snow is also involved in experiments at CERN. D0 involves hundreds of collaborators from institutions around the world. Participation in D0 requires faculty to travel to Fermilab regularly and requires graduate students to spend weeks or months on-site to develop the necessary detector technology and to help run the experiments. Thus we now have a significant involvement in "big" science research.

The past decade has seen tremendous growth in the capabilities of synchrotron light sources at various facilities around the country, and Nebraska now has a substantial presence at several of these facilities. Synchrotron sources use particle accelerators to produce high-brightness beams of ultraviolet light and soft x-rays, which can then be used to probe the physical properties of atoms, molecules and solids. Peter Dowben, Jim Samson, and Dave Sellmyer have made measurements at the Synchrotron Research Center (SRC) in Wisconsin for a number of years. These measurements require students and postdocs to load ultra-high vacuum chambers, pumps and data acquisition electronics on a truck, travel to SRC, and then install the apparatus on the beamline and test every component prior to the scheduled beam time. Typically students and postdocs remain on site working very hard for weeks at a time. Synchrotron-source measurements have led to new understanding of the electronic structure of magnetic materials (Dowben and Sellmyer) and to a new understanding of electron-atom correlation during the photoemission process (Samson).

Peter Dowben recently moved his photoemission experiments from SRC to the new CAMD source in Baton Rouge because of the large improvement in uv beam brightness. With this move, Nebraska now has a share of a unique \$2,000,000 beam line at CAMD; further we own half of a second beam line and the entire end station (experimental vacuum chamber) of this \$800,000 facility. The use of these beam lines requires a full-time postdoc stationed in Baton Rouge, with periodic visits from faculty and graduate students to help with data acquisition and end-station development. It is expected that more of our faculty and students will carry out experiments at CAMD when the new beam line is operational. It should also be noted that Peter is collaborating with researchers at the Humbolt University and the University of Osnabrück to carry out experiments at the Synchrotron Facility in Berlin.

Nebraska is also sharing beam lines at the Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory. Duane Jaeck's group just completed their first experimental run at the ALS. Postdocs Kenny McLaughlin and Orhan Yenen spent several weeks taking data on the 6:00 a.m. to 2:00 p.m. shift, and they were simply astounded at the results. The more than an order of magnitude improvement in energy resolution resulted in so much good data that it will take weeks or months to complete the analysis. Duane is already planning the next

phase of the experiments, which will involve the use of circularly polarized light.

Jim Samson has taken a different approach. He carries out experiments at SRC, Brookhaven National Laboratory, the ALS, and at the Cornell CHESS facility. Using these four sources, Jim is able to cover the whole energy range from 10 eV to nearly 100 keV in his photoemission experiments and obtain data which is unprecedented in its scope. His photoemission results have been partially responsible for a world-wide resurgence in theoretical activity on the photoemission process.

Research in Condensed Matter/Materials Physics has also grown bigger in other dimensions. It is now quite common for publications to have eight or so co-authors, often from different departments or institutions, because samples must be characterized in many different ways (x-ray diffraction, electron microscopy, magnetic measurements, etc.) and because more complex materials and devices are now being produced and studied. In addition, Nebraska has entered into some collaborations between industries and universities. The largest of these, the National Storage Industry Consortium (NSIC), has the goal of developing ultra-high density data storage devices, and involves Professors Sellmyer, Kirby, and Liou. While Nebraska's primary role in NSIC is to study and understand the magnetic and structural properties of promising new thin film media for hard disk and optical storage applications, our researchers have had to learn to communicate effectively with engineers and scientists working on all aspects of the problem, including read/write heads, tribology, error correction and other topics important in modern data storage devices. The interaction with industry has certainly broadened our students' perspectives about the range of scientific enterprise which can be interesting and exciting.

Finally, Astronomy/Astrophysics is not immune to this transition to "bigger" science. Astronomers have long competed for observing time on the large telescopes at places like Cerro Tololo and Kitt Peak. This process is continuing, especially since the Hubble Space Telescope became operational. In the past, however, most research was still done by individual investigators. There are now many fairly large collaborations, particularly in astrophysics, which are seeking to unravel the mysteries of the cosmos. For example, Visiting Assistant Professor Steve Platt is currently in Antarctica working on the CARA project, which seeks to measure and understand anisotropy in the cosmic microwave background. Projects such as CARA require the efforts of a substantial group of scientists over an extended period of time, and in this case the scientists must work under somewhat adverse circumstances.

While our transition to "bigger" science has been hard work and at times even painful, many benefits are being realized. First of course is that excellent physics and astronomy is being done. Experiments that were inconceivable two decades ago are now being carried out, and we are involved in some very exciting research. Second, this process is serving to more fully integrate our Department into the wider community of physics; Nebraska

is now heavily involved in research at several major experimental facilities. Finally, our graduate students and postdocs gain a broader perspective of physics research world wide and are made more aware of the many viable options that they have beyond the relatively sheltered confines of graduate school.

Let me encourage you to remain in touch with the department. We always enjoy hearing from alumni and friends and being brought up to date on your activities. This is now easier than ever to do as many of you are connected to the internet. If you don't have time for a more complete report on your activities, please fill out the enclosed card. Also we always appreciate contributions to our UN Foundation accounts since these private funds give us increased flexibility in carrying out our many educational and research activities.

Sincerely,



Roger D. Kirby  
Professor and Chair

---

### Sellmyer Wins Award continued from page 1

In 1988, Sellmyer was named the first Director of the CMRA, which was funded under the State Legislature's then-new Nebraska Research Initiative (NRI). The purpose of this governmental support has been to stimulate nationally recognized research including areas with potential to contribute to economic development of the State. Since 1988, the University's research budget for materials science has grown more than six-fold to over \$7.7 million. The CMRA currently comprises more than 60 faculty members from seven departments.

Dave remains characteristically modest about his achievements. "Any success I've had certainly has to do with support and all the good students and postdocs and faculty colleagues that we've had around here...We've been very fortunate with the Nebraska Research Initiative, I think. There aren't many places - state schools or otherwise - that will give one the opportunity to build like this. And the strength of the University is such that we've been able to attract high caliber students and postdocs...We've been able to function and win this award with the help of these fine people."

(Sections of this article have been reprinted with permission from the NU Alumni Magazine *Nebraska*.)

## Starace Named AAAS Fellow, *RMP* Associate Editor

Professor **Anthony F. Starace** was elected a Fellow of the American Association for the Advancement of Science (AAAS) this fall. Approximately 4/10 of one percent of the 142,000 members of the AAAS are elected to Fellowship each year in all fields of science. This year only 18 were elected in physics. Fellows are selected whose "efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." Starace will be presented with a citation and a rosette at a Fellows Forum to be held at the Seattle AAAS meeting in February 1997. His citation will read "For numerous and significant contributions to atomic and optical theory and for equally important contributions to the conduct of physics."



Anthony F. Starace

At the beginning of this year Starace was named an Associate Editor of the journal *Reviews of Modern Physics*. He is in charge of the relatively new section, *RMP* Colloquia, which contains articles on recent developments in physics written for a broad physics audience, including graduate students. Starace says he enjoys being in contact with some of the world's best physicists in all areas of physics. The toughest part of the job is ensuring that each article is accessible to physicists who are not specialists in the topic of the article. Partly for that reason the rejection rate is quite high. Each published article typically undergoes extensive editing. Also, unlike regular research journals, review journals such as *RMP* are not inundated with articles; rather the editors work hard to solicit suitable authors to write for the journal.

The editorial office for the *RMP* Colloquia is located in the Department, with staff member **Elizabeth Wilhelm** serving part-time as Editorial Assistant.

---

## Leslie-Pelecky, Claes continued from page 1

APS meeting in St. Louis and has recently published a review article (with Reuben Rieke) in *Chemistry of Materials*. In addition to her research, she directs the NSF-sponsored Research Experiences for Undergraduates in Nanostructured Materials, which brings 18 outstanding students from across the country to UNL to work with faculty on original research for 11 weeks during the summer. Another NSF-funded project, *Strengthening Graduate Education through Systemic Involvement in Research and*

*Outreach Activities*, encourages the development of valuable workplace skills such as oral and written communication, teamwork, communicating science to the public and designing apparatus. This program has received broad attention, including a letter of commendation from the Governor and an invited poster for a recent National Academy of Sciences convocation on graduate education.

At Nebraska, Dr. Leslie-Pelecky will continue to pursue both condensed matter physics research and interests in education and outreach. Her laboratory will include a UHV inert gas condensation facility to fabricate nanoparticulate and nanostructured materials. Subsequent study of these materials will focus on the time and frequency dependence of the magnetization and structural properties of these materials.

Dr. Claes joins Professor **Gregory Snow** as the second faculty member in the newly-formed experimental high-energy physics group. He was a physics and math teacher and math department chairperson at Zion-Benton Township High School in Zion, Illinois, from 1976 to 1983. One of his accomplishments in this setting was to lead an effort to establish computer centers at the two school campuses and integrate the use of computers throughout the high school curriculum. During this period, he also gained experience in continuing-education teaching at the College of Lake County in Illinois.

Claes commenced high-energy physics research during graduate school at Northwestern University. His dissertation covered experiments he performed at Fermilab in Batavia, Illinois, in which mesons containing heavy quarks (strange, charm) were produced using an incident high-energy photon beam. He was awarded the Ph.D. degree in 1991. As a postdoctoral research associate working for the State University of New York at Stony Brook, he was a member of the DZERO Experiment at Fermilab, one of the two experiments to announce the discovery of the top quark in 1995. He was an integral part of the team of physicists who designed and operated the DZERO "trigger" system, which decides which collision events are interesting enough to write to computer tape for later detailed analysis. Claes' physics analysis interest in DZERO was directed toward searching for signs of the creation of "stop" particles – partners of top quarks which are predicted to exist in super-symmetric theories, which are extensions of the Standard Model of particle physics.

At Nebraska, Dan will continue to work on an upgraded version of the DZERO experiment during the next few years. He recently was assigned responsibility for coordinating the software algorithms which will be used in the trigger for the experiment in the upgraded phase of data-taking beginning in 1999. He will also join Professor Snow on the CMS Experiment which will be performed at CERN's Large Hadron Collider after the year 2000. In addition to a full plate of undergraduate and graduate teaching in the Department, Claes will also be active in educational outreach projects.

Dan's wife, Shireen Adenwalla, is an experimental condensed matter physicist. She is investigating nanoscale magnetic structures and collaborating with Prof. Peter Dowben. This fall she also taught our senior-level optics course.

## Samson "Retires"

After a career of 26 years as a Professor in the Department, the last 16 of them as Charles Mach Distinguished Professor of Physics, James A. R. Samson "retired" as of the end of the 1995-96 academic year. More accurately, he became a Professor Emeritus, as retirement is far from what Jim intends to do in the next few years as a very active researcher in the Department. Indeed, his work is smack in the middle of two of the hottest research areas in all of atomic physics: the problems of double photoionization and single and double Compton ionization of atoms. (Indeed he has always been a major player in the former area and he literally started the latter research area a few years ago with a brief Comment in *Physical Review Letters*.) Unlike his competitors in these fields, who tend to band together in large teams, Jim's relatively small group (currently including two postdoctoral research associates, Ying Lu and Wayne C. Stolte) has been making some of the most reliable measurements around all by themselves. Far from retiring, Jim took emeritus status to free himself of all other normal university duties so he and his group can focus on their research at this exciting time.

Samson has had a long and distinguished career. He received his B.Sc. with Honors from Glasgow University in 1952. His graduate work was carried out at the University of Southern California under the direction of Gerhard Weissler on vacuum ultraviolet (VUV) spectroscopy and VUV single ionization processes in atoms and molecules. Following receipt of his Ph.D. in 1958, he took research positions at USC and Harvard before becoming a Laboratory Director at GCA Corp in Bedford, Massachusetts in 1961. His laboratory there concentrated on basic research in atomic and molecular physics applied to planetary atmospheres and was supported by many NASA grants. In 1970 he joined UNL as a Professor. During 1973-78 he served as Department Vice Chair and in 1981 he became Charles Mach Distinguished Professor of Physics.

Jim has received many honors over the course of his career. He is a Fellow of the American Physical Society as well as the Optical Society of America. He held a Fulbright-Hayes Senior Fellowship at Bonn, Germany and Southampton, U.K. during 1976-77. From 1976-81 he served as an Associate Editor of the *Journal of the Optical Society of America*. In 1985 he received a UNL Distinguished Teaching Award, largely based on his teaching of many classes of our introductory course for life science majors. [One always became aware that Jim was teaching this course when he started to grow wheat and peas on a rotating phonograph turntable in order to demonstrate that some plants sense the effective force of gravity in their roots and some in their stems.] In 1987 he received the University of Nebraska's



James A. R. Samson

highest award for research: the ORCA award. The Synchrotron Radiation Center (SRC) at the University of Wisconsin presented him with its G. J. Lapeyre Award in 1987 and in 1989 he was named an honorary member of Phi Beta Kappa.

Samson has published more than 140 scientific papers plus 9 book chapters. His book, *Techniques of Ultraviolet Spectroscopy* (Wiley, 1967), is the book in its field. It was reprinted in 1980 and a completely revised and updated version is currently being edited together with Professor David Ederer of LSU. He holds four patents for various devices developed in the course of his research. As of Fall 1996 he has received nearly \$4 million in external research grants over the course of his career. Currently he holds two NSF grants (from the Divisions of Physics and of Atmospheric Sciences) and one NASA grant (for planetary atmospheres research).

For most of his career, Jim has preferred to do his work in Lincoln using his discrete VUV line sources, with occasional excursions to one synchrotron facility or another. In recent years, however, that has changed dramatically, as illustrated by his current research projects. His work on double photoionization processes has been carried out at both the SRC at Wisconsin and the Advanced Light Source (ALS) at Lawrence Berkeley National Lab. His Compton double and single ionization work has been carried out both at the Cornell High Energy Synchrotron Source (CHESS) and at the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory. Finally, his work on post-collision interaction (PCI) effects during Auger decay of Ar and O has been carried out at the ALS.

What are his plans when he really, really decides to retire? Jim is hesitant to be specific, saying that he's always thought he and his wife Mary would return to their native Scotland. But then, he adds, Lincoln has been their home for so many years it would be difficult to leave.

## Research Highlights

We present here a selection of recent research results by the Department's faculty and staff which have been accorded rapid publication in leading journals.

In the November 6th, 1995 issue of *Physical Review Letters*, Professor **Ilya I. Fabrikant** and a group of colleagues at the University of Sherbrooke, Québec, presented a joint theoretical and experimental report of the effect of condensed phase on the process of dissociative electron attachment (DEA). DEA is a two-step process in which an electron attaches to a molecular target to form a temporary negative ion, which then dissociates into neutral and ionic fragments. The process is well-known in the gas phase, but has recently been observed in a variety of condensed matter systems. In this paper the authors measured the DEA cross section for the  $\text{CH}_3\text{Cl}$  molecule adsorbed onto a multilayer Kr substrate as a function of the thickness of the substrate. Remarkably they find that the DEA cross section is increased by factors of ten thousand to one million over the gas phase value. This represents the largest known increase of any electron cross section resulting from a phase change.

Since the 1995 report of the D0 Collaboration's observation of the top quark, there has been a host of additional publications in *Physical Review Letters (PRL)* and elsewhere dealing with other analyses of the voluminous data which the collaboration obtained. We describe one of these more recent reports. In the November 13th issue of *PRL*, Professor **Gregory R. Snow** and the D0 collaboration report on a search for leptoquarks in their proton-antiproton scattering data. Leptoquarks were predicted by Salam, Glashow, and others in extensions of the Standard Model to be bosons which couple to both leptons and quarks. The search carried out assumes that leptoquarks are produced in pairs and that they decay either to a muon and a quark or to a neutrino and a quark. The search turned up no events having this expected signature; consequently only a lower limit on the mass of the leptoquark is reported.

In the March 11th, 1996 issue of *Applied Physics Letters*, Professor **Peter A. Dowben** and colleagues from the UNL Center for Materials Research and Analysis and from the Research Institute for Industrial Science and Technology in Pohang, Korea, reported on successfully fabricating a boron-carbide/boron diode on an aluminum substrate and a boron-carbide/boron junction field effect transistor. Such boron and boron-carbide devices have been sought for more than 25 years, but only recently have efforts at fabrication been successful. As the authors report, "such devices would have applications in a wide number of harsh conditions; they should be resistant to corrosive, high temperature, and mechanically abrasive environments." Moreover, because of their large neutron capture cross section, "these materials could potentially be used as devices in radioactive environments as well." This work

demonstrated that a silicon interface, which earlier successful fabrication efforts had used, was not necessary: they were able to fabricate the diode directly onto an aluminum substrate. Their work also showed that "the use of plasma-enhanced chemical vapor deposition ... provides a means for fabricating boron and boron-carbide thin films successfully in a high resistivity form."

In the April 8th, 1996 issue of *Physical Review Letters*, Professors **Peter A. Dowben** and **Sitaram S. Jaswal**, postdoctoral research associates **David N. McIlroy** and **Renat F. Sabiryanov**, and graduate research assistant **Carlo Waldfried**, together with colleagues from both Argonne and Brookhaven National Labs, reported joint experimental and theoretical results on the effects of oxygen adsorption on the surface magnetization of Gd. The authors note that "almost all practical magnetic materials" employ rare earths because of their large magnetic moments. However, "the rare earths oxidize easily, thereby losing their useful magnetic properties." The aim of this paper is to shed light on "the physical mechanisms responsible for the changes in the magnetic properties of a rare earth with oxidation." What this work finds is that the loss of magnetic order may be understood as resulting from a reduction in the exchange coupling between Gd 4f core levels via the conduction electrons owing to the hybridization of the Gd *s-p-d* bands with the oxygen *p* bands.

In the June 1996 issue of *Physical Review A: Rapid Communications*, graduate student **Min-Qi Bao** and Professor **Anthony F. Starace** reported theoretical calculations of the effect of a static electric field on harmonic generation. Harmonic generation is the process whereby an atomic gas that is exposed to laser light emits photons having frequencies that are odd integer multiples (or harmonics) of the incident laser frequency. (Only odd integer multiples are permitted by electric dipole selection rules.) Recently harmonics of order up to 135 have been observed experimentally using rare gas targets. The fact that the intensities of these harmonics are roughly comparable over a large range of harmonic numbers (dubbed the "harmonic intensity plateau") has heightened interest in using harmonic generation to produce short pulse, coherent light sources in the ultraviolet and x-ray frequency ranges. In this paper, theoretical calculations were reported which show that a static electric field having an intensity only a few per cent of that of the laser electric field leads not only to the production of even integer harmonics (which is to be expected) but also to an increase in low order harmonic intensities of factors of 100 - 10,000. Thus, a static electric field appears to be a very sensitive means for controlling high harmonic emission rates as well as for producing high even harmonics.

In the June 20th, 1996 issue of *Astrophysical Journal Letters*, Associate Professor **C. Martin Gaskell** reported the discovery of a systematic long-term change in the velocity of the gas close to the heart of the quasar 3C 390.3. In 1983, Gaskell had drawn

attention to a class of quasars with dense gas moving at speeds exceeding 1% of the speed of light with respect to the galaxies in which they are located. He had suggested that such quasars might have not one but *two* black holes in them. His model predicted that there should be changes in the observed velocities as the black holes orbited each other. After a 13 year wait, Gaskell has found just such a change. Following the publication of this paper, *Sky and Telescope* magazine devoted almost a full page to discussing the model. As Gaskell notes, "the production of supermassive black hole binaries through galactic mergers is something we know *must* be going on." Whatever the cause of the velocity changes, there is a new quasar phenomenon to be explained.

## Forty-Fourth Annual Midwest Solid State Conference

With the help of **Kay Haley** and his condensed matter colleagues, **Sitaram Jaswal** organized the Forty-Fourth Annual Midwest Solid State Conference, which was held in Lincoln on October 18-19, 1996. The conference was attended by approximately 80 people from fourteen universities in Iowa, Illinois, Kansas, Missouri, Nebraska, Oklahoma, and South Dakota. Forty three invited and contributed papers were presented during the conference.

The distinguished speaker of the conference was Dr. Gary A. Prinz of the Naval Research Laboratory, who gave a talk on "The Emergence of Spin Polarized Electronics." The following four invited talks were presented at the conference:

- Prof. Amitabha Chakrabarti, Kansas State University, "Structure and Dynamics of Polymers at Interfaces."
- Prof. Sashi Satpathy, University of Missouri-Columbia, "Electronic Structure of Colossal Magneto-Resistive Oxides."
- Prof. David M. Wieliczka, University of Missouri-Kansas City, "Tales of the Mad Hatter: Are Amalgams Safe?"

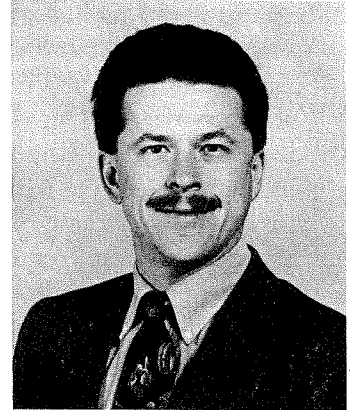
The 38 contributed papers were divided into the following four sessions: (1) Surfaces, Interfaces and Thin Films; (2) Magnetism; (3) Semiconductors; (4) Some Exotic Systems (Quasicrystals, Superconductors, Photorefractive and CMR Materials).

Since 1952 when the First Midwest Solid State Conference was held at Purdue University, our Department's faculty have hosted it five times, the second-largest number for any university.

The conference was sponsored by the UNL Department of Physics and Astronomy, Center for Materials Research and Analysis, College of Arts and Sciences, and College of Engineering and Technology.

## Ducharme Promoted with Tenure

**Stephen Ducharme**, who came to UNL in January 1991 from IBM Almaden Research Center in California, was granted tenure and promoted to Associate Professor in 1996. Steve is a condensed matter and optical physics experimentalist whose main research interests are in photorefractive and ferroelectric polymers. Photorefractive materials



Stephen Ducharme

have potential applications for optical computing, data storage and image processing. His work on ferroelectric polymers, which is done in collaboration with Vladimir Fridkin, Lev Blinov, and Alexander Bune of the Institute of Crystallography, Russian Academy of Sciences, Moscow, has potential applications in infrared cameras and non-volatile computer memory. In addition, Steve's collaboration with Professor **John Woollam** (UNL, Electrical Engineering) has led to a novel ellipsometer for NASA that has been patented.

Steve's teaching activities have also been noteworthy. Three Masters Degree theses have been produced under Steve's direction by **Brian Jones** (MS 93), **Bao Vu** (MS 93), and **Chuanxing Zhu** (MS 96). Currently **M. Liphardt**, **A. Goonesekera**, **C. Zhu** are completing Ph.D. degrees with him. He has also developed and taught a new physics course, Physics 343, "Physics of Lasers and Modern Optics Laboratory." It emphasizes hands-on laboratory experiences in modern optics and lasers for non-majors as well as physics students. The course has attracted students from many departments.

Steve received his B.S. degree from the University of Lowell in Massachusetts in 1981, his M.A. and Ph.D. from the University of Southern California in 1982 and 1986 and held post-doctoral appointments at the University of Utah and at IBM. He has been the conference chairman of the Organic Photorefractive Materials Conference of the SPIE in 1995 and 1996. His work has been funded by the Center for Materials Research and Analysis, the National Science Foundation, the Air Force Office of Scientific Research, NASA, and the J. A. Woollam Co.

## Brief Notes

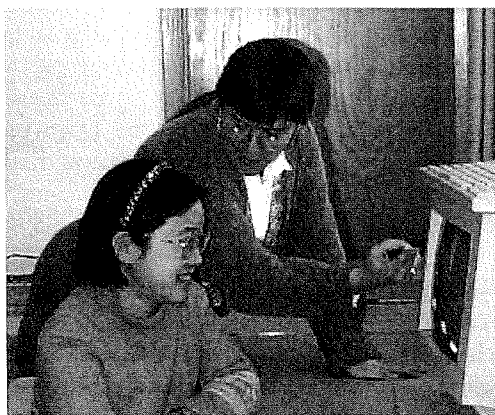
- *Stop the Press!* Just as we were bringing this issue of *Spectrum* to the printers we learned that the Rhodes Scholarship Trust at Pomona College in Claremont, California named Department major **Jeremy Vetter** one of the 32 1997 Rhodes Scholars. Rhodes Scholars pursue graduate work in their areas of interest at Oxford University in England. This award is certainly one of academia's highest honors. Vetter plans to study either the history or the philosophy of science at Oxford. At UNL he is majoring in history and philosophy, as well as physics. His senior honors thesis concerns how theoretical physics in the 20th century has influenced the social sciences.
- The Department has a Web page on the internet. It is still under construction, but there's already quite a bit there. The address is: [www.unl.edu/physics](http://www.unl.edu/physics).
- The paper "Design and Construction of a Novel Cylindrical Mirror Analyzer for Electron Spectroscopy of Solids and Gases," presented by **Tara McAvoy** at the 31st Midwest Regional Meeting of the American Chemical Society, Nov. 7, 1996 in Sioux Falls, South Dakota won *Honorable Mention* and a cash prize. McAvoy is a graduate student working in Professor Peter A. Dowben's group.
- Graduate student **Brian Adrian** was invited to give a talk to the American Association of Physics Teachers in College Park, Maryland, in August. He spoke on the topic "TA Training at the University of Nebraska." Brian is a student in the Research in Physics Education Group. He was asked to give this talk based on his experiences as a TA and as a researcher in education.
- In August graduate student **Weijia Zhang** (MS 1994, Ph.D. 1996) became the first member of the Research in Physics Education Group to complete a Ph.D in physics. The Department approved a physics Ph.D. program that featured a Ph.D. thesis on research in physics education in the fall of 1989. Dr. Zhang's Ph.D. thesis topic was "Using Multimedia to Teach Optics to College Students." Zhang is now a postdoctoral research associate with Professor David Hestenes at Arizona State University.
- **Kevin Aylesworth** (MS 1986, Ph.D. 1989) made the front page of the March 15, 1996 issue of *The Chronicle of Higher Education*. Kevin is an American Physical Society Congressional Fellow in Washington, D.C. The *Chronicle* story dealt with jobs for young scientists.
- In the past year, Professor **Peter A. Dowben** has received two patents. The first, issued in November 1995, concerns, "Fabrication of Boron Carbide and Boron Electronic Devices." The second, issued jointly to Dowben and postdoctoral research associate **David N. McIlroy** in July 1996, concerns "A Reduced Diameter Retractable Cylindrical Mirror Analyzer."
- Professor **Robert G. Fuller** of our Department was invited to address the 63rd meeting of the Southeastern Section of the American Physical Society (SESAPS) in Decatur, GA in November. He chose as his topic "Preparing Physicists for Paperless Pedagogy." A lively discussion followed his presentation.
- **Eugene Rudd** (Professor Emeritus) gave a talk, "DeWitt Bristol Brace: Professor, Instrument Maker, Innovator," on September 9, 1996 at the Ottawa meeting of the Scientific Instrument Commission, a division of the International Union of the History and Philosophy of Science. Later in September he attended a meeting of the Antique Telescope Society in Bath, England where he gave a talk, "The Construction of the Giant Telescope at Birr Castle."
- **Mark W. Plano Clark** has moved from a visiting faculty position at UNL associated with the Research in Physics Education group to a tenure-track faculty position at Doane College in Crete, NE.
- Laboratory Manager **Vicki Plano Clark** is the current President of the Nebraska Section of the American Association of Physics Teachers. At the national level, she is also serving the AAPT as a member of the Committee on Laboratories and the Committee on Women in Physics.
- **Vicki Plano Clark** (co-chair), Doane College Professor **Mark Plano Clark** (co-chair), Research Associate **Chris Moore**, and Demonstrations Manager **Cliff Bettis** all serve on the Science Committee of the Lincoln Children's Museum. They have also been actively involved with the museum by offering special events such as The Balancing Act and Science Day where children were encouraged to participate in hands-on activities demonstrating how things balance, and in exploring the behavior of static electricity and magnets.
- **John (Bob) Kelty** and **Brian Farleigh** from the Electronics Shop together with members from the UNL Snow and Ice Research Group (SIRG) launched a new thermal probe to test guidance control features and new ice parameter measurement systems. The 3m long probe was successfully tested in the ice at the former Dye 2 radar site on the south Greenland ice cap in August 1996. This work was supported by a NASA grant.



## New GTA Training Programs Established

Introductory physics laboratory sections are taught almost exclusively by graduate teaching assistants (GTAs). In this way, graduate students have the opportunity to fine tune their own understanding of basic physics concepts and at the same time develop their teaching and presentation skills. However, in the past couple of years, the increased use of technology and a broader variety of weekly laboratory activities has also placed higher demands on the physics GTAs. Therefore, the Physics Department approved the development of its own training program by the Physics Laboratory Manager for all new GTAs entering the physics program.

The new GTAs are asked to arrive on campus a week before the start of Fall courses. At this time, the students work through activities designed to introduce them both to the Department in general and the specific needs required in their laboratory teaching assignments. The training activities include sessions on using multimedia equipment, practicing safety in the laboratory, assessing student work, completing actual laboratory experiments, and doing sample teaching with feedback. Students also participated in activities to expose them to physics education research results on student reasoning levels and to creative teaching and learning strategies. In addition, Department faculty have given presentations on GTA responsibilities, the long-term value of skills developed as a GTA, and success tips for teaching recitation sections.



Stephanie Snedden (standing) working with graduate teaching assistant Huang Sa.

Last summer the College of Arts and Sciences initiated an innovative new orientation and training session for graduate teaching assistants throughout the College. **Stephanie Snedden**, a Ph.D. candidate in astronomy, served as the graduate student coordinator for the program.

Over one hundred students from physics and astronomy, math and statistics, computer science, chemistry, geology and the biological sciences participated in the week-long program. Workshops covered various topics (ranging from learning strategies and styles to motivational and practical teaching tips) presented by experts representing a cross-section of the campus and community.

This program was directed by Assistant Dean Laura White. In addition to Ms. Snedden, the Department was well represented with Professor **Robert Fuller** presenting a workshop and Laboratory Manager **Vicki Plano Clark** serving as the Department representative.

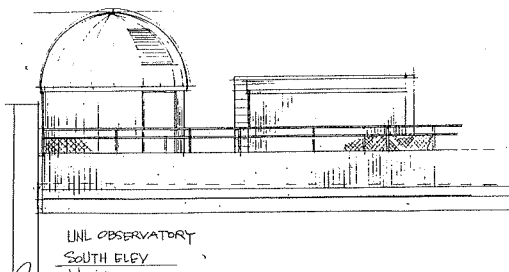
---

## IBM Equipment Grant Advances Department Teaching and Research

Following the conclusion of a joint research agreement with the group of Professor **Peter A. Dowben**, IBM Corporation has donated a large amount of scientific equipment. The equipment includes two large optical tables with vibration isolation. One table is now in use in the laboratory of Roger D. Kirby, and the other is used in the senior undergraduate advanced laboratory. Also donated were a Coherent Ar ion laser, a frequency doubler and dye laser, various vacuum gauges, and a large 1/10 micron stepper. A turbo-molecular pump that is also part of this equipment donation will be used as part of the Nebraska facility currently being built at the CAMD Synchrotron at Louisiana State University. (CAMD stands for **C**enter for **A**dvanced **M**icrostructures and **D**evelopments.) This large equipment donation is intended to foster continued research collaborations with IBM as well as to enhance the educational infrastructure at the University of Nebraska.

With the equipment donated by IBM as well as with joint funding provided by the Nebraska Research Initiative, the W. M. Keck Center for Molecular Electronics, Oak Ridge National Laboratory, and the State of Louisiana, a high-resolution beamline facility for Nebraska is being built at the CAMD Synchrotron in Louisiana. This beamline will provide a tunable bright light source in the range of 25-120 eV and will complement an even higher resolution beamline facility that Nebraska shares with Texas, Michigan, Tennessee and Louisiana that is also under construction at the CAMD Synchrotron at LSU. This beamline provides a tunable light source from 8 eV to 32 eV with a resolving power of 3,000 to 10,000. This latter facility has been funded by the states involved and by the National Science Foundation.

## New Undergraduate Observatory Under Construction (Deja vu thwarted?)



After four years of planning, construction has finally begun this fall on the new on-campus undergraduate teaching observatory. The observatory was the idea of **Martin Gaskell** who had made the use of such observatories a cornerstone of his teaching before he came to UNL in 1992. Although the Department has long operated a major research observatory (Behlen Observatory), this is much too far away from campus to be of use for routine teaching. Until now, the only permanently-mounted telescope on campus capable of accurately tracking the sky was the Minnich solar telescope, designed by **Don Taylor**. [The May 1996 issue of *Sky & Telescope* has an excellent article by Taylor on his novel design of the Minnich telescope]. Although this has proved to be a wonderful instrument for showing students solar activity, the Minnich telescope is small and hence of limited use for night-time viewing. Also, it can only access less than half the sky. Gaskell therefore proposed building a more substantial observatory on the roof of Ferguson Hall that would give access to just about every class of astrophysical object with the latest CCD technology. In early 1993 the NSF recognized our need and funded a proposal by Gaskell and veteran telescope builder Taylor. There was some delay in obtaining local matching funds, but in early 1995, **Anthony Starace** (then Department chairman) gave the go-ahead for ordering the telescope and dome.

There was considerable excitement in the astrophysics group in spring 1995 with the arrival of a Meade 16-inch Schmidt-Cassegrain telescope and an Ash dome. Despite the final arrival of the large boxes after over two years of planning, excitement was soon tempered by a major setback to the plans: the Department could no longer use the roof of Ferguson for student observing. Changes in fire and building codes since the roof was last modified now restrict roof occupation to "maintenance only." Building modifications to bring the project into compliance with the latest codes threatened to cost a staggering quarter of a million dollars! The new restriction was a major setback for the astrophysics teaching program. We could no longer use our many portable telescopes on the roof for "roof nights" for our highly popular Astronomy 103 courses.

After a year during which Gaskell, Taylor, Starace, Kirby, and Facilities Management explored various options, the only viable option proved to be Starace's novel idea of locating the observatory atop a new parking structure being constructed opposite the football stadium. This has the advantages of having a reasonably clear horizon, no lights shining directly into the dome, excellent handicapped access and reasonable proximity to the Department's building (not to mention nearby parking!). Tests carried out by Taylor with a telescope on similar parking structures showed that vibration from cars should not be a serious problem.

As this issue of *Spectrum* goes to press, a bid for finishing the observatory has been accepted and the parking garage is under construction. The observatory is expected to be ready for operation by summer 1997. In addition to the dome, there will be a separate handicapped-accessible building from which the telescope will be operated and where the portable telescopes will be stored. The telescope, the largest of its kind in Lincoln, can be pointed completely automatically and has a state-of-the-art, self-autoguiding, CCD camera. With this, the telescope can record objects in 20 minutes from downtown Lincoln that only a generation ago could not have been detected on an hour-long photograph taken with the giant telescope on Mt. Palomar. The new facility is expected to get heavy use by undergraduates in almost all the astronomy classes. We expect that 500 - 1000 students a year will be using the observatory. A new lab course based around the telescope has been approved and will be offered for beginning astrophysics majors in fall 1997. The telescope will also let astrophysics majors carry out an enormous range of independent research projects with relatively little supervision.

Throughout the world, from the early 19th century onwards, a university could not consider itself a proper place of higher education without a small observatory on campus. Readers of **Eugene Rudd's** history of the Department will know that in the early years of this century the Department lost a then state-of-the-art 12-inch refractor because the University would not provide a building for it. What became of the 12-inch refractor is not known. [An article by Rudd on this lost telescope accompanies the *Sky & Telescope* article about the Minnich telescope.] We are grateful that in the last decade of the 20th century history does not seem to be repeating itself, but there have been a few moments in the last 18 months when Gaskell and Taylor worried that it would!

This project would not have been possible without the generosity of many people. In addition to the National Science Foundation, funds were provided by the Department, from the Kositzky fund and the Stowell fund, and by Brian Foster, Dean of the College of Arts and Sciences, Donald Helmuth, Associate Vice-Chancellor for Research, David Brinkerhoff, Associate Vice-Chancellor for Academic Affairs, and Irvin Omtvedt, Acting Senior Vice-Chancellor for Academic Affairs. Because telescopes have long lifetimes, students could be benefiting from this generosity throughout the next century.

## Ruckman Lecture/Dinner Remains Popular with High School Teachers

"I called the physics office to give them my new address, so I could get my invitation to the Ruckman events", said one regular participant in the fall Ruckman Lecture and Dinner. This annual event to foster a dialogue between Lincoln and Omaha area high school physics teachers and Department faculty is supported by funds provided by **Jerry E. Ruckman** (B.S. 1962), a UNL physics alumnus now living in Denver.



Courtney Willis

The Ruckman event includes a Department Colloquium on a topic in physics education, a dinner with the high school teachers as guests of the Department, and a post dinner physics activity. It is very well received by both the high school physics teachers and Department faculty.

In Fall 1995 the Ruckman lecturer was Professor Edward F. Redish from the University of Maryland, who spoke on the topic "Why is it so hard to teach physics?" Recent research in physics education has demonstrated that what students learn in our physics classes may be very different from what their teachers hope and expect. In this talk, Dr. Redish reviewed and synthesized information for physics teachers from cognitive science, education theory, and physics education research. He also described some "methods that work"—recently developed approaches that are more effective than traditional teaching techniques.

The after-dinner session featured Multimedia Physics Activities in the new UNL Media Center led by Laboratory Manager **Vicki Plano Clark**, staff members **Chris Moore** and **Mark Plano Clark**, and graduate students **Brian Adrian** and **Weijia Zhang**.

Connie Willis, Nebula- and Hugo-Award-winning science fiction author, gave the Fall 1996 Ruckman lecture. She discussed how science fiction can be used in a variety of ways in teaching physics. Not only are there many stories that use physics as part of their settings and/or plots, but there are numerous stories with quantum theory, gravity, and relativity as their subject matter. In addition, science fiction stories incorporate attitudes and ideas about science itself,

## Multimedia Project Funded

The National Science Foundation has awarded \$946,394 for four years to UNL and Oklahoma State University for a Multimedia Mathematics Across the Curriculum and Across the Nation project. At UNL the project will emphasize mathematics in physics and biology. At OSU chemistry and engineering will be the focus of project activities. Professor **Robert Fuller** and Laboratory Manager **Vicki Plano Clark** from our Department are working with Steven Dunbar, Department of Mathematics and Statistics, on the project.

The primary product of the Oklahoma-Nebraska Consortium will be an integrated math, science and engineering core curriculum based on a collection of cross-curricular, multimedia mathematics learning module clusters. Each module will be a topic or application in itself, and it will also be part of a larger vertical and horizontal structure. The idea is to draw together and focus horizontally on fundamental concepts from other disciplines that fit naturally with fundamental mathematics concepts learned at the same time. Vertically, students will revisit topics on more than one occasion and in more than one course, showing the power of mathematics as it unfolds. Thus in a given course, the students will witness several applications of a single mathematical idea, and over several years they will also encounter a particular application several times with increasing mathematical sophistication. This structure will provide motivation for mathematical development, an appreciation for topics students are currently studying, and an understanding of how fundamental ideas from many disciplines fit together.

The first course at UNL to be implemented in the project will be a special "paperless" Physics 211/220 course to be offered beginning in January, 1997.

Drs. Fuller and Dunbar are Co-PI's on the project with Drs. Evans and Crowther of OSU.

and exemplify the scientific method. She discussed how her own works deal with quantum theory, black holes, and chaos theory in such stories as "At the Rialto" and "Schwarzschild Radius," and in her novels *Bellwether* and *Doomsday Book*.

After the Ruckman dinner, Connie's husband, Courtney Willis, described how the physics department at the University of Northern Colorado has developed a friendly user-interface for students in the physics laboratories there.

## Zeidler Speaks at Recognition Luncheon



James R. Zeidler

**James R. Zeidler** (Ph.D. 1972) returned to campus to speak at the May 2nd, 1996 Recognition Luncheon for Department graduates. Zeidler is a scientist in the Research and Development Division of the Naval Command, Control, and Ocean Surveillance Center. He also holds an Adjunct Professor appointment in the Electrical and Computer Engineering Department of the University of

California - San Diego. Zeidler spoke to graduating students on the topic "Working at the Interface of Physics and Engineering."

Zeidler told graduates that "the work I did at UNL was one of the single most frustrating experiences of my life." He was researching the low-temperature photoconductivity oscillations in semiconducting diamond under the direction of Professor Frank Ullman. This work required him to solve the difficult problem of making electrical contacts to diamond so that the currents induced by radiation could be measured. After 18 months of intensive work, he was just beginning to obtain valid data that agreed with theoretical predictions when he learned that he had been scooped by a student at King's College in London, who had just published a paper on his very experiment. He was forced to start an entirely new project without any publications to show for his efforts. (His eventual thesis was on phase transformations of ferroelectric materials.)

This disappointing experience, however, had a silver lining. Almost twenty years later he got involved in research on the development of the first diamond transistors. The knowledge he developed as a student at UNL on how to make ohmic contacts to diamond crystals led to a proposal to ONR which resulted in 8 years of project support and many publications. In fact, in writing the proposal he drew upon his graduate student research lab notebooks to document the validity of his proposed approach.

Zeidler then described to current students how the job market when he graduated was as bad or worse than it is now. He landed a job in engineering in 1974 at the Naval Undersea Center (NUC), where he was the principal investigator on programs in adaptive signal processing, underwater acoustic

communications, and signal localization and tracking technology. Beginning in 1978 he was head of the Analysis Branch of the Electronics Division at the Naval Ocean Systems Center. In 1983 he was selected to serve a one-year assignment in the Office of the Assistant Secretary of the Navy in Washington, D.C., where he was responsible for research and development programs in various adaptive signal processing technologies. In 1988-89 he was one of the U.S. representatives to the US/UK/Australia/Canada Technical Cooperation Program, serving on the Technical Panel for Satellite Communications.

In his current position, Jim is responsible for fundamental research and new technology development for communications signal and array processing techniques and image processing research. At UC-SD he is involved in both teaching and research on adaptive signal and image processing. He has written over 140 journal articles, conference papers, and technical reports. He holds over 8 patents for signal processing, data compression, and electronic devices. In 1994 he was elected a Fellow of the IEEE for his contributions to adaptive signal processing and its applications.

Zeidler gave numerous examples of the use of adaptive signal processing techniques, both in the military and commercial spheres.

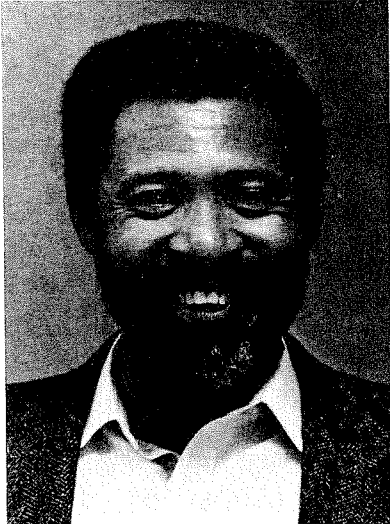


## Hands-On Physics is Hot!

A new Hands-On Physics course has proved to be popular with Teachers College students. With the support of funds received by the School of Biological Sciences from the Howard Hughes Medical Institute, the Department has developed a hands-on physics course that specifically addresses the needs of elementary education majors, for whom the physical sciences are very important in the elementary school curriculum. By designing a course that takes into account the background of these students as well as their learning styles, these students can graduate feeling more confident and comfortable with bringing science-related activities into their future classrooms. Members of the Department, led by Dr. **Charles Lang**, are active in the development and instruction of this course. In addition, **Vicki Plano Clark** oversaw the preparation of these students as assistants in the Department's Saturday Science program (Spring, 1996). This experience gave the elementary education majors a chance to use the hands-on physics they learned in a classroom-type environment with real elementary school children.

## Kennedy Reed Returns for Master's Week

**Kennedy Reed** (Ph.D. 1977) returned the first week in November with his wife Jane to participate in Master's Week. Each fall the Alumni Association and the Chancellor's Office invite five outstanding UNL graduates back to campus to involve these alumni with current students and faculty through class visitations and special activities. Selection for participation is based on nominations and is meant to be honor for those who have established leadership positions in their chosen life work, as well as an inspiration to both students and faculty.



Kennedy Reed

Reed is a theoretical atomic physicist in the High Temperature Physics Division at Lawrence Livermore National Laboratory (LLNL). He did his thesis work at UNL under the direction of former Professor Joseph H. Macek. Following graduation he spent three years as a faculty member at Morehouse College in Atlanta before joining LLNL. His research has concerned theoretical studies of highly charged ions in high temperature plasmas for application to the fusion energy and other programs at LLNL. He has over 100 research publications, focusing most recently on electron impact ionization of highly charged ions.

In addition to his research, Reed has taken nationally prominent roles to nurture the development of other minority and women scientists. Immediately upon joining LLNL he initiated a co-operative education program for Atlanta University graduate students at LLNL. In 1985 he was appointed to the American Physical Society's Committee on Minorities. In 1987 he helped found the National Physical Science Consortium (NPSC), which provides generous graduate fellowships to both minority and women science graduate students and also pairs each fellow with a government or industrial lab for summer internships. (UNL is a member of the NPSC.) During 1990-92 Kennedy served as President of the National Society of Black Physicists. Since then he has taken numerous advisory roles aimed at furthering

the opportunities for minority students and minority programs at LLNL, Alabama A & M University, Clark Atlanta University, Spellman College, and Fisk University. Recently he served on the advisory board for a PBS documentary series on Minorities in Science. Currently he is the Vice Chair of the APS's Bouchet Prize Committee.

During his Master's Week visit Reed met with minority freshman students and held two discussions with students on "Doing Science in a National Laboratory" and "Being a Minority in the Sciences." He met with numerous Department faculty and presented an Atomic Physics Seminar on "Indirect Contributions to Electron Impact Ionization of Positive Ions." He also met with Merlin Lawson, Dean of the Graduate School, Roger Kirby, Dept Chair, and members of the Center for Materials Research and Analysis to discuss the possibilities for establishing linkages with historically black undergraduate institutions.



## Stowell Bequest

The Department of Physics and Astronomy recently became a beneficiary of the estate of Mary and Elbridge Stowell. Mr. and Mrs. Stowell were both alumni of the University of Nebraska, with Mrs. Stowell earning a Bachelor of Arts degree in 1919 and Mr. Stowell receiving a Master of Science degree in Physics in 1923. After leaving UNL, Mr. Stowell received a Ph.D. from American University in 1927 and Mrs. Stowell graduated from Columbia University with a Masters degree in Home Economics education in 1925.

Elbridge Stowell was employed as a Research Analyst at the Southwest Research Institute in San Antonio, Texas, an "independent, non-profit, applied research and development organization that serves industry, government and the public through science and technology." Mr. Stowell passed away a number of years ago, and with Mrs. Stowell's recent death, the newly-formed Stowell fund was endowed in the amount of \$245,000. The interest from this fund will be available to develop the Department's instructional and research programs. The first year's income will be used to partially fund the new rooftop observatory (see story elsewhere in this issue).

## Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 1995–31 October 1996. These contributions have been made in support of major items of capital equipment, an endowed professorship, graduate fellowships, undergraduate scholarships, and invited lectures as well as for unrestricted purposes. Those who have not been contacted by one of the University of Nebraska Foundation's telephone campaigns or who might be considering an additional tax-deductible gift to us should note that we have the following general accounts at the UN Foundation:

- (1) Physics & Astronomy Development Fund (for unrestricted gifts) (Account No. 2557.0)
- (2) Physics & Astronomy Lecture Endowment Fund (Account No. 3321.0)
- (3) Physics & Astronomy Scholarship Endowment Fund (Account No. 3303.0)

Contributions to any of these may be made conveniently using the contribution card and return envelope enclosed with the mailing of this newsletter. Checks should be made payable to the University of Nebraska Foundation and should indicate for which account the money is intended. Those contributors whose employers have a matching gift program should indicate this. Thank you very much!

### Ball Corporation

**Minqi Bao** (MS 1992, PhD 1995)

**William Baumert** (BS 1974)

**William L. Burmester** (MS 1975, PhD 1975)

**Mrs. James C. Coe**

**Julie Doerr** (BS 1987)

**Dwight Dumpert** (BS 1984)

### FMC Corporation

**Maxwell H. Halderson** (MS 1936)

**Maurice Hawthorne** (BS 1964)

**Alan J. Heeger** (BS 1957)

### IBM Corporation

**David Keifer** (BS 1968)

**Roger Kirby**

**Wilma Carol Marcy Labelle** (BS 1955)

**John E. Lahiff** (BS 1964)

**James E. Maclay** (BS 1959)

**Robert L. Maher** (MS PhD 1975)

**Robert L. McKenzie** (BA 1948)

**Hwan Park** (PhD 1984)

**Mr. & Mrs. Joseph L. Parker** (Ph.D. 1940 Chem./Physics)

**Edgar Pearlstein**

**Harold Perera** (MS PhD 1990)

**Phillips Petroleum**

**Rockwell International**

**Jerry E. Ruckman** (BS 1962)

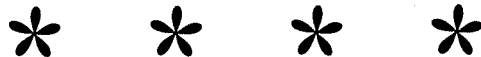
**Eugene M. Rudd** (PhD 1962)

**Theodore Schuldt** (BA 1959 MA 1961)

**Lt. Scott Sinkular** (BS 1992)

**Mary Stowell**

**United Technologies Corp.**



## We Heard From...

**Allen, Glenn E.** (BS 1989) 7025 Palamar Turn, Lanham, MD 20706-2165. Is a postdoctoral research associate with the National Research Council. "Graduated with a Ph.D. in Physics (cosmic rays) from University of Maryland, College Park in May 1996. Now working at NASA Goddard Space Flight Center in x-ray astrophysics group."

**Minqi Bao** (MS 1992, Ph.D. 1995) 733 Naamans Road, #2E, Claymond, DE 19703. Is a solutions analyst at Quantum Development Corporation. "My five years of study at UNL left me wonderful memories. As a foreign student, I appreciate the quality of education, generous financial support, and warm friendship from the Department."

**Baumert, Bill** (BS 1974) 5830 W. 96th St., #2, Los Angeles, CA 90045. Is a Survivability/EMC Engineer with Hughes Aircraft Company. A member of the technical staff working in the areas of survivability, nuclear hardening, and electromagnetic compatibility. "I'm grateful for all you folks at the Physics Department."

**Brown, Bradley A.** (BS 1977) 5519 Enfield Dr., Richardson, TX 75082. "Currently I am a firmware/software engineer at Alcatel Network Systems in Richardson, TX. Susan and I have three children: Sarah (15), Emily (13), and Nathaniel (11). We're all big fans of Nebraska football!"

**Chan, Vincent** (Ph.D. 1995) 175 W. Larpenteur Ave., Apt. 12, Roseville, MN 55113. "I have been working in Destron Fearing Corporation for about a year as an electronic and computer engineer. My job involves software and hardware design of embedded microprocessors for an electronic identification system. It has been a challenging and rewarding year and I found that the training I got from working in the electron scattering group [of Professor Paul D. Burrow] at Lincoln very valuable."

**Fagerquist, Randy Lee**, (BS 1980, MS 1981, Ph.D. 1985) 3100 Research Blvd., Dayton, OH 45420. Is a senior scientist at Scitex Digital Printing.

**Fickler, Debra Cleveland** (BS 1988) 413 Briscoe Ave., O'Fallon, MO 63366-1235. Is an environmental engineer at McDonnell Douglas Aerospace. "Since graduating from UN-L, I've worked for MDA, left for law school for two years and returned. I've been assigned to all aircraft programs, F-15, AV-8B, T-45TS, F/A-18, as a non-destructive testing engineer. I am still attending law school part time to complete the third and final year."

**Hall, Thomas P** (BS 1984) 408 Robinson Ave., Bellevue, NE 68005-5816. Is working at PRC Information Sciences Company in Bellevue, and has three children. Has been in touch with several other 1984/85 graduates including Rob Bass, Otto Breugmann, and Phil Doer (who works at PRC also). Has considered commuting to Lincoln for Ph.D. degree, but family obligations take precedence for the moment. Misses school, though. Email: gentlegiant@FreeMark.COM

**Hartt, Kenneth L.** (Ph.D. 1963) 16 Gregory St., Wakefield, RI 02879-2905. Is now on the faculty in the Physics Department at the University of Rhode Island. Email: hartt@uriacc.uri.edu.

**Homan, Dean M.** (BS 1991) 3859 Belleau Wood Dr., #3, Lexington, KY 40517-1845. Wife Dawn gave birth to their daughter, Meghan Elizabeth, on September 25th. Is busy writing his Ph.D. thesis at the University of Kentucky. Email: homan@server1.pa.uky.edu

**Johnson, David L.** (BS 1992) 2630 Kapiolani Blvd., Honolulu, HI 96826. Is a research assistant in the Department of Oceanography at the University of Hawaii.

**LaBelle, Wilma Carol Marcy** (BS 1955) 6166 S. Packard Ave., Apt. 208, Cudahy, WI 53110. Is an engineer/scientist, and recently gave a talk on "Energy" to a conference of women engineers and scientists in Budapest, Hungary.

**Lang, Johathan** (BS 1988) Bldg. 431/A005 Advance Photon Source, Argonne National Laboratory, Argonne, IL 60439. Is a research scientist at Argonne National Laboratory.

**MacLay, James E.** (BS 1959) P.O. Box 14939, Albuquerque, NM 87191. Is retired.

**McKenzie, Robert L.** (BS 1948) 1063B Alta Mira Dr., Santa Clara, CA 95051.

**Moudry, Brian W.**, (MS 1989, Ph.D. 1995) 206 Davis Ave., Apt. 3F, Elkins, WV 26241. Is an assistant professor of physics and math at Davis & Elkins College.

**Nutter, Gene D.** (BS 1951, MS 1956) Rt. 2, Box 132 B, Hayesville, NC 28904. Is retired.

**Pan, Cheng** (Former Research Assistant Professor) 70 Perry St., Apt. 4, Brookline, MA 02146. Is a Medical Physics Fellow at Harvard Medical School. Email: Pan@physics1.unl.edu.

**Park, Hwan** (Ph.D. 1984) 5 Tallow Wood Ct., Clifton Park, NY 12065.

**Perera, Harold** (MS 1985, Ph.D. 1990) Dept. of Rad. Onc. & Nucl. Med., MS200, Hahnemann University, Broad & Vine Street, Philadelphia, PA 19102. Is an Assistant Professor at the Medical College of Pennsylvania Hahnemann University.

**Poffenbarger, Brett** (BS 1993) 3591 Rue University, Apt. 7, Montreal, Quebec, Canada H3A 2B1. Is a graduate student in medical physics at McGill University.

**Sinkular, Lt. Scott** (BS 1992) 708 41st Pl. SE, Albuquerque, NM 87116. Is a space systems analyst with the U.S. Air Force.

**Wells, David**, (BS 1991) 1668 Riverstone Lane, #202, Boise, ID 83706, email: dhwells@micron.com. Is a photo engineer at Micron Display Technology.

# The Record

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

No. 12 Fall 1996

Roger D. Kirby, Editor

## 1995-96 DEGREE RECIPIENTS

### Bachelor of Science

**Erik L. Fagerquist** (May 1996) Is an intern with Union Pacific Railroad in Omaha.

**Robert B. Nickeson** (May 1996) Is enrolled in the graduate physics program at UNL.

**Paul R. Sorensen** (May 1996) Is living in London, where he is studying French and applying to U.S. graduate programs in physics.

### Master of Science

**Adam S. Green** (May 1996) Is engaged in doctoral thesis research under the supervision of Professor Timothy J. Gay.

### Doctor of Philosophy

**Minqi Bao** (Dec 1995) Is a solutions analyst with Quantum Development Corp. in Claymont, Delaware.

**Vincent Chan** (Aug 1995) Is an electronic and computer engineer with Destron Fearing Corp., South St. Paul, MN.

**Shaukat Goderya** (Aug 1995) Is a visiting lecturer in the Physics Department at Bradley University, Peoria, Illinois.

**Dmitri Khrebtukov** (Aug 1995) Is a postdoctoral research associate with former UNL Professor Joseph H. Macek at Oak Ridge National Laboratory.

**Kenneth McLaughlin** (Aug 1995) Is a postdoctoral research associate with Professor Duane H. Jaecks at UNL.

**Brian W. Moudry** (Aug 1995) Is an assistant professor in the Department of Physics and Mathematics at Davis and Elkins College in Elkins, West Virginia.

**Kenneth W. Trantham** (May 1996) Is a postdoctoral research associate at The Australian National University in Canberra.

**Ying Bo Zhang** (Dec 1995) Is with Applied Magnetics Corp. in Santa Barbara, California.

## HONORS

### *1995-96 Fellowships*

<b>Chien-Nan Liu</b>	Parker Fellowship
<b>Mark Meldrim</b>	Avery Fellowship
<b>Kenneth W. Trantham</b>	John W. McDonald Fellowship
<b>Lisa Wiese</b>	Mabel J. Reichenbach Fellowship
<b>Mingjun Yu</b>	Bukey Memorial Fund and Ed F. & Clara M. Degering Trust Fund

### *1995-96 Scholarships*

<b>Adam R. Beltz</b>	Joel Stebbins Fund Scholarship
<b>Michael R. Johnson</b>	Physics and Astronomy Scholarship
<b>Elizabeth S. Klimek</b>	Henry H. Marvin Memorial Scholarship
<b>Robert B. Nickeson</b>	John E. Almy Scholarship
<b>Jessica L. Petersen</b>	Ed Hirsch Scholarship Fund and Joel Stebbins Fund Scholarship
<b>Paul R. Sorensen</b>	Henry H. Marvin Memorial Scholarship
<b>Jeremy A. Vetter</b>	U.S. Harkson Scholarship
<b>Stephen M. Whalen</b>	U.S. Harkson Scholarship

### *Outstanding Graduate Research Assistant Award* **Imaddin Al-Omari**

*1996 Distinguished Teaching Assistant Awards*  
**Fatt Foong**      **Carl Lundstedt**      **Weijia Zhang**

*1995-96 Society of Physics Students Officers*  
**Jeremy A. Vetter, President**  
**Mary Hiller, Secretary Treasurer**

*Fellow of the American Physical Society*  
**Ilya I. Fabrikant**

*1996 Outstanding Research and Creative Activity (ORCA) Award*  
**David J. Sellmyer**



## Faculty Professional Activities

In addition to service on Department, College and University-wide committees, for 1996-97 a number of the faculty are active in local, national and international professional activities, as follows:

**P.D. Burrow:** Organizing Committee for ICPEAC Conference on Electron-Molecule Scattering.

**W.B. Campbell:** Steering Committee, Rocky Mountain Consortium for High Energy Physics

**P.A. Dowben:** Advisory Board, CAMD Synchrotron Source

**S.P. Ducharme:** Conference Co-Chair and Proceedings Editor, SPIE

**R.G. Fuller:** Member, Advisory Board, Edgerton Educational Center; Member, Oversight Committee, C<sup>3</sup>P Project

**T.J. Gay:** External Referee for Promotion and Tenure Committee, University of North Texas

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

**D.L. Leslie-Pelecky:** Chair, APS Task Force on Career and Professional Development; Chair, AAPT Committee on Professional Concerns; Member, Organizing Committee for AAPT/AIP Conference on Addressing the Concerns of Balancing Research and Teaching for New Faculty

**K.C. Leung:** Chair, Chretien International Research Award Committee of American Astronomical Society; United Nations

Working Group on Astronomical Facilities in the Pacific Rim; International Astronomical Union, Information Bulletin on Variable Stars (Editorial Board).

**J. Samson:** Member, Fellowship Committee of DAMOP Division of APS; Life-Time Honorary Member, International Advisory Board for the International Conference on Vacuum UV Radiation Physics; Member, Atomic Physics Research & Synchrotron Beamline Committee, Advanced Light Source; Atomic Physics Review Committee, Argonne National Laboratory

**L. Sartori:** Steering Committee, Midwest Consortium for International Security Studies

**E.G. Schmidt:** Coordinator of the Archives of Unpublished Observations of Variable Stars for the International Astronomical Union.

**D.J. Sellmyer:** International Organizing Committee, MORIS; Advisory Council, MMM-Intermag Conference; Technical Council, National Storage Industry Consortium; Member, Nebraska State EPSCoR Committee; Member, Governor's Science and Technology Planning Committee.

**G.R. Snow:** Site Visitor for NSF-funded Summer Teacher Institutes; NSF Teacher Enhancement Program, Proposal Review Panel

**A.F. Starace:** Associate Editor, *Reviews of Modern Physics*; Member, Editorial Board, *Physical Review A*; Investment Committee, American Physical Society; Task Force to Review *Physical Review A*

---

## 1996-97 Visiting Staff Members

Visiting Professors this year are **Sam Cipolla** (Ph.D. 1969, Purdue) and **George Hadjipanayis** (Ph.D. 1979, Manitoba, Canada).

**C. Martin Gaskell** (Ph.D. 1981, California-Santa Cruz) remains a Visiting Associate Professor this year and **Zhengshen Shan** (Ph.D. 1990, Nebraska) remains a Research Associate Professor working with Professor Sellmyer.

Visiting Assistant Professors this year are **Charles Lang** (Ph.D. 1975, Kansas State), working with Professor Fuller, **Stephen Platt** (Ph.D. 1991, University of Chicago), **Linxiang Zhou** (B.S. 1960, Xiamen University), working with Professor John Hardy, **Shireen Adenwalla** (Ph.D. 1989, Northwestern), **Juan Martinez** (Ph.D. 1994, Illinois), and **Rochelle Ondracek** (Ph.D. 1994, Johns Hopkins Univ.) working with Professor Sellmyer

Research Associates during the 1995-96 academic year are **Alexander Boune** (Ph.D. 1992, Moscow Institute of Crystallography), working with Professor Ducharme, **Charles Hutchings** (Ph.D. 1994, Heidelberg University), working with Professor Dowben and Professor

Sellmyer, **Herman Batelaan** (Ph.D. 1991, U. Utrecht, Holland) working with Professor Gay, **Ruolin Li** (Ph.D. 1995, University of Mainz), working with Professor John Hardy, **Toshiyuki Matsui** (Ph.D. 1995, U. Osaka Prefecture, Japan), working with Professor Kirby, **J. Ping Liu** (Ph.D. 1995, U. of Amsterdam), working with Professor Sellmyer, **Ying Lu** (Ph.D. 1995, University of Tsukuba-Ibaraki), working with Professor Samson, **Mircea Marinescu** (Ph.D. 1995, Bucharest University), working with Professor Starace, **Kenneth W. McLaughlin** (Ph.D. 1995, Nebraska), working with Professor Jaecks, **Christopher Moore** (M.S. 1992, UNL), working with Professor Fuller, **Brian Patterson** (Ph.D. 1991, University of Delaware), working with Professor Sellmyer, **Vicki Plano-Clark** (M.S. 1993, Michigan State), working with Professor Fuller, **Renat Sabiryanov** (Ph.D. 1993, Institute of Chemistry of Solids, Ekaterinburg, Russia), working with Professor Jaswal, **Wayne Stolte** (Ph.D. 1994, Nevada-Reno), working with Professor Samson, and **Orhan Yenen** (Ph.D. 1986, Nebraska), working with Professor Jaecks.

## 1995 Fall Semester Colloquia

- September 14  
 Professor Nikos Giokaris, Rockefeller University  
**"Discovery of the Top Quark at Fermilab"**
- September 21  
 Professor Nicholas J. Giordano, Purdue University  
**"Domain Wall Tunneling in One Dimensional Ferromagnets"**
- September 28  
 Dr. William C. Moss, Lawrence Livermore Laboratory  
**"Sonoluminescent Thermonuclear Fusion"**
- October 5  
 Professor William Harris, McMaster University  
**"Globular Clusters and the Age of the Universe"**
- October 12 *The Jerry E. Ruckman Lecture*  
 Professor Joe Redish, University of Maryland at College Park  
**"Why is it so hard to teach physics?"**
- October 16  
 Dr. Jean-Pierre Revol, CERN, Geneva, Switzerland  
**"ICARUS: A Second Generation Neutrino Observatory and Proton Decay Experiment"**
- October 19  
 Dr. Elaine Seddon, Daresbury Laboratory, United Kingdom  
**"Spin Polarized Photoemission Using Synchrotron Radiation"**
- October 26  
 Dr. Peter Johnson, Brookhaven National Laboratory  
**"Spin Polarized Photoemission"**
- November 2  
 Dr. Wendy Hagen Bauer, Wellesley College  
**"The Interacting Binary Star System VV Cephei"**
- November 9  
 Professor Ilya I. Fabrikant, University of Nebraska-Lincoln  
**"Atomic and Molecular Processes Induced by Slow Electrons"**
- November 16  
 Professor Sara A. Majetich, Carnegie Mellon University  
**"Carbon-Coated Nanocrystals"**
- November 30  
 Professor Gregory R. Snow, University of Nebraska-Lincoln  
**"Precision Experiments at Fermilab to Test Lorentz Invariance and the CPT Theorem"**
- December 7  
 Professor James A.R. Samson, University of Nebraska-Lincoln  
**"Atomic Inner Shell Vacancies: A New Look at the Auger Effect"**

## 1996 Spring Semester Colloquia

- January 18  
 Professor Stephen Ducharme, University of Nebraska  
**"Development of the Space Ellipsometer: Surface Science on the Fly"**

## 1996 SPRING SEMESTER COLLOQUIA (cont'd)

- January 25  
 Professor Diandra Leslie-Pelecky, University of Nebraska  
**"Magnetic and Structural Properties of Chemically Synthesized Nanoparticle Systems"**
- February 1  
 Professor Norman Simon, University of Nebraska  
**"Cepheids and the Distance Scale (with a Short Primer on Cosmology)"**
- February 8  
 Dr. Michael Waligórski, The Maria Sklodowska-Curie Memorial Centre of Oncology, Poland  
**"Hadron beams - a New Modality in Cancer Radiotherapy"**
- February 22  
 Professor F. Barry Dunning, Rice University  
**"Rydberg Atoms: Giants of the Atomic World"**
- February 29  
 Professor Beverly Wills, University of Texas at Austin  
**"Black holes in Quasars: New results from the Hubble Space Telescope"**
- March 7  
 Dr. Jing Shi, University of California at Santa Barbara  
**"Magnetic Nanostructures in GaAs Semiconductors"**
- March 14  
 Professor Dana Anderson, University of Colorado, JILA  
**"Optical Machines that Learn on Their Own"**
- March 27  
 Dr. Peng Xiong, University of California at San Diego  
**"Superconducting Fluctuations in One Dimension"**
- April 1  
 Dr. Z. Charles Ying, Oak Ridge National Laboratory  
**"Surface and Nanomaterial Research Using Laser Techniques"**
- April 4  
 Dr. Roger Proksch, St. Olaf College  
**"Magnetism, Microbes and Microscopy"**
- April 18  
 Dr. Daniel Claes, State University of New York at Stony Brook  
**"Beyond the Standard Model: The Search for Supersymmetry at DZERO"**
- April 30  
 Kathleen Streets, New York University  
**"Determination of the Mass of the  $W$  Boson Using the  $D\bar{0}$  Detector"**
- May 6  
 Dr. Michael Fero, Massachusetts Institute of Technology  
**"The Best Measurement of the Weinberg Angle"**
- May 9  
 Dr. Kevin McFarland, Fermi National Accelerator Laboratory  
**"Neutrino Physics at Fermilab"**

# New Research Grants and Contracts

*during the period 1 November 1995 – 31 October 1996 the following new and renewal grants and contracts were received by our faculty*

Principal Investigator	Title (Source of Funds)	Amount (\$ Thousands)
Dowben	Equipment Donation (IBM)	16.0
Dowben	Direct Writing of Magnetic Devices (MMES)	20.0
Dowben	W.M. Keck For Molecular Electronics (Keck)	25.0
Dowben	Fabrication and Characterization of Micron Scale Ferromagnetic Features (DOE)	101.3
Ducharme	Photovoltaic Effects on Ferroelectric Films: Final Report (SNL)	2.5
Ducharme/Takacs	Photorefractive Polymers for Integrated Optics (DOD, EPSCoR/AFOSR)	144.3
Fabrikant	Atomic Processes Involving Negative Ions (NSF)	60.0
Fuller	Mechanical Universe-High School Adaptation-An Institute for Pre-Service Physics Teachers (CCPE)	43.0
Fuller	Research & Development Using Hypermedia for Knowing Physics (NSF)	112.5
Gay	Polarized Electron Physics (NSF-REU)	2.0
Gay	Polarized Electron Physics (NSF-REU)	12.0
Gay	Polarized Electron Physics (NSF)	163.0
J. Hardy	Microwave Optics of Ionic Molecular Solids: Theory and Experiment (ARO)	45.0
Jaacks	Experimental Study of Collective Motion, Charge Distributions and Bound-Free Electron Correlations in Unusual States of Ar <sup>+</sup> : Correlation Studies of Three Massive Coulomb-Interacting Particles (NSF-REU)	31.0
Jaacks	Experimental Study of Collective Motion, Charge Distributions and Bound-Free Electron Correlations in Unusual States of Ar <sup>+</sup> : Correlation Studies of 10Three Massive Coulomb-Interacting Particles (NSF)	180.0
Leslie-Pelecky/ Ducharme	Summer Research Experience for Undergraduates in Nanostructured Materials Research (NSF)	60.0
Leslie-Pelecky	Strengthening Graduate Education in Science and Engineering Through Systemic Involvement in Research and Outreach Activities (NSF)	147.0
Liou	Hg- and Ti-Based Superconducting Films	85.0
Samson	Interaction of Radiation with Planetary Gases (NASA)	52.0
Samson	Ultraviolet and X-ray Bombardment of Planetary Atmospheres (NSF)	75.0
Samson	Photoionization Studies of Atoms (NSF)	100.0
Sellmyer	Ultra High Density Recording: Optical Recording Component (NSIC/ARPA)	8.6
Sellmyer	Surface Studies of Metal Film Resistors (Dale)	25.0
Sellmyer	Tailored Magnetic Materials (DOE)	55.2
Sellmyer	Materials Research on Nano-Structured and Complex Systems (EPSCoR)	174.3
Sellmyer/Jaswal	Fundamental Studies of Novel Permanent-Magnet Materials (DOE)	75.0
Sellmyer/Woolam/		
Kirby	Magnetism & Magneto-Optics of Novel Nanoscale Materials (NSF)	64.5
Starace	Research Experiences for Undergraduates (REU) Supplement (NSF-REU)	3.4
Starace	Coherent Control of Continuum Quantum Processes (NSF)	75.0
Starace	Dynamics of Few-Body Atomic Processes (DOE)	80.0
Weymouth	Fort Clatsop National Memorial Survey (FCNM)	3.0
Weymouth	Geophysical Survey at Wright Patterson Air Force Base (MAC)	5.0
<b>Total</b>		<b>\$2,045.6</b>

AFOSR - Air Force Office of Scientific Research  
 ARO - Army Research Office  
 CCPE - Coordinating Commission for Postsecondary Education  
 Dale - Dale Electronics  
 DOD - Department of Defense  
 DOE - Department of Energy

EPSCoR - Experimental Program to Stimulate Competitive Research  
 FCNM - Fort Clatsop National Memorial  
 IBM - International Business Machines Corporation  
 Keck - W.M. Keck Foundation  
 MAC - Midwest Archeological Center  
 MISCON - Midwest Superconductivity Consortium

MMES - Martin Marietta Energy Systems, Inc.  
 NASA - National Aeronautics and Space Administration  
 NSF - National Science Foundation  
 NSIC/ARPA - National Storage Industry Consortium/  
 Advanced Research Projects Agency  
 REU - Research Experience for Undergraduates  
 SNL - Sandia National Laboratories

# 1995 Faculty Publications

## ASTRONOMY AND ASTROPHYSICS

- K.T. Korista, ... **C.M. Gaskell**, et al. "Steps Toward Determination of the Size and Structure of the Broad Line Region in Active Galactic Nuclei. VIII. An Intensive HST, IUE, and Ground-Based Study of NGC 5548," *Astrophysical Journal Supplement Series* **97**, 285 (1995).
- D.Q. Zhou and **K.C. Leung**, "A Numerical Method of Smooth Discontinuity at Initial State for Circulation in Contact Binary System," *Astrophysics Publ. Beijing Astronomical Observatory* **25**, 20-30 (1995).
- S. Goderya, **K.C. Leung**, and **E.G. Schmidt**, "A Photometric Study of V508 Cygni," *Astronomical Journal* **110**, 346-352 (1995).
- E.G. Schmidt** and G.R. Carruthers, "Far Ultraviolet Stellar Photometry: Fields in Scorpius and Sagittarius," *Astrophysical Journal Supplement Series* **96**, 605 (1995).
- E.G. Schmidt**, J.R. Chab, and D.E. Reiswig, "The Behlen Observatory Variable Star Survey. Paper III.," *Astronomical Journal* **109**, 1239 (1995).
- N.R. Simon** and S.M. Kanbur, "Long Period Cepheids: Models and Observations," *Astrophysical Journal* **451**, 703 (1995).

## ATOMIC, MOLECULAR AND OPTICAL PHYSICS

- P.D. Burrow** and D.M. Pearl, "Dissociative Attachment from Monochlorinated Hydrocarbons in the Gas Phase" *Nuclear Instruments and Methods B* **101**, 219 (1995).
- A.R. Johnston and **P.D. Burrow**, "Electron-impact Ionization of Na," *Physical Review A* **51**, R1735 (1995).
- D.M. Pearl, **P.D. Burrow**, J.J. Nash, H. Morrison, D. Nachtigallova and K.D. Jordan "Dissociative Attachment as a Probe of the Distance Dependence of Intramolecular Electron Transfer," *Journal of Physical Chemistry* **99**, 12379 (1995).
- D.M. Pearl, **P.D. Burrow**, **I.I. Fabrikant**, and **G.A. Gallup**, "Dissociative Attachment in Hot CH<sub>3</sub>Cl: Experiment and Theory," *Journal of Chemical Physics* **102**, 2737 (1995).
- D.N. McIlroy, **P.A. Dowben**, A. Knop and E. Rühl, "A Novel Design for a Small Retractable Cylindrical Mirror Analyser," *Journal of Vacuum Science and Technology* **A13** 2142 (1995).
- M.T. Frey, S.B. Hill, K.A. Smith, F.B. Dunning, and **I.I. Fabrikant**, "Studies of Electron-Molecule Scattering at Microelectronvolt Energies Using Very-High-n Rydberg Atoms," *Physical Review Letters* **75**, 810 (1995).

- D.B. Khrebtukov and **I.I. Fabrikant**, "Off-Shell Effect in Rydberg-Atom—Alkali-Metal-Atom Scattering," *Phys. Rev. A* **51**, 4675 (1995).
- L. Sanche, A.D. Bass, P. Ayotte, and **I.I. Fabrikant**, "The Effect of the Condensed Phase on Dissociative Electron Attachment: CH<sub>3</sub>Cl Condensed on a Kr Surface," *Physical Review Letters* **75**, 3568 (1995).
- I.I. Fabrikant**, "Two- And Three-Body Dynamics Governing Collisions of Rydberg Atoms with Neutral Targets," in *Atomic and Molecular Physics*, edited by I. Alvarez, C. Cisneros, and T.J. Morgan (World Scientific Publishing, Singapore, 1995), p. 313.
- M.T. Frey, S.B. Hill, K.A. Smith, F.B. Dunning, and **I.I. Fabrikant**, "Studies of Electron-Molecule Scattering at Microelectronvolt Energies Using Very-High-n Rydberg Atoms," in *The Physics of Electronic and Atomic Collisions*, edited by L.J. Dubé, J.B.A. Mitchell, J.W. McConkey, and C.E. Brion (AIP Conference Proceedings, 1995), p. 815.
- K.W. Trantham, M.E. Johnston, and **T.J. Gay**, "Failure to Observe Electron Circular Dichroism in Camphor," *Journal of Physics B* **28**, L543 (1995).
- D. H. Jaecks**, B. W. Moudry, O. Yenen, "Correlated Motion of 4p and 3p Electrons of Ar<sup>+</sup> Formed in Collisions," in *Atomic and Molecular Physics*, edited by I. Alvarez, C. Cisneros, T.J. Morgan (World Scientific, Singapore, 1995), pp. 304-312.
- M.W. Gealy, G.W. Kerby III, Y.-Y. Hsu and **M.E. Rudd**, "Energy and Angular Distributions of Electrons from Ion Impact on Atomic and Molecular Hydrogen. I. 20-114 keV H<sup>+</sup>+H<sub>2</sub>," *Physical Review A* **51**, 2247 (1995).
- G.W. Kerby III, M.W. Gealy, Y.-Y. Hsu, **M.E. Rudd**, D.R. Schultz and C.O. Reinhold, "Energy and Angular Distributions of Electrons from Ion Impact on Atomic and Molecular Hydrogen. II 20-114 keV H<sup>+</sup>+H," *Physical Review A* **51**, 2256 (1995).
- Y.-K. Kim, W. Hwang and **M.E. Rudd**, "New Model for Electron-Impact Ionization Cross Sections of Atoms and Molecules," *Proceedings of the 3rd Symposium on Laser Spectroscopy* **3** (4), 44 (1995).
- J.H. McGuire, N. Berrah, R.J. Bartlett, **J.A.R. Samson**, J. Tanis, C.L. Cocke, and A.S. Schlachter, "The Ratio of Cross Sections for Double to Single Ionization of Helium by High Energy Photons and Charged Particles," *Journal of Physics B* **28**, 913 (1995).

- M. Sagurton, R.J. Bartlett, **J.A.R. Samson**, Z.X. He, and D. Morgan, "Effect of Compton Scattering on the Double-to-Single Photoionization Ratio of Helium," *Physical Review A* **52**, 2829 (1995).
- Z.X. He, J.N. Cutler, S.H. Southworth, L.R. Hughey, and **J.A.R. Samson**, "Zero Kinetic Energy Proton and Deuteron Production From Photoionization of  $H_2$  and  $D_2$ ," *Journal of Chemical Physics* **103**, 3912 (1995).
- J.N. Cutler, Z.X. He, and **J.A.R. Samson**, "Relative Photoionization Cross Section Study of OH and OD from 68nm to 95nm," *Journal of Physics B* **28**, 4577 (1995).
- Z.X. He, R. Moberg, and **J.A.R. Samson**, "Threshold Behavior in Single-Photon Double Ionization of Atomic Oxygen," *Physical Review* **52**, 4595 (1995).
- J.N. Cutler, Z.X. He and **J.A.R. Samson**, "Relative Photoionization Cross Section Study of OH and OD from 68 nm to 95 nm," *Journal of Physics B* **28**, 4577 (1995).
- Q. Wang and **A.F. Starace**, "Coherent Control of H-Photodetachment in Parallel, Static Electric and Magnetic Fields," *Physical Review A* **51**, 1260 (1995).
- C. Pan and **A.F. Starace**, "Target Dependence of the Triply Differential Cross Sections for Low Energy ( $e, 2e$ ) Processes, in *Many-Body Atomic Physics*, Edited by J.J. Boyle and M.S. Pindzola (Cambridge University Press, 1995).
- Jiandi Zhang, **P.A. Dowben**, Dongqi Li and M. Onellion, "An Angle Resolved Photoemission Study of Oxygen Chemisorption on Gd(0001)," *Surface Science* **329**, 177 (1995).
- D.N. McIlroy and **P.A. Dowben**, "The Paramagnetic Correlation Length of Mn Thin Films," in *Applications of Synchrotron Radiation Techniques to Materials Science II*, edited by L.J. Terminello, N.D. Shinn, G.E. Ice, K.L. d'Amico and D.L. Perry, MRS Symposium Proceedings **375**, 81 (1995).
- Dongjin Byun, B.R. Spady, N.J. Ianno and **P.A. Dowben**, "Comparison of Different Chemical Vapor Deposition Methodologies for the Fabrication of Heterojunction Boron-Carbide Diodes," *NanoStructured Materials* **5**, 81 (1995).
- Dongqi Li, J. Pearson, S.D. Bader, D.N. McIlroy, C. Waldfried and **P.A. Dowben**, "Spin-Polarized Photoemission Studies of the Exchange Splitting of the Gd 5d Electrons Near the Curie Temperature," *Physical Review B* **51**, 13895 (1995).
- Dongjin Byun, Seong-don Hwang, Jiandi Zhang, Hong Zeng, F. Keith Perkins, G. Vidali and **P.A. Dowben**, "Synchrotron Radiation Induced Decomposition of *closo*-1,2-dicarbododecaborane," *Japanese Journal of Applied Physics Letters* **34**, L941 (1995).
- Bong-Ok Kim, Geunseop Lee, E.W. Plummer, **P.A. Dowben**, and A. Liebsch, "Mercury Surface Plasmon Dispersion: Experiment and Theory," *Physical Review B* **52**, 6057 (1995).
- Jiandi Zhang, D.N. McIlroy, and **P.A. Dowben**, "The Correlation Between Screening and Electron Effective Mass Across the Nonmetal - Metal Transition in Ultrathin Films," *Physical Review B* **52**, 11380 (1995).
- Jiandi Zhang, D.N. McIlroy, **P.A. Dowben**, Hong Zeng, G. Vidali, D. Heskett and M. Onellion, "The Electronic Structure of Molecular Icosahedra Films," *Journal of Physics: Condensed Matter* **7**, 7185 (1995).
- C. Waldfried, D.N. McIlroy, Dongqi Li, J. Pearson, S.D. Bader, and **P.A. Dowben**, "Dissociative Nitrogen Chemisorption and Bonding on Gd(00001)," *Surface Science Letters* **341**, L1072 (1995).
- A. Bune, **S. Ducharme**, V. Fridkin, L. Blinov, S. Palto, N. Petukhova, and S. Yudin, "Novel Switching Phenomena in Ferroelectric Langmuir-Blodgett Films," *Applied Physics Letters* **67**, 3975 (1995).
- S. Ducharme** and Bao Vu, "Intensity-Dependent Asymmetric Transmission Through a Photorefractive Fabry-Perot talon," *Ferroelectrics* **174**, 197 (1995).
- V. Katkanant and **J.R. Hardy**, "Lattice- and Molecular-Dynamics Studies of  $RbLiSO_4$ ," *Physical Review B* **51**, 137 (1995).

## CONDENSED MATTER PHYSICS

- Seong-Don Hwang, Dongjin Byun, J.A. Glass Jr., Brian Robertson, J.T. Spencer, S. Datta and **P.A. Dowben**, "Photo-Assisted Direct Writing of Conducting Aluminium," *Materials Science & Engineering* **B30**, L5 (1995).
- Jiandi Zhang, D.N. McIlroy and **P.A. Dowben**, "Changes in the Electron Effective Mass Across the Nonmetal - Metal Transition in Magnesium Overlayers," *Europhysics Letters* **29**, 469 (1995).
- P.A. Dowben**, Dongqi Li, Jiandi Zhang and M. Onellion, "Resonant Photoemission Studies of the Thickness Dependence of the Unoccupied Gd 5d Bands," *Journal of Vacuum Science and Technology* **A13**, 1549 (1995).
- J.M. Carpinelli, E.W. Plummer, Dongjin Byun and **P.A. Dowben** "An STM Study of Molecular Intermediates in the Dissociative Adsorption of *closo*-1,2-dicarbododecaborane on Si(111)," *Journal of Vacuum Science and Technology* **B13**, 1203 (1995).
- D.N. McIlroy, Jiandi Zhang, **P.A. Dowben**, P.Xu and D. Heskett, "The Coadsorption of Metals and Molecular Icosahedra on Cu(100)," *Surface Science* **328**, 47 (1995).

- H.Z. Cao and **J.R. Hardy**, "Interplay of Ionic Breathing and Rotational Instabilities in Perovskites," *Ferroelectrics* **164**, 189 (1995).
- Q. Shen, H.Z. Cao, and **J.R. Hardy**, "Bismuth Valence and Lattice Dynamics Studies in  $\text{BaBiO}_3$  by Molecular Dynamics," *Physica C* **243**, 262 (1995).
- K.M. Yenice, S.A. Lee, H.M. Lu, and **J.R. Hardy**, "Experimental and Theoretical Study of  $\text{K}_2\text{SeO}_4$  at Low Temperature and High Pressure," *Ferroelectrics* **173**, 7 (1995).
- S.S. Jaswal**, "Is  $\text{TiInPd}_2$  Magnetic?" *Journal of Magnetism and Magnetic Materials* **139**, L1 (1995).
- R. Lorenz, J. Hafner, **S.S. Jaswal**, and **D.J. Sellmyer**, "Disorder and Noncollinear Magnetism in Permanent-Magnet Materials with the  $\text{ThMn}_{12}$  Structure," *Physical Review Letters* **74**, 3688 (1995).
- I.A. Al-Omari, **S.S. Jaswal**, E.W. Singleton, **D.J. Sellmyer**, Y. Zheng and G.C. Hadjipanayis, "Mössbauer Study of Permanent-Magnet Materials  $\text{Sm}_2\text{Fe}_{17-x}\text{Ga}_x\text{C}_y$  Compounds," *Journal of Magnetism and Magnetic Materials* **151**, 145 (1995).
- J.P. Woods, B.M. Patterson, A.S. Fernando, **S.S. Jaswal**, D. Welipitiya and **D.J. Sellmyer**, "Electronic Structures and Curie Temperatures of Rare Earth—Iron Based Permanent Magnet Compounds," *Physical Review B* **51**, 1064 (1995).
- D.J. Sellmyer**, **R.D. Kirby**, J. Chen, K.W. Wierman, J.X. Shen, Y. Liu, B.W. Robertson, and **S.S. Jaswal**, "Magneto-Optical and Structural Properties of Nanocrystalline MnBi-Based Films," *Journal of the Physics and Chemistry of Solids* **56**, 1549 (1995).
- D.J. Sellmyer**, **R.D. Kirby** and **S.S. Jaswal**, "Magnetism and Magneto-Optics of Rare Earth-Transition Metal Glasses and Multilayers," in *The Magnetism of Amorphous Metals and Alloys*, Eds. J.A. Fernandez-Baca and W.Y. Ching (World Scientific Publishing, Singapore, 1995), pp. 281-334.
- J.X. Shen, **R.D. Kirby**, K.W. Wierman, Y.B. Zhang, T. Suzuki, and **D.J. Sellmyer**, "Magneto-Optical and Structural Properties of DIG/T (T = Fe, Co, Dy) Multilayers," *Journal of Magnetism and Magnetic Materials* **140-144**, 2139 (1995).
- J. Chen, K.W. Wierman, **R.D. Kirby**, and **D.J. Sellmyer**, "Magnetic and Magneto-Optical Properties of  $\text{Mn}_x\text{CuBi}(x=0.75-2.0)$  Films," *IEEE Transactions on Magnetics* **31**, 3334 (1995).
- D.N. McIlroy, J. Zhang, **S.H. Liou** and **P.A. Dowben**, "Changes in Screening and Electron Density Across the Coupled Metallic-Magnetic Phase transition of  $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ ," *Physics Letters A* **207**, 367 (1995).
- D.J. Sellmyer**, Z.S. Shan, Y. Liu, **S.H. Liou**, S.S. Malhotra, and B.W. Robertson, "Magnetic and Structural Properties of High Coercivity Nanocrystalline CoSm Films with In-Plane Anisotropy," *Scripta Metallurgica et Materialia* **33**, 1545 (1995).
- Y. Liu, **D.J. Sellmyer**, B.W. Robertson, Z.S. Shan and **S.H. Liou**, "High Resolution Electron Microscopy and Nano-Probe Study of Sm-CoCr Films," *IEEE Transactions on Magnetics* **31**, 2740 (1995).
- Y. Liu, B. W. Robertson, Z. S. Shan, **S. H. Liou**, and **D.J. Sellmyer**, "Microstructure of the Cr Underlayer and its Effect on Sm-CoCr Thin Films," *Journal of Applied Physics* **77**, 3831 (1995).
- B.W. Robertson, Y. Liu, Z.S. Shan, **S.H. Liou** and **D.J. Sellmyer**, "Structure, Property, Processing Relationships in Nanocrystalline Sputtered Magnetic Films," *Materials Science Forum* **179-81**, 603 (1995).
- I.A. Al-Omari and **D.J. Sellmyer**, "Magnetic Properties of Nanostructured CoSm/FeCo Films," *Physical Review B* **52**, 3441 (1995).
- Z.S. Shan, Y. Liu, Y.S. Jeong, Y.B. Zhang, I.A. Al-Omari and **D.J. Sellmyer**, "Magnetism of Nanocomposite CoSm-Based Films," *Journal of the Korean Magnetics Society* **5**, 702 (1995).
- C.P. Luo and **D.J. Sellmyer**, "Magnetic Properties and Structure of Fe/Pt Thin Films," *IEEE Transactions on Magnetics* **31**, 2764 (1995).
- E.W. Singleton, Z.S. Shan, Y.S. Jeong and **D.J. Sellmyer**, "Magnetic Switching Volumes of CoSm Thin Films for High-Density Longitudinal Recording," *IEEE Transactions on Magnetics* **31**, 2743 (1995).
- R.L. Schalek, **D.L. Leslie-Pelecky**, J. Knight, **D.J. Sellmyer**, and S.C. Axtell, "Tailoring The Magnetic Properties Of  $\text{SmCo}_5$ :  $\text{Nb}_{0.33}\text{Cr}_{0.67}$  Nanocomposites Using Mechanical Alloying," *IEEE Transactions on Magnetics* **31**, 3772 (1995).

## HIGH ENERGY PHYSICS

- S. Abachi, ..., **D. Claes**, **G. Snow**, et al., "Search for High Mass Top Quark Production in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **74**, 2422 (1995).
- S. Abachi, ..., **D. Claes**, **G. Snow**, et al., "Observation of the Top Quark," *Physical Review Letters* **74**, 2632 (1995).
- S. Abachi, ..., **D. Claes**, **G. Snow**, et al., "Inclusive m and b-Quark Production Cross Sections in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **74**, 3548 (1995).

- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Search for Squarks and Gluinos in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 618 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Search for  $W$  Boson Pair Production in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 1023 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Measurement of the ZZg and Zgg Couplings in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 1028 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Measurement of the WWg Gauge Boson Couplings in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 1034 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "W and Z Production in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 1456 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Transverse Energy Distributions within Jets in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physics Letters B* **357**, 500 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Search for Heavy  $W$  Bosons in 1.8 TeV in pCollisions," *Physics Letters B* **358**, 405 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "A Study of the Strong Coupling Constant Using  $W$  + Jets Processes," *Physical Review Letters* **75**, 3226 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Top Quark Search with the D0 1992-93 Data Sample," *Physical Review D* **52**, 4877 (1995).
- S. Abachi, ..., **D. Claes, G. Snow**, et al., "Second Generation Leptoquark Search in pCollisions at  $\sqrt{s}=1.8$  TeV," *Physical Review Letters* **75**, 3618 (1995).

• **Physics Education**

- L. Sartori**, "Elementary Derivation of the Relativistic Velocity Addition Law," *American Journal of Physics* **63**, 81 (1995).

• **Track Physics**

- F.A. Cucinotta, R. Katz, J.W. Wilson, R.R. Dubey**, "Heavy Ion Track Structure Calculations for Radial Dose in Arbitrary Materials," NASA Technical Paper 3497 (February 1995).
- C.X. Zhang and R. Katz**, "Thindown in Biological 1-Hit Detectors: E. Coli B/r, and B<sub>st</sub>," *Chinese Science Bulletin* **40**, 1479 (1995).
- C.X. Zhang and R. Katz**, "Thindown in Radiobiology: E. Coli B/r, Bs-1, B. Subtilis Spores and V-79 Chinese Hamster Cells," *Nuclear Science and Techniques (China)* **6**, 65 (1995).
- R. Katz and R.A. Cucinotta**, "Low Dose," Letter to the Editor, *Health Physics* **68**, 859 (1995).



## INTERDISCIPLINARY PHYSICS

• **Archaeometry**

- J.W. Weymouth**, "Analysis of Geophysical Data Gathered Over the Dixon Site," Appendix II in *Excavations at the Dixon Site (13WD8): Correctionville Phase Oneota in Northwest Iowa*, edited by R.L. Fishel, Contract Completion Report 442 (Office of the State Archaeologist, The University of Iowa, 1995).
- J.W. Weymouth**, "Geophysical Surveys at Sites of the Nebraska National Trails Foundation, Brule, Nebraska," Report submitted to the NNTF Project, University of Nebraska (1995).
- J.W. Weymouth**, "Geophysical Evaluations of Two Hopewell sites in Ross County, Ohio," Report submitted to the Midwest Archeological Center, NPS (1995).