University of Nebraska Lincoln

Spectrum

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

No. 22 Winter 2002 Anthony F. Starace, Editor

Tsymbal and Uiterwaal Join Department Faculty

Two new faculty joined the Department during the 2001-2002 academic year.

Evgeny Tsymbal is a theoretical condensed matter and materials physicist. **Kees Uiterwaal** is an experimental atomic, molecular, and optical physicist. They represent the first two of up to 10 new faculty that will be hired over the next several years to replace retiring Department faculty.

Evgeny Tsymbal

Kees Uiterwaal

Evgeny Tsymbal was born in Moscow, received an M.Sc. degree from Moscow State University, and a Ph.D. in solid state theory from the Russian Academy of Sciences in 1988. During his period at the Russian Academy of Sciences, he was awarded the prestigious I.V. Kurchatov Award for his research on spin-lattice relaxation.

After receiving the Ph.D. degree, he continued as a postdoctoral researcher at the Russian Academy of Sciences. In 1993 he was awarded an Alexander von Humboldt Fellowship to carry out research in magnetism at the Institute of Solid State Physics in Julich, Germany, where he worked on the theory of magnetic interfaces in thin film multilayers and complex magnetic coupling phenomena.

Since 1995 Tsymbal has been a Senior Research Scientist in the Department of Materials at Oxford University, where he was especially interested in giant magneto-resistance (GMR) phenomena. He joins our Department as an Associate Professor of Physics.

Tsymbal's main research interests revolve around electron spin phenomena in solids, especially spin transport across interfaces and junctions. He has been collaborating with researchers at Hewlett Packard Corp. to develop a theory of GMR which takes into account the structural properties of the "spin-valves," which have many important technological applications.

His research at UNL will include theoretical studies of spin-dependent conduction across ferromagnetic nanocontacts, ballistic electron transport in nanoscale magnetic junctions, and spin-dependent tunneling processes. His theoretical work complements nicely **Sitaram Jaswal's** theoretical electronic structure research, and overlaps with the experimental work of **Bernard Doudin, Sy Hwang Liou,** and **David Sellmyer.**

Kees Uiterwaal was born and raised in Utrecht, The Netherlands. He received a master's degree with distinction at Utrecht University and subsequently received his Ph.D. degree there in 1994, working under the supervision of Professor A. Niehaus studying ion-molecule interactions.

During 1994-97 he was a postdoctoral researcher at the Foundation for Research and Technology-Hellas, Institute of Electronic Structure & Laser, in Heraklion, Crete, which is one of six major European intense laser facilities. There he studied multiphoton processes in rare gases using short pulse laser radiation.

NEW FACULTY *continued on page 4*

Nobel Winner Heeger Awarded Inaugural Bessey Medal

Alumnus and Nobel Laureate Alan J. Heeger (B.S. 1957) was honored on Oct. 10, 2001, by the University as the first recipient of the Bessey Medal, which is a newly established award designated for a person who has made great accomplishments in science.

The award is named in honor of Charles Bessey, world renowned botanist and former Chancellor of the University of Nebraska. (Bessey is often credited with establishing ecology as a field of scientific inquiry.)

Heeger shared the 2000 Nobel Prize in Chemistry for the discovery that plastics can be made to conduct electricity. He became a member of the National Academy of Sciences (NAS) in May 2001.

Alan Heeger (middle) stands with former classmate Melvin Thornton (left) and Department Chair Roger Kirby. Thornton is an Emeritus Professor of Math & Statistics at UNL.

It should be noted that UNL recognized Heeger's accomplishments *before* he won the Nobel Prize or became a member of the NAS: In August 1999 he was awarded an Honorary Doctor of Science degree by UNL for his outstanding research discoveries.

As part of the Bessey Award ceremonies, Heeger visited with faculty and students in the Department and presented a lecture at the Nebraska Union. Afterward, Chancellor Harvey Perlman hosted a reception and dinner in his honor at the Lied Center.

Heeger's talk was entitled "Semiconducting and Metallic Polymers: The Fourth Generation of Polymeric Materials." In his talk, he traced the development of these novel materials, which not only can be made to conduct electricity but also to emit light.

Heeger also shared with the audience the experience of being awarded the Nobel Prize, from the telephone call informing him of the award to the elaborate ceremonies in Stockholm. Heeger's talk was the subject of an article appearing the next day in the Lincoln Journal Star.

The reprinted article can be found on page 3.

HEEGER *continued on page 3*

Spectrum
Physics&Astronomy

Letter from the Department Chair

Let me begin this letter with some excellent news. Over the past two years, the University of Nebraska has engaged in a process of setting priorities, which began with the development of the report, *A 2020 Vision: The Future of Research and Graduate Education at UNL*. This report is meant to serve as a guide to where the University wishes to be by the year 2020. While the *2020 Vision* report addresses many topics, it places primary emphasis on developing research and graduate education during the next twenty years.

Roger D. Kirby

One part of the development process is to select "priority" academic areas which will be the beneficiaries of any new funding. It was reported in last year's issue of the *Spectrum* that three of our research areas had been selected as "Priority Areas": Atomic, molecular and optical (AMO) physics, high-energy physics (HEP), and nanoscale science and technology (NST); in addition, the Department was heavily involved in the Math/Science Teachers for the 21st Century priority.

> *I am pleased to announce that the AMO physics and NST proposals have been selected for academic enhancement. While more details will be presented in next year's edition of the Spectrum, these two enhancements will help provide startup funds for seven new faculty hires over the next five years.*

Since then we have had a competition to determine which of the campus-wide priorities areas will initially receive funding. I am pleased to announce that the AMO physics and NST proposals have been selected for academic enhancement. While more details will be presented in next year's edition of the *Spectrum*, these two enhancements will help provide startup funds for seven new faculty hires over the next five years. They will also permit us to expand the number of postdocs and other visitors, and enhance our seminar and colloquium series. The Math/Science Teachers for the 21st Century was also selected for enhancement, and this too will benefit the Department. These enhancements come at a time when the Department's research funding has reached a new high ($5.3 M during the November 2000–October 2001 period, or about $200 K per tenured/tenure-track faculty member).

While this is very good news, funding of these priorities will place additional stress on the Department's research and instructional space, and this problem will occupy much of our time over the next few years. Our success in obtaining research funding has permitted us to buy more equipment, hire more postdocs and Ph.D. research faculty, and engage more graduate and undergraduate students in research. This problem has been exacerbated by the Department's plan to replace theoreticians (as they retire) with experimentalists. We are now figuratively bursting at the seams, and major steps must be taken to use our space even more effectively to house people and laboratories. While we have been planning for this, progress has been slow and somewhat painful.

Over the past 20 years we have carried out dozens of renovation projects. Among the more major changes: The Department Offices and the Library were both moved to renovated space on the first floor of Brace, and the Instrument and Electronic shops were moved to new homes in Ferguson; to make room in Brace for the Department offices, the Advanced Laboratories were moved to renovated space on the third floor of Brace; we renovated several offices in Brace Laboratory to provide office space for 10 or so postdocs and two faculty members; we moved our high-energy experimental group to newly-renovated space in Ferguson; we renovated our large lecture hall (Brace 201), and Brace 202 was converted from lecture/demonstration storage into a seminar/meeting room with a good bit of character; Brace 203, 204, and 205 have also been modernized to provide additional meeting rooms and office space for five postdocs. Several rooms in Behlen have also been renovated to gain more useful space to house people and laboratories.

However, our space problems are really just beginning, and we are actively seeking solutions to carry us through the next two to three years, when additional space may become available in Ferguson Hall. By Fall semester 2003, we must have three additional laboratories in place to house new experimentalists.

Where will this space be found? First, some faculty may have to release some real estate that they have acquired by, for example, combining two laboratories into one. Behlen SB61, the entrance room to the "accelerator" laboratory, currently provides offices for six graduate students, postdocs and other Ph.D. researchers. With proper renovation, this space would make a fine laboratory, with room for two or three graduate students, but a new entrance to the accelerator room would have to be installed in the north stairwell. Finally, we may relocate the student machine shop to the basement of Ferguson (across from the existing electronics shop). The vacated space would provide a small, but perhaps suitable, laboratory in Behlen for one of the new experimentalists.

As we continue to add experimentalist faculty and postdocs, our laboratory and office space will become even tighter. We anticipate gaining an additional floor and a half in Ferguson Hall, which will be an adequate short-term solution. But ultimately, we need a new building, or at the least a substantial and modern addition to Behlen Laboratory. Hopefully a positive resolution to this problem will be a topic in a future Letter from the Chair.

Sincerely,

Roger D. Kirby

Professor and Chair

Starace Named George Holmes University Professor

During his Aug. 24, 2001, State of the University Address, Chancellor Harvey Perlman announced that Professor **Anthony F. Starace** has been named a George Holmes University Professor, joining David J. Sellmyer and John R. Hardy of our Department.

Anthony F. Starace

There are only 24 named University Professors on campus; thus this is a great honor. Although all aspects of the nominee's career are considered, the major criterion is "an extraordinary level of scholarly or creative achievement and clear potential for continuing major accomplishments that enhance the reputation of the University of Nebraska."

Starace received an A.B. degree (*cum laude*) from Columbia University and a Ph.D. from the University of Chicago, where he was under the guidance of Professor Ugo Fano, perhaps the foremost atomic theorist of his generation.

Prior to joining the University of Nebraska as an Assistant Professor, Starace was a postdoctoral Research Associate at Imperial College in London.

Starace is a theoretical atomic physicist with more than 130 publications in books and first-rank journals, more than 40 invited presentations at national and international scientific conferences, and numerous presentations at universities and other institutions.

Much of his earlier research was directed towards the understanding of how ultraviolet light and X-rays interact with atoms, primarily through photoionization. This subject is very complex because atoms have many electrons that strongly interact. These electrons behave to a certain extent collectively, and this complicates the theory tremendously.

At the time he began his thesis research, the topic was a "hot" one due to a burgeoning of new experimental results from the world's first synchrotron light sources. In his many papers since then, Starace has been able to classify the key electronic interactions which must be included in any theoretical approach to properly describe the photoionization process.

The high esteem with which his work in photoionization is held by the international community is evidenced by their invitation to him to contribute a chapter in the very prestigious archival publication *Handbuch der Physik*. In this 630-page volume, in which there are only four chapters, the lead chapter is by Professor Starace.

In recent years, Starace has expanded his investigations to reveal new effects in multiphoton ionization processes caused by very intense laser light. Beginning in the 1980s Starace foresaw that the availability of intense lasers would revolutionize the field of atomic physics and, in particular, lead to many new experimental results that need theoretical interpretation. For that reason, he began investigating in what ways intense laser light interacts with many-electron atoms.

His work is known for its clarity and accuracy in a field in which other researchers often—for ease of calculation—make gross approximations in their calculations. He is now known to the major experimental groups in this field throughout the world, and has presented many

STARACE *continued on page 4*

HEEGER *continued from page 1*

NU grad recalls winning Nobel

University of Nebraska graduate Alan Heeger doesn't remember the words of the fateful phone call that woke him from sleep one year ago. He just remembers being told that he, along with two colleagues, had won the 2000 Nobel Prize in chemistry for their discovery of plastics that could be altered to conduct electricity. That call came on Oct. 10, 2000.

"That's a day I won't forget," he said. Exactly one year later, Heeger stood in front of students, faculty and others at his alma mater to talk about his 1977 discovery, the inventions it has spawned, and the experience of becoming a Nobel laureate.

Heeger, a 1957 NU alumnus, also received the University of Nebraska-Lincoln's first Bessey Medal, awarded in recognition of his distinguished contributions in the sciences. The medal is named for Charles Bessey, a faculty member and chancellor at Nebraska in the late 19th and early 20th centuries and one of the world's pioneers in botany.

Winning the Nobel Prize put Heeger in elite company, one that includes most of the great names of science during the past century. The prizes were first awarded in 1901. "Through the history of the 20th century, all the great names that you know (are winners)," he said. "So it (the prize) carries with it a great aura and a responsibility."

The award ceremony took place in a big concert hall in Stockholm, Sweden, he said. On stage were the members of the Swedish Academies, the Swedish royal family and the Nobel laureates. In the audience were his wife, two sons and grandchildren. Each laureate received a medal and a diploma with original artwork.

The full Nobel experience included a banquet, during which Heeger found himself seated next to Crown Princess Victoria. It also included several lectures about his work on conductive polymers. During those lectures, he said, he was asked to explain the importance of his discovery. The answer he gave is that conducting polymers offer a unique combination of properties that cannot be found in any other material. They can conduct electricity and produce light just like metals and semiconductors. But they can be made easily and share the mechanical properties of plastics, such as flexibility.

In 1977, Heeger said, such an idea seemed so far out that scientific journals rejected his first report about conductive polymers. At the time, it was accepted knowledge that plastic was so poor at conducting electricity that it could be used as an insulator.

Eventually, the article by Heeger and his colleagues was accepted and published. Since then, many different types of conducting polymers have been developed. Among them are materials that conduct electricity almost as well as copper and have nearly the strength of steel. "That took 20 years. It seems that's the way science goes. It takes time," he said, noting, "This was not done by the three of us. This was done by hundreds of scientists all around the world."

Some results of the past two decades of research will make their way to market in 2002, Heeger said. They include supersharp, superbright screens for personal digital assistants and cell phones. Full-color flat screens are on the way. Researchers are working with flexible plastic sheets that can be used like computer screens, then rolled up and stored or carried around. Integrated circuits that can be printed on machines similar to computer printers are under development in laboratories. "This field is by no means finished in the context of scientific progress," he said.

By Martha Stoddard
Lincoln Journal Star

UNL Hosts Electron-Molecule Scattering Symposium

The *International Symposium on Electron-Molecule Scattering and Swarms*, a satellite of the *XXII International Conference on the Physics of Electronic and Atomic Collisions*, was held in Lincoln July 14-16, 2001. The meeting was chaired by **Ilya Fabrikant.** Attendance was approximately 85 scientists, representing 19 countries.

Over the years, these symposia have dealt with both fundamental and practical aspects of the physics of electron-molecule collisions and swarms. The local committee, in selecting the invited speakers, encouraged contributions from the newer areas of cluster and surface phenomena, noting that one of the most important directions for the future is to relate gas phase measurements and theory to phenomena at surfaces and in condensed phases.

The committee also invited a substantial number of graduate students and postdoctoral research associates to speak, with representation from Tokyo, Belgrade, Heidelberg, Kaiserslautern, University College London, Innsbruck, USC and UCSD. Their work indicates that the field is developing successfully and that one can anticipate many new results in the future.

The symposium was opened with a talk by **Paul Burrow,** who presented the results of long-term efforts of his group to establish correlations between dissociative attachment and resonance properties in electron-molecule scattering. Other exciting talks presented at the conference were those of **Leon Sanche** (University of Sherbrooke, Canada) and of **Chris Greene** (University of Colorado), a graduate of this Department (B.S. 1976). Sanche showed the importance of reactive electron-molecule collisions to biology and to medical research; part of this work was recently published in *Science*. Greene discussed his group's recent discovery of a new mechanism of destruction of H_3^+ by electrons; these results were recently published in *Nature*.

Conference photo. Ilya Fabrikant, symposium chair, is pictured fourth from the left in the first row.

The local organizing committee comprised Ilya, **Gordon Gallup**, who also created and maintained the web site for the meeting, Paul Burrow, and **Tim Gay. Marilyn McDowell** was an invaluable member of the team, taking care of the registration, numerous arrangements, and the assembly of the program and abstracts. Graduate students **Amiran Khuskivadze, Yelena Kosheleva,** and **Yuanguang Xu** also contributed to the smooth running of the meeting.

Financial support for the conference was provided by two federal funding agencies—the National Science Foundation and the Office of Basic Energy Sciences of the DOE, and by three UNL entities, the College of Arts and Sciences, the Center for Materials Research and Analysis, and the Department of Physics and Astronomy.

The International Organizing Committee has announced that the next symposium of this series will be held in Prague in July 2003.

NEW FACULTY *continued from page 1*

He continued postdoctoral research work in this area with both atoms and molecules during 1997-2001 at the Max-Planck-Institute of Quantum Optics in Garching, Germany, in the group of Dr. K. L. Kompa. For two of the years, 1997-99, he was an Alexander von Humboldt Foundation Fellow. He joins our Department as an Assistant Professor of Physics.

Uiterwaal's research area is strong field physics, which is a new experimental area in the Department's AMO group. His expertise includes quantitative high-resolution laser-ionization mass spectroscopy, high-resolution photoelectron spectroscopy, coherent XUV generation, and control of laser-molecular fragmentation and ionization processes.

Most recently, he has developed expertise in obtaining three-dimensional spatial charge state distributions within laser foci, so that ionization rates can be associated with particular laser intensities without any averaging over the laser focal region.

It is this latter expertise that Uiterwaal plans to build a research program upon in the area of femtosecond, high-intensity laser atomic and molecular physics. This experimental research overlaps the theoretical research of **Anthony Starace** and his group.

STARACE *continued from page 3*

invited talks on these subjects at international scientific meetings. The understanding of such processes is of crucial importance in such diverse areas as plasma physics and stellar atmospheres, and thus his theoretical results have wide-ranging implications and applications.

Very recently, he has begun work in the new area of quantum information technology in collaboration with other UNL faculty. This modern field of physics holds great promise.

Starace has held a number of distinguished fellowships, including the prestigious Alfred P. Sloan Fellowship, an Alexander von Humboldt Research Fellowship, and a Fulbright Fellowship. In addition, he has been a Visiting Fellow at the Joint Institute for Laboratory Astrophysics at the University of Colorado-Boulder, and an ITAMP Fellow at the Harvard-Smithsonian Center for Astrophysics. Starace is also a Fellow of the American Physical Society and a Fellow of the American Association for the Advancement of Science.

By Roger D. Kirby

Research Highlight:

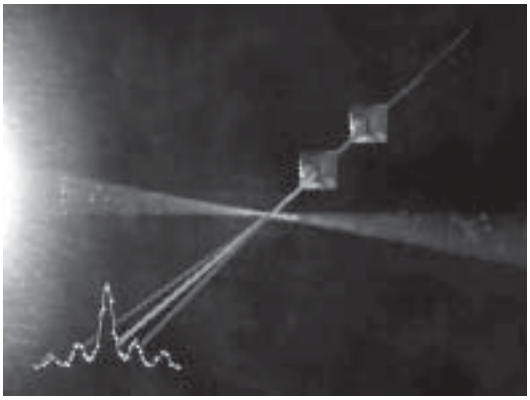
Batelaan Group Observes Kapitza-Dirac Effect

The luminous green light of the lasers in **Herman Batelaan's** laboratory was the critical element in Batelaan's team becoming the first to observe the Kapitza-Dirac effect, an accomplishment that could make possible measuring devices that are thousands of times more accurate than those in use today.

The Kapitza-Dirac effect is the diffraction of a beam of particles, electrons in particular, by a standing wave of light. It was predicted in 1933 by a pair of future Nobel Prize winners, Russian Peter Kapitza (1894-1984) and Englishman P.A.M. Dirac (1902-84), but the technology needed to demonstrate it didn't exist at the time, and wouldn't until well after the laser was invented in 1960.

Early lasers weren't capable of producing the Kapitza-Dirac effect and it wasn't until April 11, 2001, when it was observed for the first time in Batelaan's lab in NU's Behlen Laboratory for Physics.

The confirmation was reported by Batelaan and his team of Daniel Freimund and Kayvan Aflatooni in the Sept. 13 issue of *Nature*, the international weekly journal of science. Freimund, the lead author of the Nature article, a doctoral candidate under Batelaan, earned his bachelor's degree in mechanical engineering and his master's in physics at Nebraska.



The Kapitza-Dirac effect. Observed electron diffraction pattern resulting from crossing an electron beam with a standing light wave.

Aflatooni, who was a post-doctoral researcher in Batelaan's lab at the time of the discovery, earned his bachelor's, master's and doctoral degrees in physics at Nebraska and now is an assistant professor of physics at Fort Hays (Kan.) State University.

A basic physics experiment that illustrates the wave nature of light involves placing a screen with two slits in it at a distance from a point source of light and placing a second screen beyond the first. Instead of two bars of light appearing on the second screen directly in line with the light and the slits, multiple light bars appear across the second screen. That's because the slits diffract the light and the bars mark the convergence of light waves. It's Quantum Mechanics 101.

Batelaan and his team in essence repeated that experiment in April, except they used an electron beam instead of a light beam and substituted a laser beam for the slit screen. They saw that the electrons were diffracted by the laser, just as Kapitza and Dirac had predicted 68 years earlier.

Scientists have long used diffraction of optical, acoustic and radio waves in interferometers, devices that among other things measure very small distances and thicknesses. They're also used as rotation sensors in the avionics systems of airplanes. And now that Batelaan and his team have shown that particle waves can also be diffracted, Batelaan said it's possible that particle waves can be used to make a much more accurate interferometer.

"The average wavelength in a laser beam is one micron (one-millionth of a meter), which is 1 percent of the thickness of a human hair," Batelaan said. "The wavelength of this electron wave, because the electrons also have a wave, is 10,000 times smaller. That's the size of one atom.

"If you use the Kapitza-Dirac effect multiple times, you can make an interferometer. But we haven't done that yet. We're trying to figure out what the implications are for use in rotation sensors and electromagnetic field sensors."

Batelaan and his team observed the Kapitza-Dirac effect with funding from the Research Corp. A $350,000 grant received in July from the National Science Foundation will help start the search for an electron wave interferometer. Batelaan said he's excited about the possibilities of the ongoing research, but that doesn't keep him from savoring his team's discovery.

"The effect was predicted in 1933 and we were the first ones to observe it—and that's kind of nice," he said, sitting in his office beneath portraits of Kapitza and Dirac. "There were four attempts in the 1960s, but they all failed. If someone had tried it in the '90s, they would have pulled it off, so in a sense we're a bit lucky. But, hey, you need luck."

By Tom Simons
University Communications

New Project FULCRUM Leverages Students Love of Science

***Editor's Note: Assistant Professor Diandra Leslie-Pelecky has been awarded a $1.44 million grant from the National Science Foundation to stimulate and/or reinforce K-12 students' interest in science by pairing science graduate students with experienced K-12 teachers. This intervention will be timed for the critical period when, studies show, students often lose their innate curiosity about science: sometime during the fourth through eighth grades. We reprint here an article about the project with the above title, which appeared in the University's weekly newsletter* The Scarlet.**

By the eighth grade, most U.S. students are lagging their international peers in their understanding of and interest in science. A new project developed at UNL aims to change that.

The Third International Mathematics and Science Study compared science and math scores from students from around the world at the fourth- , eighth- , and 12th-grade equivalents. In the fourth grade, American students are competitive with students from around the world, but by the eighth grade, they've fallen behind their international peers.

"Something is happening in that region between the fourth and eighth grades," said **Diandra Leslie-Pelecky,** assistant professor of physics and astronomy in UNL's College of Arts and Sciences. "The kids are either not learning science or they're not being interested in science," she said. "All the research that's been done on gender studies in science indicate that that's really the period of time during which young women become less interested in science."

With that in mind, she and Gayle Buck, assistant professor of curriculum and instruction in Teach-

FULCRUM *continued on page 10*

Introductory Physics Teaching Laboratories Revitalized

Recent advances in computer-based technologies and teaching strategies are changing the look of introductory physics laboratory courses throughout the country.

Nowhere is this more true than at the University of Nebraska-Lincoln, where all introductory laboratory courses now make extensive use of computer-assisted data collection and analysis. One of the challenges faced in implementing these changes here and elsewhere has been to incorporate the new technology and active learning into the old classroom spaces.

The UNL introductory physics teaching laboratories are currently located on the third floor of Ferguson Hall. These classrooms, originally designed for electrical engineering laboratory courses in the 1950s, were not particularly well-suited to facilitate physics laboratory lessons that make extensive use of technology and collaborative small-group work.

They provided limited access to electrical power and the table space was too small to support both laboratory equipment and computers.

In addition, there were limitations specific to physics experiments, such as being unable to mount equipment overhead due to the asbestos-laden ceilings and having inadequate lighting control for optics and modern physics experiments.

Fortunately, **Robert G. Fuller** and **Vicki L. Plano Clark** were successful in obtaining renovation funds from the University of Nebraska Foundation in 1998. Over the past three summers, these funds, combined with supplemental funding from the Department and from the College of Arts and Sciences, have allowed for a complete renovation of the architecture of two of the laboratory rooms used for teaching the introductory physics labs. Major aspects of this renovation include:

- Installation of an overhead Unistrut grid to support equipment and electrical power access, allowing for flexible use of the entire classroom space.
- Installation of blackout blinds and variable overhead lighting for better lighting control during optics and modern physics experiments.
- Development of new lab tables that accommodate computers and physics equipment and encourage interaction among students working in small groups.

TEACHING LABS *continued on page 11*

Faculty, postdocs, and students involved in the ONR Nanotech Initiative.

Office of Naval Research Funds Nanotech Research Groups

The Electronics Division of the Office of Naval Research (ONR) has awarded $1.83 million to five collaborative faculty research groups for "Nanoscale Magneto-Electronic Structures and Devices."

Nanoscale science and technology is the study of condensed matter structures and devices with dimensions in the range of 1-100 nanometers. (One nanometer equals one-billionth of a meter, which is about four atomic diameters). Before devices can be built, basic research is required to develop nanomaterials and test the new properties that result from altering the way atoms are put together. This work focuses on nanoscale magnetic and electronic materials, and holds the promise of many applications, such as lightweight portable power sources, high-density data storage, and ultrafast optical communications.

The award of this grant will greatly strengthen UNL's research capabilities in nanoscale science and technology, not least because it makes possible the hiring of four new faculty in this area: two in Physics and Astronomy and two in the College of Engineering and Technology.

The five faculty collaborations funded by the ONR grant comprise faculty primarily from the Departments of Physics and Astronomy and Electrical Engineering, but include faculty from the Departments of Chemistry, Chemical Engineering, and Mechanical Engineering at UNL and from Physics at UNO. The five specific research thrust areas are:

- Spin transport in nanoscale systems
- Optical and electronic devices based on self-assembly
- Nanoscale-structured polymers for piezoelectric devices
- Novel nanoscale magnetic heterostructures
- Miniaturized integrated sensors based on cellular neural network chips

Possible specific applications of the work include novel spintronic magnetoresistive devices, quantum-dot-based infrared sensors, acoustic sensors based on nanoscale piezoelectric materials, high-density energy storage capacitors, non-volatile random-access memories, and a rudimentary cellular neural network.

More than 20 faculty are involved in this research as well as a large group of students and postdocs (see photo). The following 11 faculty from Physics participate: **Bernard Doudin, Sy-Hwang Liou, You Qiang, Peter Dowben, Sitaram Jaswal, Roger Kirby, Yi Liu, David Sellmyer, Ralph Skomski, Stephen Ducharme,** and **Shireen Adenwalla.** Three of the projects are led by Physics faculty: Professors Doudin, Ducharme, and Dowben. The Principal Investigator for the grant is David Sellmyer, Director of the UNL Center for Materials Research and Analysis.

NSF Funds Project to Reform Physics Curriculum

A three-year, half-million-dollar curriculum project, "Reforming Physics: Algebra-based Physics with Human Applications," has been funded by the Division of Undergraduate Education of the National Science Foundation (NSF) to the University of Nebraska and its collaborating institutions.

Reform movements in calculus and physics education have shown the advantage of active methods of instruction involving lively applications for improving students' conceptual understandings. Research has also shown that diverse groups of students learn better through the use of multimedia.

The "Mathematics Across the Curriculum" projects supported by the NSF have shown the efficacy of embedding mathematics within other disciplines. This project proposes to blend these insights with interesting human applications of physics to reform the algebra-based physics course.

The students at UNL enrolled in the algebra-based introductory physics course are significantly different from the calculus-based introductory physics students (*refer to the charts*). The calculus-based students are typically male (80%), in their first two years at the university (75%), and are pursuing careers in engineering (60%). In contrast, the students enrolled in the algebra-based introductory course include many more females (50%). In addition, these physics students are typically nearing graduation (65% juniors and seniors) and planning to pursue careers in the health sciences (70%).

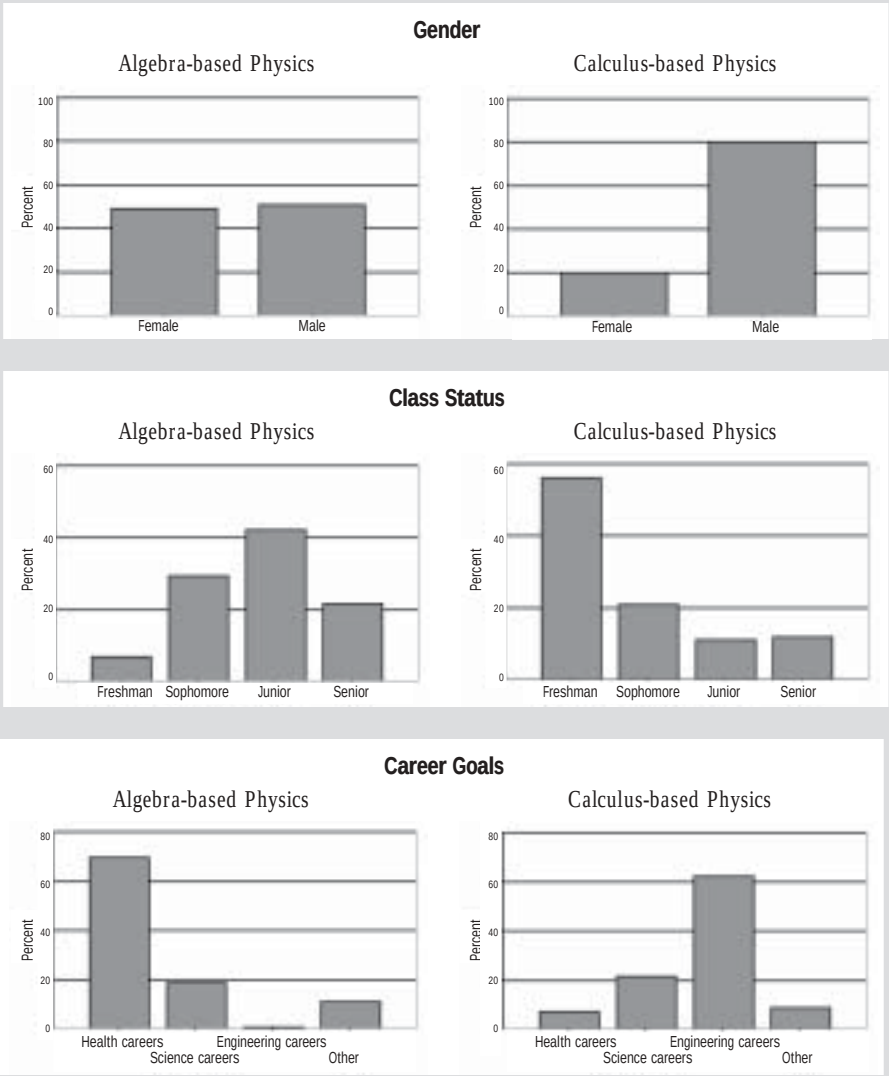
This project will result in a complete set of course materials and background physics notes that can be used in a wide variety of institutional settings to offer a reformed algebra-based physics course to diverse student audiences.

In addition to the human applications, the interactive learning methods encouraged by these materials will be especially helpful to enable the students to learn by inquiry-based methods.

The project co-PIs are: **Robert G. Fuller** and **Vicki L. Plano Clark,** UNL; Beth Ann Thacker, Texas Tech University (Lubbock, Texas) ; Nancy L. Beverly, Mercy College (New York City); and Mark W. Plano Clark and Christopher D. Wentworth, Doane College (Crete and Lincoln, Neb.).

The project began in May 2001 with a project meeting held at UNL. Materials are being developed at each institution and will be field tested at the other collaborating institutions. Six modules are being developed and used in the fall 2001 semester:

Demographics of UNL Algebra-based & Calculus-based Physics Students



- How Do We Move? (Mercy College)
- How Do We Make Speech Sounds? (Doane College)
- How Do Fluids Function in Our Bodies? (Texas Tech University)
- How Do We Sense, Think, and Move? (UNL)
- How Do We See? (UNL)
- How Do We See Inside Ourselves? (UNL)

An example of the human application of physics principles is the use of the principles of simple harmonic motion in studying the swinging of various body parts. These principles are also related to the gait of individual students in the course.

The tested materials will be available for commercial distribution. By fall 2004, a reformed algebra-based physics course featuring human applications supported by interactive multimedia and mathematical modeling will be available for use across the nation.

For additional information, please visit the project Web site at http://www.doane.edu/physics/hpp/.

By Robert G. Fuller

Finkler Retires after 36 Years as Faculty Member

Associate Professor **Paul Finkler** retired at the end of the Fall semester 2001, after more than 36 years as a faculty member in the Department.

Paul Finkler

Paul received his A. B. degree from Brooklyn College and his Ph.D. in theoretical particle physics from Purdue University. His Ph.D. thesis involved theoretical studies of the application of dispersion relations to *pi meson* photo-production. He subsequently spent two years as a post-doc at the Lawrence Livermore Laboratory where he pursued phenomenological analyses growing out of his thesis research.

After joining the Department as an Assistant Professor in 1965, Paul continued his research in elementary particle theory using the techniques of dispersion relations and S-matrix theory. He also collaborated in work involving the application of path integral methods. More recently, his research involved non-linear mechanics and chaos theory.

As a teacher, Paul was a "wild card" because he could teach courses at all levels, ranging from liberal arts (non-mathematical) physics classes to our most mathematical advanced graduate physics classes. His approach to teaching was uniformly dedicated and thoughtful, and students especially praised his willingness to give thorough help outside of class.

He also thought deeply about how to present complex, non-intuitive physics concepts to students. For example, he devised a useful and original way of determining the form of relativistic momentum in a way suitable for teaching undergraduates, and this was published in the *American Journal of Physics* in 1996. More recently, he was among those in the Department to adopt new teaching methods, especially active-engagement techniques.

Paul's knowledge of physics is broad and deep, and both experimental and theoretical colleagues value his advice and input on research and teaching issues.

Paul is planning to travel extensively after retirement, and he expects to continue his research on non-linear mechanics and chaos theory. We all wish him well in his retirement.

Brief Notes:

• Fuller Publishes Book on Karplus

Professor **Robert G. Fuller** has edited a book on Robert Karplus entitled *Love of Discovery: Science Education - The Second Career of Robert Karplus*. The 356-page book will be published by Kluwer Academic / Plenum Publishers, New York, in January 2002 (ISBN: 0-306-46687-2).

Robert Karplus received his Ph.D. from Harvard in 1948, where his thesis was supervised by Julian Schwinger and E. Bright Wilson. He then spent two years at the Institute for Advanced Study in Princeton, N.J., where he wrote, with Norman Kroll, his most famous paper, on 4th order QED corrections to the magnetic dipole moment of the electron [*Phys. Rev.* **77**, 536 (1950)].

He returned to Harvard briefly as an Assistant Professor, but joined the physics department at Berkeley in 1954, where he spent the rest of his career. Early in his career there he switched his attention from QED to science education. Through the leadership of Karplus the "scientific reasoning" approach to science teaching and learning was introduced to science students and their teachers at all educational levels.

Karplus was a pioneer in the use of the work of Jean Piaget in education, which influenced Fuller, following one of Karplus' visits to UNL, to develop the ADAPT program (a multidisciplinary, Piagetian-based program for college freshman). Fuller spent a sabbatical year with Karplus in the 1970s. Karplus died in 1990. In Spring 1999, Fuller took a faculty development leave to Berkeley to interview Karplus's co-workers and to edit their essays as well as to select Karplus articles for this book.

• Jaecks 'Retires'

Officially Professor **Duane H. Jaecks** retired at the end of the Spring semester in May 2001, but you wouldn't know that from the way his research program is progressing. His long-running NSF grant was renewed last July for another 3 years at a level of $657,500, he still guides graduate students, and he continues to plan his next experiments at the Advanced Light Source at Lawrence Berkeley National Laboratory.

Duane H. Jaecks

Jaecks came to Nebraska in 1966 after spending a year as a postdoctoral researcher at the FOM Institute in Amsterdam and another at the University of Washington. Upon arrival, he immediately set out upon a program to study inelastic processes in heavy particle collisions, with a particular emphasis on using polarized photon-scattered particle coincidence techniques. The first photon-particle coincidence measurements in the field were published with his first two students **Ronald H. McKnight** (M.S. 1964, Ph.D. 1970) and **David H. Crandall** (M.S. 1967, Ph.D. 1970).

Part of his work has slowly evolved to the present research program of studying angular momentum and energy exchange in multi-electron atoms formed in photoionization by circularly polarized synchrotron radiation. Another continuing research effort is the detailed quantitative analysis of the Coulomb three body problem. Asked about his plans, Jaecks replied, "I plan to continue a research program until I either run out of gas, money or ideas."

• Football Physics Draws Attention, Imitators

Professor **Timothy J. Gay's** series "Football Physics" is now in its third season. The segments are shown on the Mitsubishi Diamondtron screens in Memorial Stadium at every home football game.

In addition to being featured on ABC News Tonight with Peter Jennings and in *People* Magazine, Football Physics has turned into a local outreach vehicle for the Department; Gay has given presentations to numerous clubs, meetings, and several chapters of the UNL Alumni Association. Imitation being the sincerest form of flattery, the Universities of Tennessee and Virginia have started their own Football Physics programs.

Gay has become the semi-official Husker Team Physicist, providing physics advice to the coaches on topics ranging from football aerodynamics to strength and conditioning exercises. This year's Football Physics segments have discussed inertia, impulse, vectors, Newton's Third Law, and atomic physics. They have featured such Husker notables as Eric Crouch, Dave Volk, and Jammal Lord. All of the Football Physics pieces can be viewed at http://www.physics.unl.edu/football.html.

• Early Instruments on Web

Like an aging movie star making a comeback, some of the Department's oldest physics apparatus has made an appearance on a new Web page. Entitled "Historical Scientific Instrument Gallery," the page was recently created by the staff of the Publications Office of the College of Arts

BRIEF NOTES *continued on page 10*

Electronics Shop's Farleigh Wins Regents KUDOS

Brian Farleigh, an Electronics and Computer Specialist in the Department's Electronics Shop, received a KUDOS Award from the University of Nebraska Board of Regents on Sept. 7, 2001.

The award was based upon the numerous ways in which Farleigh effectively provides outstanding support to the different groups and individuals in the Department.

Last year Farleigh received the College of Arts and Sciences' Applause Award, which recognizes the efforts of staff members for their innovative ideas, outstanding performance, or service beyond the call of duty.

Farleigh is the key person responsible for satellite and radio communications in Greenland for the Snow and Ice Research Group (SIRG) of UNL's Polar Ice Coring Office (PICO). He assists annually in setting up field research camps; two years ago he helped install a wind generator on the Greenland ice cap and was the primary designer of the electrical power systems for the atmospheric research station at Summit, Greenland. Brian's work for PICO continues his work of more than a dozen years on polar-related electronics and field support that have also taken him to Antarctica.

Farleigh displays Regents' KUDOS Award plaque. Front row: Department Chair Roger Kirby, Farleigh's fiancée Beth Wilhelm, Farleigh, Regent Drew Miller. Back row: Electronics Shop Supervisor John Kelty, UNL Chancellor Harvey Perlman

Farleigh has provided electronics support to the astronomers, both at Behlen Observatory in Mead, Neb., and at the new telescope facility atop the parking garage west of Memorial Stadium.

He oversaw the installation of a new machine shop area for the Electronics Shop in the basement of Ferguson Hall. He is involved daily with computer setup, interfacing, and repair, as well as the design and construction of specialized electronics equipment for both education and research. This work has been essential to the success of many faculty and staff both in the Department and around the campus.

Above all Farleigh was cited for his positive attitude, the professional manner in which he goes about his work, and the fact that he is a perfectionist with the highest work ethic.

Haley, Magwire Receive Arts & Sciences Applause Awards

The College of Arts and Sciences is fortunate to employ many highly competent, loyal, innovative staff members. Without the efforts of these dedicated employees, the missions of the College and its departments could not be achieved. The Applause program recognizes these efforts and honors staff members for their innovative ideas, their consistently outstanding performance, or their service above and beyond the call of duty. In the past year two staff members in the Department won Applause Awards.

Kay Haley, staff secretary, was the Oct. 19, 2001, Applause Award winner. As her nominations state, "Kay's major responsibility is to process all the paperwork related to both new and present graduate students. . . . Actually a more honest statement would be that she does all the 'real' work.

"We have about 60 graduate students and admit 10-12 new students every year. She processes tons of documents required for the admission process. Once they are here, she keeps track and processes documents required by the Graduate College at various stages of their standing in the program. She also has to make sure that everything is in order so that the students get paid as RAs and TAs throughout the year. Thus she is the workhorse of the Graduate Committee and goes out of her way to do it all with a smile. . . . Finally, the heavy load of Graduate Committee work does not stop some colleagues from piling on her other work, which she does gladly. . . . While a number of faculty form the admissions committee, Kay Haley IS the committee."

Kay Haley

Dave Magwire

Dave Magwire, business office accounting technician, was the Feb. 23, 2001, Applause Award winner. As the nominations say, "Dave is extremely reliable, careful, and friendly. The thing that really impresses me about him is the way in which he follows through on orders that we place with various companies for scientific equipment.

"These companies are often difficult to deal with and slow in shipping orders. Dave stays on their case until we, the customers, have received satisfaction from them. He really goes the extra mile to make our lives easier . . . a good friend with lots of helpful ideas and he's extremely resourceful. . . . Dave has a great reputation in the Department and strives to do his best. Dave [also] has a great sense of humor, which is always needed when dealing with so many faculty and staff."

Schneider Observes Most Distant Quasars

Donald P. Schneider (B.S. 1976) has played an integral role in the recent detection of the most distant objects in the universe ever observed. The announcement of the findings was made in June 2001, at a meeting of the American Astronomical Society in Pasadena, Calif.


Donald Schneider

Schneider is currently a faculty member at Penn State University. He and other scientists working on the Sloan Digital Sky Survey (SDSS) made the observations of the most distant objects. This is the fifth time Schneider, the chairman of the SDSS Quasar Science Group, has discovered the most distant object observed in the universe.

The objects Schneider observed are quasars, a class of celestial objects of high luminosity, strong radio emissions, and extreme age that are observed at extremely great distances from Earth. The quasars Schneider and his group observed could now be as far as 80 billion light-years away from Earth, SDSS scientists said. A light-year is the distance light travels in a vacuum in one year—about 6 trillion miles. This may seem difficult to believe, given that the universe is considered to be only 10 to 20 billion years old. However, light from these quasars began its journey toward Earth when the universe was only about 800 million years old, when it was much smaller than it is now.

The SDSS survey, which is planned for completion in five years, will be the most comprehensive and fully digital map of the sky. About 200 million objects will be located by survey scientists, and from the data obtained a three-dimensional map of the universe will be created.

Scientists want to compile data on 100,000 quasars for the digital sky map. So far more than 13,000 have been discovered. The two quasars break records for distance set by earlier readings from the SDSS, and more records are expected to fall as research continues.

Data and images from the SDSS survey can be seen on the Web at http://www.sdss.org.

Schneider was raised in Heartwell, Neb. At UNL he majored in physics (astronomy option) and mathematics. He received a doctorate from Caltech in 1982 and is now on the faculty at Penn State University. Schneider received UNL's Young Alumnus Award in 1990.

Schneider credits UNL for providing the foundation for his current work. "I'm very grateful for the superb education, both classroom and research, that I received from UNL's Physics Department," he said.

Financed by the Alfred P. Sloan Foundation, NASA, the National Science Foundation, the U.S. Energy Department, the Japanese Monbukagakusho, and the Max Planck Society, the survey is a project of the University of Chicago, Fermilab, the Institute for Advanced Study at Princeton University, the Japanese Participation Group, Johns Hopkins University, the Max Planck Institute for Astronomy in Germany, New Mexico State University, the U.S. Naval Observatory, and the University of Washington.

By Tom Hancock,
College of Arts & Sciences

BRIEF NOTES *continued from page 8*

and Sciences. An inventory of over 700 instruments was made by Emeritus Professor **M. Eugene Rudd** and about 100 of these were selected to be photographed and put on the Web page, where each instrument is described and referenced. Alumni may recognize some of the items, although the earlier instruments go back well over 100 years.

Check it out at http://www.unl.edu/histinstr/ and see if you can identify any of the items in the "Mystery Objects" section.

• Weymouth on Discovery Channel

The Discovery Channel has a project on the Lewis and Clark expedition that is filming the various camp sites used and forts built by the expedition. Professor Emeritus **John Weymouth** has been carrying out geophysical surveys (together with archaeologist Ken Karsmizki of the Discovery Center and Museum, The Dalles, Ore.) of a possible site of Fort Mandan on the Missouri River in North Dakota.

In 1804 Lewis and Clark reached a point on the Missouri River north of present day Bismarck and built Fort Mandan in order to spend the winter months there. The exact location of the fort has never been established, but Karsmizki has a fairly firm idea where it should be. Therefore Weymouth and Karsmizki are using geophysical survey methods to try to pinpoint the location. The Discovery Channel filmed their activities, which will be aired sometime in 2002.

FULCRUM *continued from page 5*

ers College, created Project FULCRUM. Funded by a $1.44 million National Science Foundation grant, the project will put graduate and undergraduate science students from the university in third- to eighth-grade classrooms in the Lincoln Public Schools, where they will form partnerships with teachers.

The goal of the project is for it to act as a "fulcrum" to leverage the love of science felt by the budding UNL scientists into the public school classrooms.

In the schools, lead teachers will act as mentors to the graduate students, teaching them about the educational process and how to work with younger kids. In turn, the graduate students will introduce the elementary students to the scientific process, show them that science is a way of doing things, not a body of knowledge. The graduate students will also be accompanied by UNL undergraduate science majors.

"We picked elementary and middle schools for a number of reasons, but when you look at the TIMSS test, you can see that something is happening in those grades," Leslie-Pelecky said. "We thought that by getting in early, we might be able to make a difference at that level, which would then continue through to the higher grades."

The three-year NSF grant eventually will allow Leslie-Pelecky and Buck to work with 30 schools, but they're starting this year with four: Clinton, Everett, and Maxey elementary schools and Lefler Middle School.

The first-year Project FULCRUM teams are teachers Peg Honeycutt and **Sue Kirby** and geosciences graduate student Andrea Bair at Clinton; teacher David Szabat and mathematics grad student Matt Koetz at Everett; teacher Ann Wardle and geosciences grad student Heidi Hoffower at Maxey; and teacher Angela Zabawa and biometry grad student Jeanette Stafford at Lefler.

"We're dealing with a diverse group of schools and we have an absolutely terrific group of people to work with," Leslie-Pelecky said.

"They're some of the most motivated and dynamic teachers I have ever met, and the graduate students that we've chosen for this project are the ones that we believe are going to go on to take leadership positions in their fields. We hope they will become effective advocates for K-12 education and for scientists getting involved in K-12 education."

To get involved:

Leslie-Pelecky said applications will be accepted through Feb. 1 for the 2002–03 school year. Application information and other materials can be found on the project's Web site http://www.physics.unl.edu/~fulcrum.

By Tom Simons,
University Communications

Raytheon Physicist Kirby Speaks at Recognition Luncheon

UNL graduate **Kathryn H. Kirby** (B.S. 1988) spoke at the May 3, 2001, Recognition Luncheon to 2000-2001 Department graduates, faculty, staff, and current students.


Kathryn Kirby

Kirby is currently the Advanced Planning Software Discipline Lead and 6-Sigma Expert at Raytheon Company's Rocky Mountain Engineering Organization in Aurora, Colorado. Her duties including engineering line management and resolution of cross-business area issues related to software training, technology development, and integration.

She also holds positions on Raytheon's Software Engineering Council and in its Information Management Technology Network. Following her bachelor's degree at UNL in 1988, she went to work for Raytheon's Hughes Aircraft Company subsidiary. With the support of Raytheon's Fellowship Program, she received an M.S. in physics from the University of Denver in 1992.

Kirby's presentation to graduates at the luncheon painted a favorable portrait of what it is like to work in industry. She first dispelled several preconceptions or stereotypes that students are likely to have of industrial physicists: that they have given up their freedom, their choice, their time, and their intellectual property rights in exchange for high starting salaries.

Kirby said that even if these stereotypes were true at one time, they are not true today because physicists are in too short supply. In her experience, Raytheon rewards employees for their contributions and provides flex time and a variety of challenges in order to attract and retain employees. And the salaries are high (but that doesn't necessarily bring happiness, she noted). Still, it is true, she says, that one has to get accustomed to a certain loss of privacy; she needed to get a security clearance, and all her communications are monitored. And as is true with any business, there is a "bottom line" mentality.

Her physics training helped her early on to solve a bug in one of the orbital prediction programs she was working with. It seems one of the moments of inertia was off because the program failed to account for the change of inertia as the projectile burned its fuel. Another early project involved pattern recognition algorithms. For this project she worked with researchers at the University of Chicago on MRI scans. Since 1995 she has been more involved in engineering management.

When not working, Kathy enjoys backpacking, hiking, skiing, or engaging in amateur photography. Her husband, William Kirby, is a freelance writer.

TEACHING LABS *continued from page 6*

- Creation of an inviting, positive atmosphere with fresh paint on the walls, new window fixtures, and whiteboards around the room. The whiteboards create a bright room environment and give groups an easy way to share their results.

By all accounts, this project has been a success. The new laboratory rooms encourage small-group work, allow for easy access to the technology for all students in a group, and support the necessary physics equipment.

This renovation work has also been of great interest to physics educators at other colleges and universities. Therefore, this work has been shared at various national meetings of the American Association of Physics Teachers and through the Project Kaleidoscope (PKAL) index of facilities projects (http://www.pkal.org/facility/projects/index.html).

For more information, please visit the Department's Web page (http://physics.unl.edu/~rpeg/renovation/Renovation.html) or drop by for a tour if you are in the area!

Borca Earns Graduate College, Sigma Xi Awards

April 2001 was a banner month for **Camelia Borca** (M.S. 1999, Ph.D. 2001).


Camelia Borca

On April 19 she was awarded the Sigma Xi Nebraska Chapter's *Outstanding Graduate Student Award* and on April 24 she received the Graduate College's *Graduate Research Assistant Award*. In 2000 Borca won the American Vacuum Society's *Graduate Research Award* (see p. 10 of *Spectrum* No. 21, Spring 2001). Her doctoral thesis research on "The Surfaces of Half-Metallic Ferromagnets," carried out under the supervision of Professor Peter A. Dowben, has received considerable attention from a number of leading research groups.

In her thesis research, Borca has shown that "half-metallic"-like systems can exhibit 100% spin polarization in certain experimental geometries, but nonetheless are definitively not half-metallic.

This is a key and fundamental advance in the understanding of high-polarization magnetic materials (half-metallic systems). As noted in an article entitled "Spintronics" in *American Scientist* (November-December 2001), an emerging major goal in condensed matter physics is the construction of spin electronic devices (in which the spin of the electron matters).

Key factors in the design of such new devices are materials that will "inject" electrons in a particular spin state: ferromagnetic materials with high spin polarization. An ideal material would be one that is half-metallic—systems that are metallic in one spin direction and insulating in the other spin direction.

As part of Camelia Borca's thesis on the surfaces of the mostly likely half-metallic systems, she has undertaken the very first detailed studies that characterize the surface composition of some complex but nonetheless very important magnetic materials.

This was undertaken with a combination of different surface spectroscopies (for cases in which using even a single spectroscopy would have been an achievement). Her detailed characterization has disproved claims of half-metallic behavior by other researchers, consequently her work is often cited. The awards she has obtained for her thesis work are a reflection of the high regard in which her research is held.

Smith Reminisces About His Father: T.T. Smith

EDITOR'S NOTE: Andrew N. Smith (B.A. 1947 Physics/Math with High Distinction) has written us a detailed letter concerning his recollections of Professor Theodore Townsend ("T.T.") Smith, who was a faculty member in the Department from 1919-1953 and who happened to be his father. Recollections of many other faculty and students are also given over the many decades of Smith's career. The letter was addressed to Department Chair Roger Kirby, with copies to Spectrum Editor Anthony Starace, and alumnus William A. Barrett (B.S. 1952, M.S. 1953). We reprint the letter for the interest it may hold for the numerous generations of alumni who were taught by T.T. Smith.

Andrew N. Smith (1998 Photo)

William Barrett's recollection of his graduate student days in the Physics Department (cf. the Spring 2001 issue of *Spectrum*) certainly got my attention. I am responding to it with the thought that perhaps the perspective of someone from a slightly earlier time who knew **T. T. Smith** really well might be of some interest. T. T., or "T-squared' as some of his close friends were privileged to call him, was my father as well as close mentor and instructor, along with **Ted [Theodore P.] Jorgensen** (B.A. 1928, M. A. 1930, faculty member 1938-75, Dept. Chair 1949-52), during my undergraduate days in the Department. As a faculty brat I knew all the staff and, prior to college, in the 1930s had heard many stories about the University, faculty, and favorite students, amongst whom was **Roland E. Meyerott** (B.A. 1938, M.A. 1940). (Is he possibly an older brother of the Arthur J. mentioned by Mr. Barrett?) Others from the 1920s were **Bob [Robert L.] Craig** (M.S. 1931), who became Vice President of Eastman Kodak, and **Maurice J. Brevoort** (M.A. 1924), my future father-in-law, who did fundamental development and refinement of aircraft propellers and, after branching out into the thermodynamics of boundary layers, rose to become head of the Physical Sciences Department at NACA Langley VA, predecessor of NASA.

Ted Jorgensen, a former student of my Dad's who completed his doctorate at Harvard, returned in the late 1930s as assistant professor, then left on a leave of absence in summer 1943, as I recall, to join the Manhattan Project at Los Alamos. To take over some of his instructional duties in the general physics courses, the Department persuaded the College of Engineering to lend Ralph Ibata, one of their star M.S. graduates in EE. Returning to Nebraska in the summer of 1946, Ted immediately started drawing the plans for his thermodynamically efficient house and introducing us GI returnees to the magic of Chinese cooking, chamber string orchestra music, Klipsch horns and acoustic impedance, and hi fidelity electronic recording and reproduction. He initiated what became a major redirection of the Department, which, after the death of Dr. **[DeWitt Bristol] Brace** (faculty member 1887-1905, Department Chair, 1895-1905) long years past, had mainly been concerned with teaching up to the M.S. degree level. I had been only peripherally acquainted with **Charlie [Charles J.] Cook** (M.A. 1950, Ph.D. 1953) and **Charlie [Charles B.] Ackerman** (M.A. 1950, Ph.D. 1954) prior to our experience as guests of various military organizations; they were a year or so ahead of me; but **Emerson Jones** (Ph.D. 1953) and I had gone back a long ways to my Cub Scouting days, when he was our Den Chief.

Theodore Townsend ("T.T.") Smith (ca. 1952)

Ted's almost single-handed revitalization of the Department began by his obtaining a government grant, the first ever after the long dark days of the Depression and the almost overwhelming task the Department took on of instructing Air Crew and Army Specialized Training Program (ASTP) GI's in elementary physics in the years 1942 — 1945. The grant provided funds to construct the accelerator Mr. Barrett mentions for studies of low- and moderate-energy scattering cross sections. The accelerator was put together in what had been used as the lab room for the heat and thermodynamics course taken over by Dr. **Henry H. Marvin** (faculty member, 1919-1952, Department Chair, 1922-1949, and my undergraduate program advisor) when **John E. Almy** (faculty member, 1900-1943) died. Charlie Cook & company were the first of a post-war crop of graduate students to be blessed by this program. From the point of view of my Dad, they were "rescued" from the Engineering College. I, as a returned GI who had yet to complete my undergraduate degree, was not involved in the program, but we all hung out together in the Department and all participated in the lunch hour discussions in Ted's office on esoteric subjects, such as whether a single-engine airplane is or is not in the same state of emergency as a twin that has lost an engine. Of course we had lots of war experiences to relate, some of which in retrospect were uproariously funny, especially as Charlie Cook told them, in particular about his training for, and then flying, B-17's in combat over Germany. Some were not so humorous, such as Emerson's about his incarceration for a year in a German POW camp, which he really didn't talk about much.

At the outset of the new program, the emphasis was on getting the accelerator as well as the instrumentation built: high voltage hardware, control circuits, vacuum systems, detectors and digital counters. The analysis, the applications of quantum mechanics, and the introduction of modern theoretical courses came somewhat later, and mostly after I had left in the fall of 1947 for graduate school at the University of Minnesota, whose Physics Department was then headed by **J. W. Buchta** (M.A. 1921), one of my Dad's former students from the early 1920s. The older Department senior staff did not materially participate in this upgrade. They had to a degree fallen behind the times for lack of research and travel funding during the Depression, and by the postwar inundation by the military afterward. The optics and electricity courses as taught by my Dad prior to and during the war got about as far as Planck's constant and its application to the photoelectric effect; the Bohr atom was introduced, but Schroedinger's wave equation, matrix mechanics, and Pauli's exclusion principle I don't recall being mentioned in the undergraduate (i.e., 200 level)

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courses that I took during the 1940s, prior to my departure for the Navy. Special relativity, statistical mechanics, and classical electrodynamics were introduced in the 300-level course of introductory theoretical physics taught by Dad at that time, and later by Ted Jorgensen, when I took it in 1946 — 1947.

My Dad's most noteworthy reputation came from his Physics 3 and 4 course sequence, General Physics for engineering and science students. This had considerable notoriety as a weeding course, especially for engineers. He initiated the first day's lecture in the fall by inviting each student to look first to his left, then to his right, and then would tell the class that next semester one of them would not be there. His great interest, though, was in his electricity and optics courses. His Ph.D. from Harvard (1910) was in the general area of optics, and I think he came to Nebraska after WWI mainly because of the Department's reputation in this field established by Brace. In a back room in the first floor southeast corner of Brace Lab there was a large Rowland grating spectrometer that Dr. Brace had used in his work prior to WWI. It sat there for years unused.

During the great funding hiatus of the 1930s T. T.'s interest in electrical measurements developed considerably, in particular concerning the characteristics of all kinds of bridges, in part because the theoretical analysis was very tidy, and possibly because - up to then - the subject of bridges may not have been collected comprehensively in one place, because theoretical analysis could be accomplished without equipment, and because experimentation was of the table-top variety with equipment already on hand. This became a real area of expertise with him. His work was conducted mainly in his office, 112 Brace Lab, on the first floor on the right near the west end of the building next to the large laboratory room that Marvin used for the heat lab. He published in the American Association for the Advancement of Science's journal *Science*. At one time I had his personal copies. Anyhow, we spent a lot of time on the study of bridges of various sorts in both semesters of the year-long sequence of the E & M and AC course.

The electricity and part of the optics lab were conducted in the corresponding lab space on the second floor at the west end of the building. The equipment components were available for assembling a number of experiments, title outlines of which he provided, but students were expected to put things together pretty much on their own, based on information in the British textbook by Sterling that my Dad used for years until his own became available after the war. Some of the optics experiments could be set up in a room on the third floor next to the office spaces used by the U. S. Weather Bureau. Students were expected to spend sufficient time to complete 5 or 6 experiments per semester, but the times for attendance were flexible. It was pretty informal... My Dad was always available, either in the lab room or in the office, for consultation in case you got into a bind. These rooms on the west side of Brace overlooking 10th Street are no longer used as I knew them, being significantly changed by the addition of Behlen Lab.

The Physics Department Library was in the second floor room directly over my Dad's office. You checked books out on the honor system by leaving notes with Marvin's secretary. I and a few others also used it as a study room until the ASTP days. Then I, along with **Roger Boom** (B.A. 1944, who became years later a Professor of Nuclear Engineering at the University of Wisconsin and program manager of the cryogenic electromagnetic energy storage facility project) and **Bob Chambers** (B.A. 1944, a Chemistry major, Physics minor, who moved on to the University of Illinois for his Ph.D. in developing some of the processes for the successful production of Buna-S synthetic rubber and afterward became Vice President of ARCO), son of a prominent local lawyer, were dragooned as undergraduate General Physics lab instructors to help out in the crunch at the princely wage of $1.00 per hour. We were then trusted with building keys and were privileged to occupy some of the unused storage space behind the big lecture room as offices.

> *"His great interest, though, was in his electricity and optics courses. His Ph.D. from Harvard (1910) was in the general area of optics, and I think he came to Nebraska after WWI mainly because of the Department's reputation in this field established by Brace."*

T. T. was a good experimentalist, especially where more or less fundamental measurements with classical precision circuit components and simple instrumentation with delicate galvanometers were involved. He was not particularly interested in more sophisticated instrumentation where the observer was several steps removed from direct observation of the processes going on in the experiment. So he was leery of electronics-derived results where it became less obvious how the output data were related to the phenomenon being studied. A table-top experiment where connections were made with wires and alligator clips and threaded binding posts was great; soldered connections on breadboards with resistors, capacitors and other components - like what you bought from Radio Shack - were suspect, because they didn't look like, nor were they so precise as laboratory equipment.

I don't think his light-hearted remark about knowing nothing about electronics should be taken seriously; he knew a lot about the subject, but was not interested in applications that were not directly related to some fundamental physical principle. So details of vacuum tube voltmeters, nonlinear amplifiers, and digital counters comprising cascades of flip-flops were things to which he just did not pay much attention. His private remark to Bill Barrett about knowing nothing about these things or vacuum tubes I would say, knowing at least a little about how he approached things, was a polite and somewhat indirect way of saying he was not much interested in talking about these things at the moment. He always felt, and so stated, that if you knew the fundamental physical principles well, you could - with sufficient application of mind - derive all the necessary information for making the detailed design applications for engineering purposes. In a sense he looked upon engineers as technicians who were too much concerned with details. For all that, he successfully instructed several generations of engineers in fundamentals as well as in some practical applications; but it was always from the point of view of the physicist. This bias was not always fully appreciated or understood by the engineers. He was never particularly adept at the niggling process of wielding a soldering iron, nor did he aspire to become so.

He most especially knew a lot about, and included a lot of time in the second semester of the electricity course on, the physical theory of operation and elementary applications of vacuum tubes. In fact, one of the required textbooks in the course was *Theory and Applications of Electron Tubes* by H. J. Reich (McGraw-Hill Book Co., 1939). I still have my copy, bought used for about $1.30 in 1943.

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We Heard That...

- **Abrahamson, Dean E.** (M.A. 1958), PO Box 233, Grand Marais, MN 55604-0233 is Professor Emeritus at the University of Minnesota and Visiting Professor at the Institute of Physics and Technical Physics, Chalmers Technical University in Goteberg, Switzerland. Dean was a long-time professor at the University of Minnesota, with interests in Public Affairs.

- **Agrawal, Bishan S.** (M.S. 1973, Ph.D. 1974), 85 Rockwell Circle, Marlboro, NJ 07746-1162, is with Telecordia Technologies in Princeton, NJ.

- **Al-Omari, Imaddin A.** (Ph.D. 1996), is teaching at Sultan Qaboos University in Oman. He writes that "I am teaching 12 hours per week: One general physics course and one advanced (Third year physics) lab two times a week for three hours each time. Regarding research, I have not started yet, but I will soon. [In the Physics Dept.] we have 3 Mössbauer spectrometers , a Faraday balance for magnetic measurements, and we are in the process of buying a VSM. In addition we have x-ray diffraction, x-ray fluorescence, and electron diffraction central facilities for the Science College and the University. The University is the only [one] in the country, started in 1986. The students are good; they are the top [ones] in the country. [I have] an Assistant Professor position and I can apply for promotion to Associate Professor after two years. We have 5 Assistant Professors from Oman and the rest are from all over: UK, India, Bangladesh, Turkey, Algeria, Morroco, and Sudan.

  The language [used] at the University is English. The official language of the country is Arabic. The students spend their first year at the language center studying English, before they start their courses. The language center is huge; it has about 160 faculty!

  The University accepts about 1500 students each year. We have a B.Sc. Physics degree program and they started a masters program last year. The yearly budget for the University is $ 150 Million! They only have Oman's students and the students don't pay anything. They even give them free housing plus spending money! What a good life for them!

  Life in Oman is good except for the weather. It is too hot and too humid. The temperature between May and August is about 130 F. In Sept., Oct., March and April it is 90-100 F, and between November and February it is between 75 F and 85F. There is NO rain here and snow is impossible! We get 60 to 75 days of vacation each year and I am planning to come to NE in the summer. The University has a big area with housing inside the University for faculty and students. I live outside the University in a small town about 5 miles from here. The sea is about 10 miles from the University. The airport is about 20 miles from the University. Oman has 1,100 miles of coastline stretching along the Indian Ocean and the Arabian Gulf. The population of Oman is only about 2 million.

- **Anderson, Terry L.** (M.S. 1971, Ph.D. 1975), 24 Hill St., Bernardsville, NJ 07924-2707, is employed by Lucent Technologies in Warren, NJ.

- **Bao, MinQi** (M.S. 1992, Ph.D. 1995), Platform Computing, Inc., 25 Metro Dr., Suite 100, San Jose, Ca 95110, Email: mbao@platform.com, wrote a letter to Dept. Chair Roger Kirby, from which we provide excerpts. "Time flies fast! It has been a decade since I started my graduate education at UNL. I still remember our communications when I applied for admission from China and the first time I met you in your office when you were the Graduate Committee Chair. I really appreciate the guidance and friendship from you, Tony [Anthony Starace], and many other faculty members in the Department. After my graduation, I started my career in the computer software business. My first job was with a consulting firm in Delaware. I [then] joined Platform Computing, Inc. in Toronto, Canada in 1997 and relocated to its San Jose office in January 2000. I bought a house in San Jose and will stay in the Bay Area at least for the next couple years. I have also made many business trips back to China, to Taiwan, and to Hong Kong for my company.

  A few words about what I am doing. My company does Intelligent Distributed Workload and Active Resources Management for Computer Clusters or Grids. We partner with SUN, HP, Compaq, SGI, and many other hardware and software vendors to provide the high scalability, availability, reliability and fault tolerance ability for very intensive and mission-critical computing needs. For example, Los Alamos National Laboratory uses our software (LSF) to run parallel applications on 10,000 CPUs. No other software in the world can do that. We have several thousand customers globally in computer manufacturing (e.g., AMD, Intel, TI, Motorola, etc.), in auto and aerospace industries (e.g., GM, Ford, Boeing, GE, etc.), in drugs and biotech (e.g., Pfizer, Merck, Celera, etc.), in defense (e.g., NSA, CIA, FBI, Air Force, Navy, Army, DOE, plus all of the National Labs), etc. We are fortunately still profitable every quarter in this gloomy economy because we have customers in different areas of the world and serve all industries in which high performance computing is essential."

- **Barney, C. Adam** (B.S. 1998), 225 B Street, Lincoln, NE 68502, is working at Design Data.

- **Baumert, William J.** (B.S. 1974), 5830 West 96th St., Apt 2, Los Angeles, CA 900045-5519, writes that after eight years as an Air Force officer, based in Mississippi, Alabama, Nevada, Alaska, and Florida, he cut his military career short in 1982 to take a job with Hughes Aircraft Company. "Those were the fun days when everybody talked about a high quality job and doing interesting work and nobody worried about money. I ended up in a specialty called "nuclear hardening and survivability." The first part was the most fun. That was the specialty that protected a spacecraft from the 'prompt' effects of a nuclear weapon detonating in space (lots of X-Rays). But all good things must end. After the fall of the Berlin Wall and the collapse of the Soviet Union, I had to find another specialty. I trained myself in one called 'Electromagnetic Compatibility.' This has to do with how the electronic units on a spacecraft work together. The idea is to prevent one from interfering with the others." Since 1997 Bill has "done purely commercial and NASA work." He's survived all the takeovers that have swirled around his company, which is now part of Boeing Corp. Meanwhile, he's continuing to take lots of computer science courses.

- **Benson, Christopher D.** (B.S. 1997), 2600 S. 58th Street, #12, Lincoln, NE 68506, is working for TMS Design Services.

- **Brace, Russell "Rusty"** is Dewitt Bristol Brace's grandson. He read David Cahan's and M. Eugene Rudd's biography of D. B. Brace while on a cruise between Bora Bora and Tahiti. He reports being "entranced" by the story and amazed by D. B. Brace's many accomplishments.

- **Bruegman, Otto** (B.S. 1984, M.S. 1987), 2203 Huntfield Ct. Gambrills, MD 21054, is now Executive Vice President at International Technology Management, an aerospace engineering firm in Maryland.

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- **Bryan, Blaine D.** (B.S. 1960), 2625 Bobcat Trail, Titusville, FL 32780-7532, is a retired consultant.

- **Burmester, William L.** (B.S. 1973, M.S. 1975, Ph.D. 1982), 4473 Pali Way, Boulder, CO 80301-3827, is working on a hyperspectral imager for the Naval Research Laboratory.

- **Dilly, Virgil D.** (M.S. 1976), Route 1 Box 126, Wentworth, SD 57075, is now working for T&R Electric Supply Co., Inc., in Colman, South Dakota. T&R Electric Supply deals with all kinds of power transformers and high-voltage switchgear.

- **Duffey, James R.** (B.S. 1971, M.S. 1972, Ph.D. 1978), 2501 Yale Blvd. SE, Suite 300, Albuquerque, NM 87106-4200, Email: duffeyj@saic.com, is now working for SAIC, which recently bought the part of Maxwell that he worked for. At Maxwell, Jim was the principal investigator on the Focal Plane Array project that Maxwell got started at Rockwell Science Center for the Air Force Research Labs.

- **Eddy, Stephan M.** (B.S. 1978), 12014 Amblewood Dr., Stafford, TX 77477-1601, writes of his work with Schlumberger Corp that his "evolution into internal consultant (including internal 'conscience of the corporation'; lexiconographer; history maintainer) has been enjoyable, if oft times frustrating. Although the machinations and inner workings of Corporate America still sometimes baffle me, looking back, I understand that I did the right thing by getting out into this so-called 'real world' (or was it the swamps of southern Louisiana?). Currently, I drift among several functions, depending on the winds and tides of immediate corporate need: *Quality Philosopher*. If you do what's 'right,' things usually work out OK. I'm a bug in the executive's ear. *Quality Systems Pundit*. I sometimes lead efforts to change methodologies and processes to accommodate changing business climates or changes in organization. *Process Enforcer*. Engineers and scientists are a creative lot and sometimes shortcuts are taken that violate recommended practices. *Jail House Lawyer*. We've got about a hundred different nationalities represented at Schlumberger. Such an international flavor and its corresponding markets have their burdens, such as compliance with certain overseas technology laws, including the European Union's directives on product safety. A perfect career for an astronomer!

  I knew I wanted to study physics when I was in 7th grade. An 'Air Force Brat,' my motivation arose from a combination of cold winters in white rolling fields in Missouri, frozen fingers adjusting a little alt-azimuth Tasco telescope, looking up at stars and wondering how they worked, and the 'Alert Pad' in Minot, North Dakota (in which were B-52s hunkered down against the shrieking prairie wind, dark, deadly but fascinating cylinders in their bellies, straining at the leash, barely held in check by mere humans with help from my superhuman Master Sergeant father). . . One Dr. Kirby eventually showed me some of the fundamentals in Physics 211 and 212. Dr. Katz (he liked my 'Lies, Lies, All Lies' T-shirts) finished off my mutation years later with his 400/900 Modern Physics (he had to pass me; after all, I'd bought his Special Relativity book!). And, although I often struggled with the material, there was usually enough help amongst the grad students (**Gordon Niva** (B.S. 1973, M.S. 1975, Ph.D 1975), **Bill Burmester** (B.S. 1973, M.S. 1975, Ph.D. 1982), and others) to beat some of it into us. Physics has been very good to me!"

- **Feng, Yu** (M.S. 1999), 430 W Muhammad Ali Blvd., Apt. 1104, Louisville, KY (40202), is working for Aegon USA, Inc. in quantitative analysis of mortality experience and pricing of insurance products.

- **Francis, Oceana** (B.S. 1995), is working as a Project Engineer for the State of Alaska and travels to rural Alaskan villages working on water/sewer and solid waste projects. She is presently in the masters program in Civil Engineering at the University of Alaska- Anchorage doing research on water resources and groundwater modeling. She recently completed a 2nd B.S. (in Civil Engineering) at UAA.

- **Gray, David M.** (B.S. 1977), 47678 Woolcott Square, Sterling, VA 20165, is working for American Management Systems.

- **Groebner, Andrew T.** (B.S. 1989), 14109 Huckelberry Lane, Silver Spring, MD 20906-2012, works in the Engineering and Software Services department of the Space Telescope Science Institute (STScI), in Silver Springs, MD. STScI is the astronomical research center responsible for operating the Hubble Space Telescope as an international observatory.

- **Katkanant, Vanvilai** (M.S. 1979, Ph.D. 1983), has become Chair of the Physics Department at California State University, Fresno, CA.

- **Keifer, David W.** (B.S. 1968), 42 Spring Hill Road, Skillman, NJ 08558-1416, is working for FMC Corporation.

- **Kieckhafer, Alexander W.** (B.S. 2000), is a graduate student in the mechanical engineering program at Michigan Tech in Houghton, MI. His research focus is advanced electric propulsion for spacecraft, working for L. Brad King.

- **Krauter, Byron** (B.S. 1976), 8312 Fathom Circle, Apt. 209, Austin, TX 78750-3109, is working for IBM.

- **Lindell, Rebecca S.** (Ph.D. 2001), is an assistant professor in the Physics Department at Southern Illinois University in Edwardsville, IL. She is currently teaching a lot of physics classes and continuing her research in astronomy education, currently working on the national dissemination of the Lunar Phases Concept Inventory (LPCI), which she developed as part of her Ph.D. dissertation work. In addition, she is developing other assessment tools for astronomy.

- **Lindseth, Christopher D.** (M.S. 2001), is presently looking for employment and helping out on his parent's farm. He is applying for a number of different kinds of jobs: actuarial, systems engineering, technical staff positions, community college teaching, etc.

- **Meyer, Kurt** (B.S. 1988), 1832 Knox Street., Apt. #4, Lincoln, NE 68521, is still recovering from an accident involving a collision between his bicycle and a tree while in Colorado. Kurt is pursuing the idea of a Masters of Secondary Education at UNL, with credentials in math and physics.

- **Moore, Donald C.** (B.A. 1942), 11 Opal Lane, Sequim, WA 98382-3873, is a retired Associate Professor and former Acting Chair of the Physics Department of the University of California at Berkeley. He has had quite a career involving both technical work in the oil industry and faculty/

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administrative positions at various universities. He is currently enjoying his retirement on the Olympic Peninsula, where he is helping the Seattle Baroque Orchestra develop a Dbase4 database of their music programs and members.

- **Nafis, Suraiya** (Ph.D. 1987), is with Celeritek Corporation in San Jose, CA.
- **Reilly, Kevin** (M.S. 1962), 304 N. Burbank Dr., Bluff Park, AL 35226, is employed at the University of Alabama-Birmingham in the Computer & Information Sciences.
- **Roth, Michael P.** (B.S. 2000), 523 S 36th Ct., Omaha, NE 68105, is at the University of Nebraska Medical Center.
- **Rudd, Eugene** (Ph.D. 1962), is an Emeritus Professor who continues his passion here at UNL cataloging and organizing our large collection of antique scientific instruments.
- **Sarris, Apostolos** (B.A. 1985, M.A. 1988, M.S. 1990, Ph.D. 1992), 4 Lerou St, Kipselo, 11364 Athens, Greece, has been working with Effie Athanassopoulos on the site of Tsoukalia on the island of Alonissos in the Aegean Sea. He is at the Laboratory of Geophysical-Satellite Remote Sensing Studies, Rethymno, Crete, Greece and Effie Athanassopoulos is in the Anthroplogy Department at UNL. They have been working in the years 1999 and 2000 at the site, which is a 4th Century B.C. amphora production workshop area. It was part of a trade network that extended up to the Black Sea. Apostolos has been carrying out geophysical studies and Effie is working on the archaeology of the site. John Weymouth has been consulting on the geophysical results. The site contains extensive scatters of pottery fragments. The geophysics had located what are probably pottery kilns.
- **Snodgrass, Thomas G.** (B.S. 1991), is now with Cypress Semiconductors in Minneapolis, MN.
- **Teays, Terry** (Ph.D. 1986), 8811 Magnolia Drive, Lanham-Seabrook, MD 20706, is employed by Computer Sciences Corporation and continues as the Director of NASA's Origins Education Forum. He recently gave a briefing to the National Research Council on the use of NASA data for education and public outreach.

SMITH *continued from page 13*

He led us through the whole thing, rectifiers, class A, B, AB, C amplifiers, power amplifiers, oscillators. In his lab we traced characteristic curves of diodes, triodes, tetrodes, and pentodes. The examples we used were even then obsolete configurations, 201-A's, 47's, 57's etc., found in radios of the 1930s, similar to state-of-the art 1940s types in the shielded metal envelopes found in military equipment. On one occasion **Dick [Richard C.] Sill** (B.A. 1945, M.A. 1950) and I got brownie points for rigging an amplifying system — call it reinventing the intercom — so our class could listen in on a lecture in Physics 2 class being given in the big lecture hall on the floor above. It didn't work especially well, because we neglected the necessity to properly match output impedances of transformers to transmission lines and lines to speakers (that lesson was learned later, in the Navy). I recall one of the questions on the final exam was to analyze the conditions of oscillation for the Colpitts oscillator. But as I said, he was not interested in pursuing the detailed applications of vacuum tubes to industrial things such as sonar, radar, computers, and other commercial exploitations of Faraday, Maxwell, Marconi, Fleming, Heaviside, Hull, and others. And when transistors came along in a big way starting in the 1950s, I think the references to electrons and "holes" in semiconductors left him rather offended, as not being scientific. By then he was probably sort of ready to get out of the hassle of teaching recalcitrant students — I know he felt increasingly behind recent developments in physics as such.

He did not abandon his interest in teaching , and when retirement actually took place in 1953 he had some regrets. Within two years he moved off to a 5-year stint as the solo member of the Physics Department of Susquehanna University in Selinsgrove, Pennsylvania before finally retiring for good to Lincoln. For several years thereafter he continued his teaching activities as a volunteer instructor in the "Great Books" series at a local branch of the City Library.

Except for occasional visits after 1947 I lost most of my direct contact with the Nebraska Physics Department. Having spent the next three years at Minnesota acquiring a Master's degree, and a year following that as a junior member of the Physics Department at Wooster College in Ohio, I wound up at the Navy Electronics Lab in San Diego, where, somewhat to my father's disappointment, I became infected with the engineering virus as I worked on the design of high power — i.e., megawatt — very low frequency antennas for the Navy. In this subject area during my 50-year association with the Navy (2 years in it, 18 years working for it in the Civil Service, 10 years employed by one of its contractors, and 22 years independently contracting my consulting services to it), I have achieved a significant success, made worthwhile contributions, and - until funding began to run dry a few years ago owing to decreased interest in narrow-band communication systems, and increased emphasis on extreme frequency satellite systems - enjoyed considerable activity at various remote sites and achieved a fair degree of expertise and notoriety. I lay this success to the thorough grounding in fundamentals during my formative years at Nebraska under both my Dad and Ted Jorgensen. I still visit Ted from time to time, the most recent occasion being late September 2000. At age 97 he is still active professionally, and is, as you know, the author of the recent book *Physics of Golf* (Springer-Verlag) that is now gaining acceptance as a teaching aid among golfing professionals.

I have not met any of you three gentlemen addressed by this letter. Never having got my Ph.D. union card (though a portion of what I have done might be worth a D.Sc. from some EE department under the right circumstances), and having worked in an applied physics subject where electrons are fuzzy balls of negativity, not tiny billiard balls or wave packets in some indescribable medium, I wouldn't be comfortable in your present-day Physics Department, with its remarkable achievements and reputation. I am impressed by the account authored by M. E. Rudd published in 1992 entitled *Science on the Great Plains — History of Physics and Astronomy at the University of Nebraska* wherein your work is summarized. I follow with pleasure the accomplishments reported in the *Spectrum*. Nice going.

Andrew N. Smith
11406 Highway E
Eldridge, MO 65463-8144

Acknowledgments

The Department is very grateful to the following individuals and corporations for their new and continuing financial contributions during the period 1 November 2000 – 31 October 2001. 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.

Imaddin Al-Omari (Ph.D. 1996)
Terry L. Anderson (M.S. 1971, Ph.D. 1975)
Min-Qi Bao (M.S. 1992, Ph.D. 1995)
William A. Barret (B.S. 1952, M.S. 1953)
The Boeing Company
Larry L. Boyer (M.S. 1968, Ph.D. 1970)
Blaine D. Bryan (B.S. 1960)
Mrs. James C. Coe
Geoffrey B. Crooks (B.S. 1965, M.S. 1967, Ph.D. 1972)
Paul O. Davey (Ph.D. 1964)
Stephan M. Eddy (B.S. 1978)
Debra Jean Fickle (B.S. 1988)
FMC Foundation
Oceana Francis (B.S. 1995)
David M. Gray (B.S. 1977)
Alan J. Heeger (B.S. 1957, HDS 1999)
Robert Hilborn
Keh-Ning Huang
IBM Corporation
ITT Industries, Inc.
Sitaram S. Jaswal
David W. Keifer (B.S. 1968)
Rebecca Richards Kortum (B.S. 1985)
Philip T. Kortum
Byron Krauter (B.S. 1976)
William J. Lannan (M.A. 1956)
Diandra Leslie-Pelecky
Michael K. Lewis (B.S. 1992)
Robert Linderholm
Lucent Technologies Foundation
Robert L. Maher (M.S. 1975, Ph.D. 1980)
Ronald H. McKnight (M.S. 1964, Ph.D. 1970)
Kurt Meyer (B.S. 1988)
Donald C. Moore (B.A. 1942)
Marlys Mortensen-Say
Suraiya Nafis (M.S. 1984, Ph.D. 1987)
Mr. & Mrs. Joseph L. Parker (Ph.D. 1940 Chem./Physics)
Kevin D. Reilly (M.S. 1962)
Jerry E. Ruckman (B.S. 1962)
M. Eugene Rudd (Ph.D. 1962)
James J. Schmidt (B.S. 1956, M.S. 1957)
Theodore J. Schuldt, Jr. (B.A. 1959, M.A. 1961)
David J. Sellmyer
Roy F. Simperman (M.S. 1965)
Anthony F. Starace
Terry J. Teays (Ph.D. 1986)
Telcordia Technologies

Thank you very much!

For more information about the Department of Physics and Astronomy, visit our Web Site at: **http://physics.unl.edu/**

University of Nebraska Lincoln

The Record

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

No. 22 Winter 2002 Roger D. Kirby, Editor

2000-2001 Degree Recipients

Bachelor of Science

Alexander W. Kieckhafer (May 2000) is in the Graduate mechanical engineering program at Michigan Technological University in Houghton, MI.

Timothy L. Mansfield (Aug. 2000) is a manager at Russ's IGA, Lincoln, NE.

Seth A. Root (Aug. 2000) is in the physics graduate program at UNL working with Professor Robert Hardy.

Yoshitaka Takano (May, 2001) is working for PWC Consulting (Price Waterhouse Coopers) in Tokyo, Japan.

Master of Science

Aliekber Aktag (May, 2001) is in the physics Ph.D. program at UNL working with Professor Roger Kirby.

Rui-hua Cheng (Dec. 2000) is in the physics Ph.D. program at UNL working with Professor Peter Dowben.

Daniel L. Freimund (May, 2001) is in the physics Ph.D. program at UNL working with Professor Herman Batelaan.

Hae-Kyung Jeong (Dec. 2000) is in the physics Ph.D. program at UNL working with Professor Peter Dowben.

Brandon Jordon-Thaden (Aug. 2000) is in the physics Ph.D. program at UNL working with Professor Duane Jaecks.

Geeta V. Kharadia (Aug. 2000) is job-hunting at home in Maryville, MO.

Christopher D. Lindseth (Aug. 2000) is job hunting.

Bo Xu (Dec. 2000) is in the physics Ph.D. program at UNL working with Professor Peter Dowben.

Cheol-Soo Yang (Dec. 2000) is in the physics Ph.D. program at UNL working with Professor Bernard Doudin.

Doctor of Philosophy

Hasan Mousa Al-Khateeb (Dec. 2000) is teaching at the Jordan Institute of Science and Technology in Irbid, Jordan.

Camelia Borca (May, 2001) is a postdoctoral research associate at JILA in Boulder, CO.

Rebecca S. Lindell (Aug. 2001) is an assistant professor of physics at Southern Illinois University in Edwardsville, IL.

Chunping Luo (Dec. 2000) is doing research and development at Headway Corp., San Jose, CA.

J. Mark Meldrim (Aug. 2000) is doing research and development at Micron Corp., Boise, ID.

Yuanguang Xu (Aug. 2001) is a postdoctoral fellow in medical physics at Columbia University.

2000-2001 Fellowships and Traineeships

Samuel Avery Fellowship
Geoffrey W. Brooks **Renee J. Lathrop**

Graduate Research Traineeship
Thomas C. Koch **Rebecca S. Lindell** **Deborah S. Williams**

IBM Graduate Fellowship
Hao Zeng

Donald F. and Mildred Topp Othmer Graduate Fellowship
Geoffrey W. Brooks **Matthew A. Poulsen**

Joseph L. Parker Fellowship
Christina M. Othon **David C. Schmitter**

Scholastic Graduate Research Assistantship
Renee J. Lathrop **David C. Schmitter**

Student Assistantship in Research and Scholarship (STARS)
Christina M. Othon

2000-2001 Scholarships

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Travis L. Jewell

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Jonathan D. Beezley **Bradley W. Peterson**

Physics and Astronomy Alumni Scholarship
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Travis J. Warnsing

Stowell Fund Scholarship
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Amber L. McClung **Nathan L. Powers** **Jason P. Sneed** **Travis J. Warnsing** **John P. Wilson**

Honors

Promotion to Rank of Professor
Stephen P. Ducharme

Commanders Award for Public Service, U.S. Military Academy
Robert G. Fuller

UNL Parents Association Certificate of Recognition
Herman Batelaan **Martin Gaskell**

University Kudos Award
Brian S. Farleigh

College of Arts and Sciences Graduate Research Assistant Award
Graduate Research Award of the American Vacuum Society
UNL Alumni Association Graduate Research Assistant Award Graduate
Silver Award of the Materials Research Society
Camelia N. Borca

Sigma Xi Graduate Student Paper Award
Hae-Kyung Jeong

2001 Distinguished Graduate Teaching Assistant Award
Handunnetti deSilva **Takashi Oe**

2001 Distinguished Undergraduate Teaching Assistant Award
Nathan L. Powers

2000-2001 Society of Physics Students Officers
Chad M. Petersen, President
Brad Peterson, Vice President
Jonathan P. Reyes, Secretary
Shawn T. Langan, Treasurer

Faculty Professional Activities

In addition to service on Department, College and University-wide committees, during 2000-2001 a number of the faculty were active in local, national and international professional activities, as follows:

Clifford Bettis: Vice President, Physics Instructional Resource Association

Daniel Claes: Review Panel, Experimental Elementary Particle Physics Program, National Science Foundation

Peter Dowben: Users Advisory Committee, Center for Advanced Microstructure and Devices (CAMD), Louisiana State University; Leader, 3M TGM Participating Research Team, CAMD

Ilya I. Fabrikant: Member, International Scientific Committee and Session Chair, European Conference on Elementary Processes in Atomic Systems, (July 2000), Uzhgorod, Ukraine; Chair, International Symposium on Electron-Molecule Collisions and Swarms (July 2001), Lincoln, Neb.

Timothy J. Gay: Secretary Treasurer, Division of Atomic, Molecular, and Optical Physics (DAMOP), American Physical Society (APS); Executive Committee, DAMOP; Program Committee (ex officio), DAMOP; Committee on Atomic, Molecular, and Optical Physics (CAMOS), National Research Council

John R. Hardy: Consultant, Army Research Laboratory; Consultant, Naval Research Laboratory

Diandra Leslie-Pelecky: Chair, American Physical Society Committee on Careers and Professional Development; APS Representative to the Advisory Committee on Career Services, American Institute of Physics

Kam-Ching Leung: Chrétien International Award Committee, American Astronomical Society; Editorial Board, Information Bulletin on Variable Stars, International Astronomical Union; United Nations Working Group on Astronomical Facilities in the Pacific Rim; Planning Committee for Pacific Rim Conferences, Hong Kong Astrophysical Society; Co-Chair, Scientific Organizing Committee for the Pacific Rim Conference on Stellar Astrophysics; Vice President, Hong Kong Astrophysical Society

M. Eugene Rudd: Associate Editor, Rittenhouse: Journal of the American Scientific Instrument Enterprise

David J. Sellmyer: International Organizing Committee, Magneto-Optical Recording International Symposium (2000) Monterey, Calif.; Vice-Chair, APS Group on Magnetism and its Applications; Chair, Nominating Committee, APS-GMAG; Session Chair, MMM Intermag Conference, San Francisco; Honorary Member, Academic Committee, State Key Laboratory of Magnetism, Institute of Physics, Chinese Academy of Sciences; Member, Nebraska State EPSCoR Committee; Member, EPSCoR Grants Committee; Member, Governor's Science and Technology Planning Committee

Gregory R. Snow: Users Executive Committee, Fermilab; Proposal Review Panel, Teacher Enhancement Program, NSF; Proposal Review Panel, SBIR/STTR Program, NSF

Anthony F. Starace: Associate Editor, Reviews of Modern Physics; Chair, Nominating Committee, APS Division of AMO Physics; Proposal Review Panel, AMO Theory Program, National Science Foundation

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2000-2001 Visiting Staff Members

Visiting Professors **Neil Boag** (Ph.D. 1980, University of Bristol, United Kingdom), working with Peter A. Dowben; **Sam Cipolla** (Ph.D. 1969, Purdue University); **Vladimir Fridkin** (Ph.D. 1965, Russian Academy of Sciences, Russia), working with Stephen Ducharme; and **Nikolai L. Manakov** (D.Sc. 1979, Leningrad State University, Russia), working with Anthony F. Starace.

Visiting Associate Professors **Mikhail Chibisov** (Ph.D. 1967, Kurchatov Institute, Russia), working with Ilya Fabrikant; and **Jianjun Liu** (Ph.D. 1994, Jilin University, People's Republic of China), working with John R. Hardy.

Visiting Assistant Professors **Kayvan Aflatooni** (Ph.D. 1998, UNL), working with Paul D. Burrow; **Nancy Beverly** (Ph.D. 1996, Stevens Institute of Technology), working with Robert G. Fuller; **Rochelle Ondracek** (Ph.D. 1994, Johns Hopkins University), working with David J. Sellmyer; and **Ralph Skomski** (Ph.D. 1991, University of Dresden, Germany), working with David J. Sellmyer.

Adjunct Professor **Ronald H. Ono** (Ph.D. 1983, SUNY at Stony Brook), working with Sy-Hwang Liou.

Research Assistant Professors **Shireen Adenwalla** (Ph.D. 1989, Northwestern University); **Imaddin Al-Omari** (Ph.D. 1996, UNL), working with David J. Sellmyer; **Renat Sabiryanov** (Ph.D. 1993, Institute of Chemistry of Solids, Ekaterinburg, Russia), working with Sitaram Jaswal; and **Orhan Yenen** (Ph.D. 1986, UNL), working with Duane H. Jaecks.

Postdoctoral Research Associates **Mircea Chipara** (Ph.D. 1987, Institute of Atomic Physics, Bucharest, Romania), working with David J. Sellmyer; Suxing Hu (Ph.D. 1998, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, People's Republic of China), working with Anthony F. Starace; **Gerard Lagmago-Kamta** (Ph.D. 1999, National University of Benin, West Africa), working with Anthony F. Starace; **Yevgeniy Ovchenkov** (Ph.D. 1997, Moscow State University, Russia), working with Bernard Doudin; **You Qiang** (Ph.D. 1997, University of Freiburg, Germany), working with David J. Sellmyer; **Mark Rosenberry** (Ph.D. 2000, University of Michigan), working with Timothy J. Gay. **Andrei Sokolov** (Ph.D. 1996, Moscow State University, Russia), working with Bernard Doudin; **Alexander Sorokin** (Ph.D. 1997, Institute of Crystallography, Russian Academy of Sciences), working with Stephen Ducharme; **Hong Tang** (Ph.D. 1996, Institute of Metal Research, Academia Sinica, People's Republic of China), working with David J. Sellmyer; **Minglang Yan** (Ph.D. 1992, Lanzhou University, People's Republic of China), working with David J. Sellmyer; **Lanping Yue** (Ph.D. 1995, Chinese Academy of Science, Peoples Republic of China), working with Diandra Leslie-Pelecky; and **Min Zheng** (Ph.D. 1997, Institute of Physics, Chinese Academy of Sciences, Peoples Republic of China), working with Roger D. Kirby and David J. Sellmyer.

Senior Lecturer **C. Martin Gaskell** (Ph.D. 1981, University of California).

Lecturers **Hurol Aslan** (Ph.D. 1994, Purdue University) and **Kevin M. Lee** (Ph.D. 1988, UNL).

2000 Fall Semester Colloquia

August 24
Professor Peter Teubner, Flinders University
"Electron Scattering from Copper and Gold"

September 7
Professor Brett Esry, Kansas State University
"Solving the Time-Dependent Schroedinger Equation for Fun and Profit"

September 14
Professor L. Eric Cross, Evan Pugh Professor Emeritus of Electrical Engineering, Pennsylvania State University
"Ferroelectric Piezoelectric Actuators and Smart Material Systems"

September 21
Professor Michael Guidry, University of Tennessee and Oak Ridge National Laboratory
"An SU(4) Dynamical Symmetry Model for High Temperature Superconductivity and Antiferromagnetism"

September 28
Professor Mark Raizen, University of Texas at Austin
"Controlling Atomic Motion with Light"

October 5
Professor Frances Hellman, University of California-San Diego
"Putting a New Spin on Amorphous Si and the Metal-Insulator Transition"

October 19
Professor Manfred Fink, University of Texas at Austin
"Are the Neutrinos the Masters of the Universe?"

October 26
Professor David R. Heskett, University of Rhode Island
"Investigations of Electromigration: An Important Failure Mechanism in Semiconductor Devices"

November 2
Professor Ann E. Orel, University of California-Davis
"Electron Impact Dissociation of Molecules and Molecular Ions"

November 7
The Jerry E. Ruckman Lecture
Professor E. Dan Dahlberg, University of Minnesota
"Physics for Elementary School Teachers: The Good, The Bad, and The Ugly"

November 9
Major Christopher J. Lehner, Formerly Assistant Professor of Physics and Course Director, USMA
"Integrating Physics and Calculus: The USMA Experience"

November 16
Professor David Logan, University of Nebraska-Lincoln
"Reaction-Mineralogy-Porosity Interactions in Porous Media"

November 30
Dr. Shireen Adenwalla, University of Nebraska-Lincoln
"Diffraction Measurements of Patterned Magnetic Arrays"

2001 Spring Semester Colloquia

January 25
Dr. David Billesbach, University of Nebraska-Lincoln
"There's Definitely Something in the Air!" – Atmospheric Trace Gas Research at UNL

February 26
Dr. Victor Barzykin, National High Magnetic Field Lab
"New Superconductivity From BCS?"

March 1
Professor Ralph Skomski, University of Nebraska-Lincoln
"Length Scales and Fundamental Interactions in Magnetic Solids"

March 8
Dr. Dirk K. Moor, Los Alamos National Laboratory
"Exotic Phases and the Hunt for the Symmetry of the Order Parameter"

March 19
Dr. Evgeni Y. Tsymbal, University of Oxford-United Kingdom
"Modeling of Spin-Dependent Transport in Magnetic Thin-Film Structures"

March 22
Professor Ivan N. Yakovkin, National Academy of Science of the Ukraine
"The Band Structure of Alkali Earth Overlayers as a Function of Lattice Constant and Coordinate Number: Why is This Interesting?"

March 26
Professor Ruqian Wu, California State University
"Application of First Principles Approach in Novel Materials Studies"

March 28
Dr. Gilford S. Summy, Clarendon Laboratory, University of Oxford, U.K.
"Accelerating Cold Atoms with Light: From Atom Optics to Quantum Chaos"

April 2
Chunlei Guo, Los Alamos National Laboratory
"Cartoon Solutions of Multielectron Problems in Strong Laser Fields"

April 4
Dr. Kees Uiterwaal
"Linear Aspects of Nonlinear Photoionization Processes: The Statistical Photoionization Model (S.P.I.)"

April 5
Professor Francis Robicheaux, Auburn University
"Toying with Electrons Inside Atoms: A Description of Recent Calculations and Experiments"

April 10
Abdoul-Carime Hassan, Universite de Sherbrooke
"Interaction of Low-Energy (<30 eV) Electrons with Biological Molecules"

April 12
Dr. Smita Mathur, Ohio State University
"Outflow of Gas From Supermassive Black Holes"

April 19
Professor J. Robert Buchler, University of Florida at Gainesville
"Chaos In the Music of the Stars"

April 26
Dr. Vittorio Paolone, University of Pittsburgh
"Neutrino Physics: Past, Present, and Future"

May 17
Professor M. Tuominen, University of Massachusetts
"Functional Nanowire Arrays from Diblock Copolymer Templates"

2000 Faculty Publications

Astronomy and Astrophysics

C.M. Gaskell, "A Look at What is (and Isn't) Known About Quasar Broad Line Regions and How Narrow-Line Seyfert 1 Galaxies Fit In," New Astronomy Reviews **44,** 563 (2000).

E.G. Schmidt and K.M. Lee, "The RR Lyrae Star V442 Mer: An Extreme Case of Light Curve Modulation," Publications of the Astronomical Society of the Pacific **112,** 1262 (2000).

Atomic, Molecular, and Optical Physics

H. Batelaan, "The Kapitza-Dirac Effect," Contemporary Phys. **41,** 369 (2000).

K. Aflatooni and **P.D. Burrow,** "Total Cross Sections for Dissociative Electron Attachment in Dichloroalkanes and Selected Polychloroalkanes: The Correlation with Vertical Attachment Energies," J. Chem. Phys. **113,** 1455 (2000).

P.D. Burrow, K. Aflatooni and **G.A. Gallup,** "Dechlorination Rate Constants on Iron and the Correlation with Electron Attachment Energies," Environ. Sci. Technol. **34,** 3368 (2000).

K. Aflatooni, **G.A. Gallup,** and **P.D. Burrow,** "Temporary Anion States of Dichloroalkanes and Selected Polychloroalkanes," J. Phys. Chem. A **104,** 7359 (2000).

Y. Xu, **G.A. Gallup,** and **I.I. Fabrikant,** "Dissociative Electron Attachment to Vibrationally and Rotationally Excited H_2 and HF Molecules," Phys. Rev. A **61,** 052705 (2000).

R.S. Wilde, **G.A. Gallup,** and **I.I. Fabrikant,** "Comparative Studies of Dissociative Electron Attachment to Methyl Halides," J. Phys. B **33,** 5479 (2000).

E. Leber, **I.I. Fabrikant,** J.M. Weber, M.-W. Ruf, and H. Hotop, "Resonance and Threshold Phenomena in Electron Attachment to Molecules and Clusters," in *Dissociative Recombination: Theory, Experiment and Applications IV*, Ed. by M. Larsson, J.B.A. Mitchell, and I.F. Schneider, 69-76, World Scientific, Singapore (2000).

I.I. Fabrikant and M.I. Chibisov, "Close-Coupling Calculations of Ca^- Formation by Charge Transfer from Rydberg Atoms," Phys. Rev. A **61,** 022718 (2000).

I.I. Fabrikant, "Studies of Dissociative Attachment Reactions: From Gas Phase to Condensed Phase," in *The Physics of Electronic and Atomic Collisions*, Ed. by Y. Itikawa, K. Okuno, H. Tanaka, A. Yagishita and M. Matsuzawa, 270, AIP, Melville, NY (2000).

H.R. Sadeghpour, J.L. Bohn, B.D. Esry, M.J. Cavagnero, **I.I. Fabrikant,** J.H. Macek, and A.R.P. Rau, "Collisions Near Threshold Involving Atoms and Molecules (Topical Review)," J. Phys. B **33,** R1 (2000).

I.I. Fabrikant and V.S. Lebedev, "Quenching of Rydberg States by Atoms with Small Electron Affinities," J. Phys. B **33,** 1521 (2000).

J.M. Weber, **I.I. Fabrikant**, E. Leber, M.-W. Ruf, and H. Hotop, "Effects of Solvation on Dissociative Electron Attachment to Methyl Iodide Clusters," Eur. Phys. J. D **11,** 247 (2000).

E. Leber, S. Barsotti, J. Bömmels, J.M. Weber, **I.I. Fabrikant,** M.-W. Ruf and H. Hotop, "Vibrational Feshbach Resonances in Electron Attachment to Nitrous Oxide Clusters: Decay Into Heterogeneous and Homogeneous Cluster Anions," Chem. Phys. Lett. **325,** 345 (2000).

E. Leber, S. Barsotti, **I.I. Fabrikant,**, J.M. Weber, M.-W. Ruf, and H. Hotop, "Vibrational Feshbach Resonances in Electron Attachment to Carbon Dioxide Clusters," Eur. Phys. J. D **12,** 125 (2000).

I.I. Fabrikant, Th. Leininger, and F.X. Gadea, "Low-Energy Dissociative Electron Attachment to Cl_2 Molecules," J. Phys. B **33,** 4575 (2000).

I.I. Fabrikant, "Theoretical Studies of Dissociative Attachment: From Gas Phase to Condensed Phase," Uzhgorod University Scientific Herald (Proc. CEPAS'2000), Part 1, Uzhgorod, 11-14 (2000).

I.I. Fabrikant,"Theory of Electron-Molecule Collisions in the Sub-meV Range," Uzhgorod University Scientific Herald (Proc. CEPAS'2000), Part 1, Uzhgorod, 51-54 (2000).

T.J. Gay, "What Physics Do We Learn From Integrated Stokes Parameter Measurements with Polarized Electrons?," Tsinghua University Review of Science and Technology (2000).

H.M. Al-Khateeb, B.G. Birdsey, and **T.J. Gay,** "Simultaneous Excitation and Ionization of Argon: Measurement of the Hexadecapole Moment," Phys. Rev. Lett. **85,** 4040 (2000).

Y.-K. Kim and **M.E. Rudd,** "Comments on 'Electron Impact Ionization of Methane,'" J. Phys. B: At. Mol. Opt. Phys. **33** 1981 (2000).

Y.-K. Kim, W.R. Johnson and **M.E. Rudd,** "Cross Sections for Singly Differential and Total Ionization of Helium by Electron Impact," Phys. Rev. A **61,** 034702 (2000).

N.L. Manakov, M.V. Frolov, **A.F. Starace**, and **I.I. Fabrikant,** "Interaction of Laser Radiation with a Negative Ion in the Presence of a Strong Static Electric Field (Topical Review)," J. Phys. B **33,** R141 (2000).

N.L. Manakov, A.V. Meremianin, and **A.F. Starace,** "Factorized Representation for Parity-Projected Wigner d^j (β) Matrices," Phys. Rev. A **61,** 022103 (2000).

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D.B. Milosevic and **A.F. Starace,** "Control of High-Harmonic Generation and Laser-Assisted X-Ray—Atom Scattering with Static Electric and Magnetic Fields," Laser Physics **10,** 278 (2000).

B. Borca, A.V. Flegel, M.V. Frolov, N.L. Manakov, D.B. Milosevic, and **A.F. Starace,** "Static-Electric-Field-Induced Polarization Effects in Harmonic Generation," Phys. Rev. Lett. **85,** 732 (2000).

D.B. Milosevic and **A.F. Starace,** "Control of Intense Laser-Atom Processes with Strong Static Fields," in *Multiphoton Processes*, Ed. L.F. DiMauro, R.R. Freeman, and K.C. Kulander (AIP Conference Proceedings No. 525, A.I.P., Melville, NY, 2000), pp. 602-612.

M. Masilli and **A.F. Starace,** "One- and Two-Photon Detachment Cross Sections and Dynamic Polarizability of H^- Using a Variationally Stable, Coupled-Channel Hyperspherical Approach," Phys. Rev. A **62,** 033403 (2000).

N.L. Manakov, M.V. Frolov, B. Borca, and **A.F. Starace,** "On the Stabilization of Decay of a Bound Level in a Strong Monochromatic High-Frequency Field," Pis'ma Zh. Eksp. Teor. Fiz. **72,** 426 (2000) [JETP Lett 72, 294 (2000)].

C.-N. Liu and **A.F. Starace,** "Mirroring and Mimicking of Partial Cross Sections in the Vicinity of a Resonance," Physics Essays **13,** 215 (2000).

Condensed Matter Physics

L.M. Blinov, V.M. Fridkin, S.P. Palto, A.V. Bune, **P.A. Dowben,** and **S. Ducharme,** "Two-Dimensional Ferroelectrics," *Uspekhi Fizicheskikh Nauk* **170,** 247 (2000) [*Physics Uspekhi* **43,** 243 (2000)].

Jaewu Choi, H.M. Manohara, E. Morikawa, P.T. Sprunger, **P.A. Dowben,** and S.P. Palto, "Thin Crystalline Functional Group Copolymer(vinylidene fluoride – trifluorethylene) Film Patterning Using Synchrotron Radiation," Appl. Physics Letters **76,** 381 (2000).

T. McAvoy, J. Zhang, C. Waldfried, D.N. McIlroy, **P.A. Dowben,** O. Zeybek, T. Bertrams, and S.D. Barrett, "The Interplay Between the Surface Band Structure and Possible Surface Reconstructions of Mo(112), " European Physical Journal B **14,** 747 (2000).

Jaewu Choi, C.N. Borca, **P.A. Dowben,** A. Bune, M. Poulsen, S. Pebley, **S. Adenwalla, S. Ducharme,** L. Robertson, V.M. Fridkin, S.P. Palto, N. Petukhova, S.G. Yudin, "The Phase Transition of the Surface Structure in Copolymer Films of Vinylidene Fluoride (70%) with Trifluoroethylene (30%)," Phys. Rev. B **61,** 5760 (2000).

C.N. Borca, D. Welipitiya, **P.A. Dowben,** and N.M. Boag, "Bonding Configurations for Nickelocene on Ag(100) and Steric Effects in Thermal Desorption," J. Physical Chemistry B **104,** 1047 (2000).

C.N. Borca, R.H. Cheng, Q.L. Xu, **S.-H. Liou,** S. Stadler, Y.U. Idzerda, and **P.A. Dowben,** "Origin of the Magnetic Moments in $La_{0.65}Pb_{0.35}MnO_3$ Epitaxial Thin Films," J. Applied Physics **87,** 5606 (2000).

C.N. Borca, D. Ristoiu, Q.L. Xu, **S.-H. Liou, S. Adenwalla,** and **P.A. Dowben,** "The Surface Terminal Layer and Composition of the CMR Perovskite: $La_{0.65}Pb_{0.35}MnO_3$," J. Appl. Phys. 87, 6104 (2000).

M.I. Chipara, **S. Adenwalla, P.A. Dowben,** Q. L. Xu, **S.-H. Liou,** and R. Shoemaker, "Magnetic Spectroscopy and Characterization of $La_{0.65}Pb_{0.35}MnO_3$," J. Appl. Phys. **87,** 7124 (2000).

D. Ristoiu, J.P. Nozières, C.N. Borca, T. Komesu, H.-K. Jeong, and **P.A. Dowben,** "The Surface Composition and Spin Polarization of NiMnSb Epitaxial Thin Films," Europhysics Letters **49,** 624 (2000).

I.N. Yakovkin and **P.A. Dowben,** "The Influence of Both Coordination Number and Lattice Constant on the Nonmetal to Metal Transition," J. Chemical Physics **112,** 7622 (2000).

D. Ristoiu, J.P. Nozières, C.N. Borca, B. Borca, and **P.A. Dowben,** "Manganese Surface Segregation in NiMnSb," Appl. Phys. Lett. **76,** 2349 (2000).

Jaewu Choi, S.-J. Tang, P.T. Sprunger, **P.A. Dowben,** V.M. Fridkin, A.V. Sorokin, S.P. Palto, N. Petukhova, and S.G. Yudin, "Photoemission Band Symmetries and Dipole Active Modes of Crystalline Films of Vinylidene Fluoride (70%) with Trifluoroethylene (30%) Across the Ferroelectric Transition(s)," J. Phys. Cond. Matter **12,** 4735 (2000).

C.N. Borca, D. Ristoiu, T. Komesu, H.-K. Jeong, Ch. Hordequin, J. Pierre, J.P. Nozières, and **P.A. Dowben,** "The Effective Surface Debye Temperature for NiMnSb(100) Epitaxial Films," Applied Physics Letters **77,** 88 (2000).

H. Dulli, E.W. Plummer, **P.A. Dowben,** J. Choi, and **S.-H. Liou,** "Surface Electronic Phase Transition in Colossal Magnetoresistive Manganese Perovskites: $La_{0.65}Pb_{0.35}MnO_3$," Applied Phys. Lett. **77,** 570 (2000).

T. Komesu, C.N. Borca, H.-K. Jeong, **P.A. Dowben,** D. Ristoiu, J.P. Nozières, S. Stadler, and Y.U. Idzerda, "The Polarization of Sb Overlayers on NiMnSb(100)," Physics Letters A **273,** 245 (2000).

P.A. Dowben, "The Metallicity of Thin Films and Overlayers," Surface Science Reports **40** (6-8), 151 (2000).

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V.M. Fridkin, **S. Ducharme,** A.V. Bune, S.P. Palto, S.G. Yudin, and L.M. Blinov, "Two-Dimensional Ferroelectrics," Ferroelectrics **236,** 1 (2000).

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M.M. Ossowski, **J.R. Hardy,** and R.W. Smith, "Molecular-Dynamics Study of Phase Transitions in Alkali Thiocyanates," Phys. Rev. B **5,** 3136 (2000).

M.M. Ossowski, **J.R. Hardy,** and R.W. Smith, "Structural Transitions in NaCN and KCN," Fundamental Physics of Ferroelectrics 2000: Aspen Center for Physics Winter Workshop, Ed. Ronald E. Cohen (AIP Conference Proceedings, No. 535, 2000), p. 332.

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I.A. Al-Omari, Y. Yeshurun, **S.S. Jaswal,** Z. Zhou, and **D.J. Sellmyer,** "Magnetic and Structural Properties of $Nd_2Fe_{17-x}M_x$ (M = Cu, Cr, V, Nb and Zr) Compounds," J. Magn. Magn. Mater. **217,** 83 (2000).

R.R. Sabiryanov and **S.S. Jaswal,** "Magneto Volume Effect in Nd_5Fe_{17}," J. Appl. Phys. **87,** 4750 (2000).

R. Skomski, R.F. Sabiryanov, and **S.S. Jaswal,** "Ruderman-Kittell-Kasuya-Yosida Interactions Between Spin Distributions of Arbitrary Shape," J. Appl. Phys. **87,** 5890 (2000).

L. Yue, R. Sabirianov, E.M. Kirkpatrick, and **D.L. Leslie-Pelecky**, "Magnetic Properties of Disordered Ni_3C," Phys. Rev. B 62, 8969 (2000).

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J.M. Meldrim, Y. Qiang, Y. Liu, H. Haberland, **D.J. Sellmyer,** "Magnetic Properties of Cluster-Beam Synthesized Cobalt: Noble-Metal Films," J. Appl. Phys. **87,** 7013 (2000).

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FACULTY PUBLICATIONS *continued on page 26*

FACULTY PUBLICATIONS *continued from page 25*

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Interdisciplinary Physics

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New Research and Renewal Grants and Contracts

during the period November 1, 2000 through October 31, 2001

Principal Investigator	Title (Source of Funds)	Amount
Adenwalla/Ducharme	Nanoscale Structural Engineering of Ferroelectric Polymers (DOE EPSCoR)	$90,859
Batelaan	NSF EPSCoR Type II (Nebraska EPSCoR)	$20,000
Batelaan	Matter Optics with Intense Laser Light (NSF)	$130,650
Batelaan/Starace/Sellmyer	Quantum Information Technology (NRI)	$107,331
Burrow	Electron-Impact Excitation of Zn, Cd and Hg Atoms (CRDF)	$2,500
Burrow/Comfort/Shea	Predicting Contaminant Dehalogenation Rates from Electron Scattering Studies (USDA)	$77,855
Claes/Snow	Cosmic Ray Observatory Project (NSF)	$344,349
Doudin	Single-Spin Electronics (NSF)	$74,963
Doudin	Optical Microscopy Station for Micromanipulation and Nanosynthesis (NU Foundation)	$93,000
Doudin/Sellmyer	Magnetometry on Individual Nanometer-Sized Ferromagnet (NSF)	$5,167
Dowben/Adenwalla	Boron-Carbide Thermal Neutron Detectors and Cameras (NRI)	$64,000
Dowben/Doudin	Spin Polarization at Ferromagnetic/Insulator Interfaces (ARO-ONR)	$94,718
Dowben/Ducharme	Adsorption and Desorption of Water from Crystalline Polymer Surfaces (ACS)	$30,000
Ducharme	Fabrication and Study of Ferroelectric Langmuir-Blodgett Films (CRDF)	$36,788
Ducharme	High Performance Capacitors and Nonvolatile Memories from Langmuir-Blodgett Films of Ferroelectric Polymers (NSF)	$67,228
Ducharme/Dowben/Adenwalla	Ultrathin Polymer Films for Microelectronic Devices (NRI)	$183,608
Fabrikant	International Symposium on Electron-Molecule Collisions and Swarms (NSF)	$5,000
Fabrikant	Collision Processes Involving Low-Energy Electrons (NSF)	$70,000
Fabrikant	International Symposium on Electron-Molecule Collisions and Swarms (DOE-EPSCoR)	$5,000
Fuller/Plano-Clark/Spiegel	Collaborative Proposal-Reforming Physics: Algebra-Based Physics with Human Applications (NSF)	$166,083
Gay	Polarized Electron Physics-REU Supplement (NSF)	$10,000
Gay	Polarized Electron Physics (NSF)	$259,095
Jaecks	REU Supplement (NSF)	$5,000
Jaecks	Mass Dependent Effects in Correlated Motion of Massive Coulomb Interacting Particles: Quantitative (NSF)	$237,500
Jones	Assess Student Achievement in Undergrad Education (NSF)	$41,096
Lee	Astronomy Applet Development (Space Telescope Science Institute)	$13,520
Leslie-Pelecky	Cluster-Assembled Soft Magnets for Power Electronics Applications (ONR-DEPSCoR)	$73,041
Leslie-Pelecky	CAREER: Cluster-Assembled Magnetic Nanostructures (NSF)	$80,000
Leslie-Pelecky/Buck/Dussault/Kirby	GK-12: Project Fulcrum-Building Partnerships (NSF)	$243,364
Liou	Deposition of Bonding Layers for Micro-Hydraulics Transducers (MIT)	$7,225
Liou/Doudin/Qiang/Rajca/Sellmyer	Acquisition of a Focused Ion Beam Workstation for Processing of Single Crystals and Nanometer-Size Materials (NSF)	$158,500
Liou/Sabirianov	Magnetic Domains of Nanometer-Size Magnetic Features (ARO-DEPSCoR)	$90,000

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GRANTS *continued from page 23*

Principal Investigator	Title (Source of Funds)	Amount
Qiang/Sellmyer/Skomski	Dynamics and Control of Interacting Spins in Nanoscale Metamaterials (ARO-DEPSCoR)	$90,000
Schmidt	Pulsational Properties of Type II Cepheid Variable Stars (NSF)	$40,000
Sellmyer	Extremely High Density Recording (NSIC)	$22,530
Sellmyer	Extremely High Density Recording (NSIC)	$45,000
Sellmyer	Acquisition of a Squid Magnetometer (AFOSR)	$160,000
Sellmyer/Doudin/Dowben/Ducharme	Nanoscale Magneto-Electronic Structures and Devices (ONR)	$980,880
Sellmyer/Doudin/Dowben/Kirby/Liou	Nanoscale Materials for Information Technologies (NRI)	$250,000
Sellmyer/Doudin/Leslie-Pelecky/ Liou/Qiang	Development of a Cluster-Deposition System for Nanoscale Magnetic Materials (NSF)	$40,000
Sellmyer/Jaswal	Fundamental and Magnetic-Hardening Studies of Rare-Earth Nanocomposite Magnets (DOE EPSCoR)	$90,000
Sellmyer/Liu, Y.	Nanocomposite Perpendicular Media for Extremely High Density Magnetic Recording (Carnegie Mellon Univ.)	$60,776
Skomski	Raytheon Magnetic Meta-Materials (Raytheon Corp.)	$70,752
Skomski/Sellmyer/Liu	Novel Magnetic Nanostructures (AFOSR-DEPSCoR)	$105,000
Snow	Dzero Collaboration (Fermi Lab)	$11,000
Snow	The Snowmass Area Large-Scale Time-Coincidence Array (US Trust Company of NY)	$85,635
Snow/Claes	Experimental High Energy Physics (NSF)	$180,000
Starace	Coherent Control of Continuum Quantum Processes (NSF)	$85,000
Starace	Dynamics of Few-Body Atomic Processes (DOE)	$94,500
Weymouth	Fort Mandan Site (History-Discovery Channel)	$2,530
	Total	**$5,301,043**

AAPT – American Association of Physics Teachers
ACS – American Chemical Society
AFOSR – Air Force Office of Scientific Research
ARO – Army Research Office
CRDF – U.S. Civilian Research and Development Foundation
DEPSCoR – Defense EPSCoR
DOE – U.S. Department of Energy
EPSCoR – Experimental Program to Stimulate Competitive Research
IBM – International Business Machines
MIT – Massachusetts Institute of Technology
NRI – Nebraska Research Initiative
NSF – National Science Foundation
NSIC – National Storage Industry Consortium
ONR – Office of Naval Research
USDA – U.S. Department of Agriculture