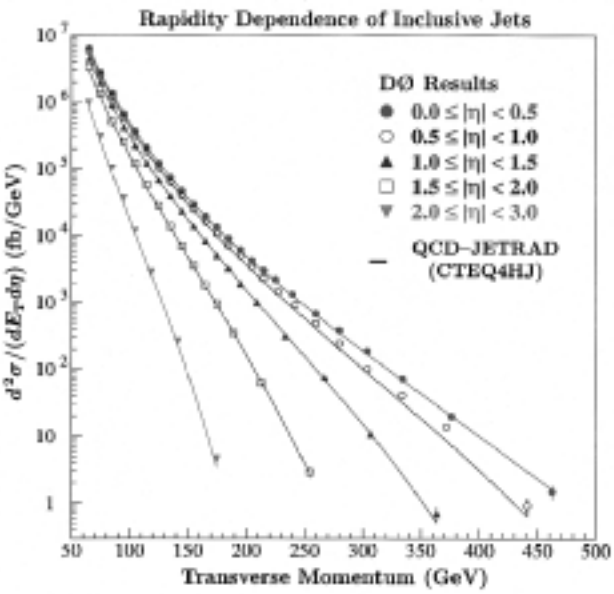
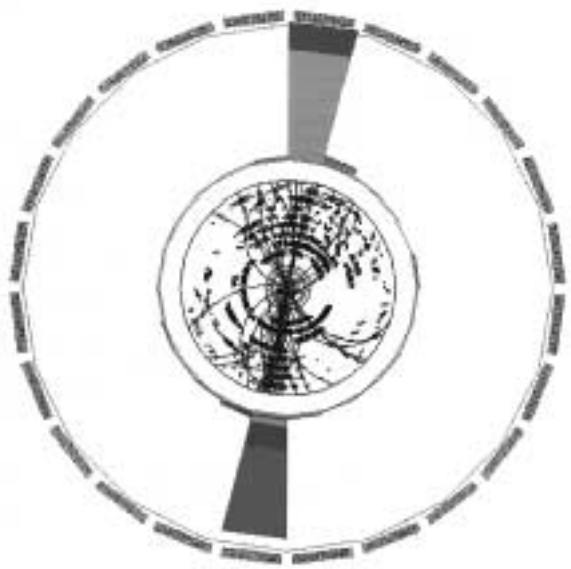
Cross Sections

DEPARTMENT OF PHYSICS AND ASTRONOMY
UNIVERSITY OF ROCHESTER
JANUARY 2001





Message from Our Chair

—Arie Bodek

Fall of 2000 has again been a very busy period at Rochester. As many of you know, the University's Sesquicentennial celebration was a great success. In particular, the excellent lectures on quantum physics (by Steve Chu) and on astrophysics (by Adam Frank) were packed to capacity.

Several of our faculty members received recognition for excellence in research or teaching this past year. The department also recently hosted the conference "Quantum Control of Atoms and Fields: A Symposium in Honor of J. H. Eberly." In addition to the conference in his honor, Eberly has been elected as one of the very few foreign members of the Polish Academy of Sciences. Eberly also received the University-wide Goergen Award for excellence in teaching at the undergraduate level. At the department level, Lynne Orr and Steve Teitel received the SPS undergraduate teaching award in physics.

Nick Bigelow was just named Lee DuBridge Professor of Physics. Eric Blackman received a Junior Faculty Development Award in Plasma Physics from the Department of Energy, and Kevin McFarland was named to the very important position of offline co-manager of the CDF experiment at Fermilab.

With the announcement of a novel M.D./Ph.D. program and a Ph.D. program in cross-disciplinary physics, the department has also expanded its educational opportunities for graduate students. These and other news items of interest to alumni, including current issues of our departmental newsletter, are available online from the department's Web page at www.pas.rochester.edu.

Finally, I wish to bring to your attention the financial needs of the department. We have several important priorities, such as supporting our junior faculty with matching department resources and providing fellowship support for our best prospective students and postdoctoral fellows. Contributions to these and to the other causes described on the last page of this newsletter can help maintain our strength in this very competitive world of science. In this regard, fund-raising from alumni contributions to the department has been lagging somewhat of late, and we urge you to consider offering us more. We know that many of you send contributions directly to the University, and we certainly applaud that. However, should you wish to contribute to any of the specific activities of the Department of Physics and Astronomy, you might consider completing the form on page 11 of the newsletter, and mailing your contributions directly to the department office.

On the Cover

About five years ago, the CDF experiment at the Fermilab Tevatron proton-antiproton collider found an excess yield of jet events (remnants of quarks) at large transverse momenta. They could not easily accommodate that excess within the "color" theory of strong interactions—quantum chromodynamics (QCD). This was very exciting, because this result could be interpreted as evidence for possible substructure within quarks. Subsequently, the DZero collaboration published their measurements, which agreed nicely with those from CDF, but, using a somewhat different parametrization of the theory, was at the same time also consistent with QCD. The data displayed in the cover illustration show the latest results from DZero for a wide range of scattering angles ("eta") and transverse momenta, and display remarkable agreement with the latest theory.

In spring 2001, both CDF and DZero will be restarting their program at the Tevatron with improved detectors, an improved accelerator complex, and a somewhat higher collision energy. The latter is particularly important, because if CDF did, in fact, observe the first hints of a substructure within quarks, then the yield of jets at largest transverse momenta will increase enormously with even a small increase in energy, and not even flexible QCD will be able to stretch its predictions sufficiently to accommodate the higher cross section. Both the CDF and DZero groups at Rochester are looking forward to those preliminary measurements. A spectacular two-jet event, observed in late October during a recent test run of the upgraded CDF detector, is also shown in the cover illustration, and it sure whets the appetite for more!

Cross Sections

Editors: Tom Ferbel and Eric Blackman

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Eberly Receives Goergen Award and Is Celebrated for His Impact on Quantum Optics

Joe Eberly, our Andrew Carnegie Professor of Physics, received one of the University's most prestigious prizes, a Goergen Award, for developing physics courses that introduce freshmen to sophisticated topics usually reserved for upperclass and graduate-level students. Making the material sufficiently digestable was a great challenge, but Joe has succeeded in introducing aspects of quantum theory, such as Heisenberg's uncertainty principle, Schroedinger's cat, and even teleportation to the freshman class. Students, teaching assistants, and parents alike have praised Eberly for demystifying and for generating enthusiasm for the advanced physics ideas through his clarity, good humor, and accessibility.

This has been an especially busy season for Joe. Besides the Goergen Award, Joe was honored by his colleagues, worldwide, with a special Symposium on Quantum Control of Atoms and Fields, in honor of his 65th birthday. Although it was clearly a powerful and an exciting conference, to those of us outside the field, the most memorable aspect was the superb quality of the

Continued on page 8

Longtime friend of our department, Iwo Bialynicki-Birula from Warsaw, bringing tidings of Joe's selection to the Polish Academy of Science

Young Kee Kim—Person to Watch!

Young Kee Kim (Ph.D. '90), now associate professor at University of California-Berkeley, was featured in the October 2000 issue of *Discover Magazine* as one of "20 Scientists to Watch in the Next 20 Years."

Young Kee received her Ph.D. in experimental particle physics on the AMY experiment under the supervision of Steve Olsen (currently at the University of Hawaii). The article states "Today, at age 37, she is a world leader in experimental particle physics." Young Kee is recognized both for her great technical skills as well for her prowess in analysis. She is one of the major leaders of the CDF Collaboration at the Fermi National Accelerator Laboratory (Fermilab), and has special interest in issues pertaining to electroweak physics. She was the key individual in the extraction of a precision value of the mass of the W Boson from events in antiproton-proton interactions observed with the CDF detector at the Fermilab Tevatron Collider. She is currently in charge of commissioning the CDF detector for its next data-taking run in March 2001.

A colleague from DZero watching Young Kee

Michael Zingale Our Neutron Star

Michael Zingale (B.S. '96), now a graduate student at the University of Chicago, was featured in the News Flash section of *Discover Magazine* (September 2000). Zingale came to Rochester as a Bausch & Lomb Scholar, served as the vice president of the SPS, and was elected to Phi Beta Kappa and Sigma Pi Sigma. He won both the Flagg Award and the Stoddard Prize for the best senior thesis in 1996, which he began with Mark Wardle, and finished under the supervision of Jack Thomas.

Zingale teamed up with astrophysicist and former Rochester graduate student Don Lamb (Ph.D. '74) and other colleagues at the University of Chicago's Accelerated Strategic Computing Initiative Flash Center to model what happens when a dense, collapsed stellar remnant—a neutron star—accretes helium gas from a more sedate stellar companion. Astronomers have seen the resulting blasts of X-rays but, because these stars are so far away from earth, it is not possible to observe the details of the interaction.

In Zingale's simulation, gas piles up on the neutron star until the material reaches critical density, touching off a thermonuclear firestorm. A supersonic shock-front then flashes over the entire 20-mile-diameter neutron star in a few milliseconds. Behind the shock-front come waves of billion-degree helium ash. As the helium fuel burns, matter from the neutron star is hurled to a height of about 10 miles before crashing back down under the intense pull of gravity. This is apparently far more violent than had been expected, and has set the astrophysics community abuzzing.
—Based on Kathy A. Svitil's story in *Discover Magazine*

Raines Is the University's 7,000th Ph.D.

Erstwhile physics and astronomy graduate student S. Nicholas Raines received the 7,000th Ph.D. granted by University of Rochester, according to University Public Relations.

Raines wrote his dissertation on "A near-infrared study of the Herbig-Haro features in GGD 37," under the supervision of Dan Watson. His work concerns the physics of regions of star formation. In particular, his dissertation is a description of his near-infrared spectroscopic imaging observations of a "paradigm" star-formation region (GGD 37, in Cepheus). Nick's work has revealed important new details

of the interaction of high-speed outflows from newly formed massive stars with the molecular-cloud surroundings from which the new stars formed. This past June, Nick took a postdoctoral position in infrared astronomy at the University of Florida in Gainesville.

First Physics From RHIC

Following a brief but productive first run of the new relativistic heavy ion collider (RHIC) at Brookhaven National Laboratory, Steve Manly and Frank Wolfs are pleased with the first results from their PHOBOS experiment. RHIC was designed to create samples of a dense and hot new state of matter, referred to as a quark-gluon plasma. This is supposed to be produced when energetic heavy ions collide, and the energy is such that normal nuclear matter can undergo a phase transition into a soup made up of its quark and gluon constituents. Such collisions mimic the conditions that existed a few millionths of a second after the Big Bang, when quarks and gluons merged to form neutrons and protons that eventually formed larger nuclei, as the universe expanded and cooled. It is hoped that detailed study of this phase transition in the laboratory can provide insight into the conditions that prevailed in the early universe, and into the force that binds quarks and gluons into protons and neutrons.

PHOBOS is one of four experiments taking data at RHIC. It was the first experiment to publish a physics result—see *Phys. Rev. Lett*. 85, 3100 (2000). PHOBOS measured the number of particles produced in central collisions in this new high-energy regime. This particle multiplicity is the most basic parameter in such interactions, and sets the scale for the energy density reached in these collisions. Much work remains before conclusions can be drawn about the possible existence of the sought-after quark-gluon plasma. New results from the data taken this summer will be released shortly. In the meantime, the accelerator and experiments are undergoing upgrades in preparation for a new run, at even higher energies, in the spring of 2001.

Natural Cyclical Events Seen to Follow Fractal Pattern

According to our own Yonathan Shapir and Jacob Jorné (chemical engineering), weather, battery life, and even the way your lawn grows are all linked by four mathematical laws. Their paper, published this past April in *Physical Review Letters*, shows how natural cyclical events, such as seasonal weather, generate very specific patterns—the same patterns that govern geometric images called fractals.

Fractals are mathematical designs that repeat their patterns on ever smaller scales: no matter how much you magnify a fractal, the same patterns reappear. Such patterns can also be created as a function of time, as in the case of sediments that build up on a surface. The tiny irregularities in the first layer become larger and more exaggerated in successive layers.

It is known that many structures in nature, from lightning bolts to cauliflower heads, produce such fractal patterns, but the new findings are the first to demonstrate that fractal patterns also appear in nature's cyclical changes. Often, a combination of growth and recession is required for a full development of some phenomenon; what amazes Shapir is how many growth and recession cycles can be described by just a few fractal solutions.

Jorné and Shapir argue that fractal equations may help physicians estimate the spread of cells that grow and recede, such as in tumors in chemotherapy patients. They also expect that the lifespan of car batteries can be predicted faster and more cheaply because engineers will be able to extrapolate data from a few charge cycles to thousands. Even predicting such seemingly random matters as how your lawn grows could be made possible by measuring the frequency of rain and sun and matching these cycles to the proper equation.

Shapir and Raychaudhuri at the blackboard

Shapir and graduate student Subhadip Raychaudhuri used computers to model random depositions and removal of material on different types of surfaces. After each deposition, they simulated processes, such as water erosion or battery discharge, that removed some of the deposited objects in equally random fashion. This was done tens of thousands of times. To their surprise, they found that no matter what type of objects, forces, or surfaces were simulated, each of the simulations could be described by fractal solutions. After any new deposition, the surface layer became more and more irregular, repeating the same basic shapes on ever larger scales.

With predictions in hand, Jorné and David G. Foster, one of our former graduate students in chemical engineering (Ph.D. '99) and currently at Eastman Kodak, designed an experiment that deposited atoms of silver onto an electrode, followed by a reverse in charge to remove some of the silver. As expected, the silver atoms accumulated in a fractal pattern.

Clearly, besides its inherent scientific interest, this work promises to have important technological ramifications.

Brignall, Van Remmen, and Ruggiero Receive Employee Recognition Awards

Physics and astronomy University Employee Recognition Awards for the year 2000 were presented at the annual fall faculty/staff reception. The reception took place at the Memorial Art Gallery. Two of the awards were for 10 years of service, one of the recipients was Dan Ruggierio (M.A. '89), who is stationed at Fermilab, and the other one was Jennifer Van Remmen, who is a University alumnus (B.A. history '89) and the undergraduate counselor. Shirley Brignall, who has been running the department since the early dawn of time was recognized and honored for 45 years (yes, 45 years!) of service to the department. Shirley is as bright and spunky as ever.

A smiling Shirley

Emil Wolf and Masatoshi Koshiba Honored at Doctoral Commencement

Emil Wolf received the University Award for Excellence in Graduate Teaching. President Jackson quoted Nobel Laureate William Phillips, who remarked that, "If there is anyone who can be said to be the world's teacher of optics for the latter part of the twentieth century, it is Emil Wolf. Emil is the Wilson Professor of Optical Physics and the coauthor with Max Born of the classic volume Principles of Optics, commonly referred to as "Born-Wolf."

Among his former students are directors of laboratories and departments and faculty members at universities throughout the United States and the rest of the world. Emil has been awarded honorary degrees from many universities worldwide and is a former recipient of the Ives Medal and many other distinctions.

Masatoshi Koshiba (Ph.D. '55) was awarded the Rochester Distinguished Scholar Medal. Toshi is currently a very active professor emeritus at the University of Tokyo. He received the Wolf Prize last year for his work on extraterrestial sources of neutrinos, which led to the discovery that neutrinos have mass. Toshi started his career as a research associate at the University of Rochester, then went on to teach at the University of Tokyo.

His long career has included positions as a professor, fellow, distinguished scholar, and research laboratory director at institutions such as the University of Chicago, California Institute of Technology, and the University of Hamburg. Among Toshi's many awards are the Bruno Rossi Award of the American Physical Society, the Fujiwara Prize of the Fujiwara Science Foundation, and the Order of Cultural Merit presented by the emperor of Japan.

Blackman Wins $450,000 Physics Prize

Eric Blackman, our most recently appointed assistant professor of physics and astronomy, has received the Plasma Physics Junior Faculty Development Award from the U.S. Department of Energy. The $450,000 prize goes to exceptionally talented scientists who are just starting their careers in the study of plasma, the ionized gas that forms stars and galaxies. Blackman won the award for his theoretical investigations designed to learn what creates very large magnetic fields, the kind that cause massive solar flares that knock out power grids and satellites. Understanding what types of forces give rise to these eruptions should lead to the ability to predict their occurrence and to design of electronics that would minimize their effects.

George Field, one of Eric's former mentors, and professor of astronomy at Harvard University, said that "Eric's work on plasmas in space has us all excited," and that "everywhere we turn there are phenomena it seems to explain: gamma ray bursts, radio galaxies, solar flares." It is easy to understand why he received this prestigious award.

Eric believes that what we can learn from laboratory plasmas may help explain some of nature's most mysterious and energetic sources from distant galaxies a billion light years away. Astrophysical plasmas conduct electricity and therefore can support huge magnetic fields. Often, these fields will leech energy away from the body that formed it into outer space, creating solar flares and other phenomena.

Harry Gove Still in Mass Spectrometry, in Toronto

Harry Gove, one of the originators of methods for precision mass spectrometry, has been spending somewhat less time around the department lately, but not because of any tendency for retirement! Harry is an adjunct professor of physics at the University of Toronto, working at the University's Isotrace Accelerator Laboratory for Mass Spectrometry. He is presently involved in a project to measure ratios of carbon-14 to carbon-12 in natural gas or petroleum products, with the hope of identifying material with lowest possible levels of radioactive carbon that could be suitable for the manufacture of liquid scintillator for very-large-volume neutrino detectors.

M.D./Ph.D. Program Initiated at the University

The Department of Physics and Astronomy is participating in a new program that provides students who have strong undergraduate preparation in physics with an opportunity to work simultaneously toward an M.D. degree and a Ph.D. degree in physics. To complete the program, students have to satisfy graduate requirements of both the School of Medicine and Dentistry and of the Department of Physics and Astronomy. It is hoped that the emerging well-trained scientists will play leading roles in medical research and education.

During their first two years, students complete the formal coursework required for their M.D. degree in the School of Medicine and Dentistry. They simultaneously locate an advisor in physics and astronomy, and start their research during summers following their first year of study. The third year is devoted primarily to coursework in the Department of Physics and Astronomy. Successful candidates have to pass a written preliminary exam based on these courses, as is the case for all students working toward their Ph.D. in physics and astronomy. The M.D./Ph.D. students normally take this exam during their fourth year in the program, when they start serious work on their Ph.D. thesis. The remaining medical part of the curriculum is finished in the two final years of study. It is anticipated that it will take typically 8 to 10 years to complete this innovative and demanding new dual-degree program.

Shapir Is Busy Harvesting Light!

Yonathan Shapir and Shaul Mukamel (chemistry) have determined the ideal size for a light-harvesting molecule that can, in principle, improve the light gathering of everything from photoelectric cells to genetically engineered plants. The phenylacetylene molecule, an artificially designed assembly of chromophores, begins to lose its efficiency at channeling light to a central core when it gets beyond a certain size. Until recently, many scientists thought that the larger the molecules the more light they could collect. However, computer simulations for the time it takes for a photoexcitation to migrate from the periphery of the molecule to its active center, where the desired chemical process takes place, have shown that the efficiency decreases beyond a certain optimal size.

Joe Eberly

Continued from page 5

wine at the banquet. Joe was also presented with a most remarkable collection of wines for his future enjoyment, and an announcement from his Polish colleagues that he was just selected as one of the very few foreign members of the Polish Academy of Science. Previously, Joe was the recipient of many awards and distinctions, including the Charles H. Townes Award of the Optical Society of America, an Alexander von Humboldt Prize from Germany, and the Smoluchowski Medal of the Physical Society of Poland.

Other Awards and Prizes

During her first year in graduate studies, Jane Wesley must have done a superb job in her teaching of undergraduate physics. She impressed not only her students, but the University, and received the Edward Peck Curtis Award for Excellence in Teaching by a Graduate Student. The departmental award for Best Graduate Teaching Assistant was awarded to Kenneth S. Anderson.

Speaking of teaching awards, Lynne Orr and Steve Teitel shared this past year's Undergraduate Physics Faculty Teaching Award, which is administered and awarded by our own undergraduates.

The first Frederick Lobkowicz Thesis Prize was awarded last May to Michael Begel. Michael is presently a postdoc on the DZero collider experiment, and among his responsibilities is the electronic communication between the DZero collider experiment and the Fermilab Accelerator Division. During his graduate studies, he worked with our late colleague on issues related to proton substructure and QCD.

The John F. Flagg Prize for best class performance by a graduating senior was shared by Peter Allen and Jason Sickler. The University Stoddard Prize for the best senior thesis was shared by Peter Allen and Aaron Reichman. The Physics Honors Prize for the sophomore student with the best academic record in the honors introductory course sequence was awarded to Lisa Marshall. For other honors announced at this past year's graduation ceremonies, see "Events" and the entry of 5/6/00 on our Web page (www.pas.rochester.edu) under "Dept. News Archive," or, more directly, see http://borg-cube.pas.rochester.edu/wwwPAS/PASforms/news/newsReader$0000041.

QuarkNet Class Updates Teachers on Trends in Physics

For three weeks of this past summer, 12 area physics teachers—from Rochester, Pittsford, Naples in Ontario County, and Geneseo in Livingston County—participated in the QuarkNet learning program organized by Kevin McFarland. This first year's experience was declared a resounding success by all involved. (For more photos from this past summer's program, see www.pas.rochester.edu/~pavone.)

QuarkNet is a nationwide effort, supported by the Department of Energy, that attempts to introduce the flavor of modern research to high school physics teachers, so that they can bring that back to their classrooms, and thereby interest students in science.

This past summer, teachers built their own cosmic ray telescopes from raw materials, learned about the physics involved, and then analyzed the information they collected using a computer-based data acquisition system. They plan to take what they have learned and built back to their own classrooms to share with their physics students. The teachers will also continue to meet during the school year for follow-up discussions about how they incorporated new learning into their curriculum, and will try to assess what worked and what didn't work.

Several of the participants in QuarkNet at a reunion in the fall

In individual experiments, one pair of teachers studied the effect of lead shielding on cosmic rays, another on whether a magnetic field would bend the rays, and so on.

After the completion of the course, the detectors became part of an equipment lending library of our department, and any teacher can borrow a detector for weeks at a time and demonstrate its performance in class.

It was an exciting learning experience for the teachers, through which they got a taste of what can be termed "big physics." McFarland is already submitting proposals to different funding agencies to keep his program going next summer.

—Based on Breea Willingham's article in the *Democrat & Chronicle*

Nick Bigelow Named Lee A. DuBridge Chair in Physics

The University Board of Trustees, at their Sesquicentenial meeting, honored Nick Bigelow with an appointment as the Lee A. DuBridge Professor of Physics. Bigelow is a distinguished researcher in the field of experimental

and theoretical quantum optics. His recent work has focused on Bose-Einstein condensates (see the 1999 issue of *Cross Sections*). Bigelow, an excellent teacher, who was awarded the Faculty Teaching Award in Physics in 1998, also serves as the director of undergraduate studies in physics.

Alumni News

Robert Greenler (B.S. '51), received his Ph.D. at Johns Hopkins University, and has maintained close professional ties with members of the University of Rochester community. He was president of the Optical Society of America in 1987, and is now professor emeritus of physics at the University of Wisconsin-Milwaukee. His recent book *Chasing the Rainbow: Recurrences in the Life of a Scientist*, published by Elton-Wolf Publishing, is available at www.blueskyassociates.com.

John Timothy Londergan (B.S. '65) is professor of physics at Indiana University, Bloomington, where he is also director of their Nuclear Theory Center. This past year he co-authored the book *Binding and Scattering in Two-Dimensional Systems: Applications to Quantum Wires, Waveguides and Photonic Crystals* (published by Springer-Verlag).

Arthur Vaughan (Ph.D. '65) retires formally from Jet Propulsion Laboratory in Pasadena in January 2001. Art was a major contributor to the design of the Wide Field Camera on the Hubble Space Telescope (HST), as well as an important contributor to the prescription for HST repair in 1993. He also participated in the Calcium H and K lines monitoring program initiated by Olin Wilson, which has led to the determination of rotation and activity cycles for solar-type stars. In his spare time, Art has advised our Institute of Optics, and built both a harpsichord and a violin.

Morton Farber (Ph.D. '69) is currently a senior analyst at Boeing International, and flies perodically by his alma mater for visits to Kodak.

Sheldon Stone (Ph.D. '72), currently professor of physics at the University of Syracuse, is the scientific cospokesperson of a newly approved major experiment at Fermilab called BTeV, that will study the properties of the bottom quark and CP violation.

John Harvey (Ph.D. '77) is serving as deputy assistant secretary of defense for nuclear forces and missile defense policy. In this role, he develops and oversees implementation of U.S. defense policy, governing strategic and theater nuclear forces and ballistic missile defense. Before this, John was director of the science program at Stanford University's Center for International Security and Arms Control.

Ronald Poling (Ph.D. '81) recently received recognition from his undergraduate alma mater, SUNY at Buffalo. He was awarded the Clifford C. Furnas Memorial Award for his contributions in the field of elementary particle physics, and his role as spokesperson for the CLEO Collaboration. Ron is professor of physics at the University of Minnesota.

Jerry Krassner (M.S '76, Ph.D. '83) has joined Dynamics Technology Inc. in Rosslyn, Va., as vice president for their intelligence/surveillance/reconnaissance in their business area. In addition, he was recently elected vice chairman of the Measures and Signatures Technology Association. In his spare time, he pitches for an international goodwill baseball team, and has played ball in Scandinavia, Russia, Ukraine, other European countries, and China.

J. Andrew Markiel (Ph.D. '99) has a staff-research position in the Department of Astronomy at the University of Washington, where he works in George Lake's group on N-body simulations, and particularly on simulations of cosmology and large-scale structure in the universe. He also continues to collaborate with his former colleagues at Rochester on stellar dynamo theory and the formation of planetary nebulae.

At the recent meeting of the American Astronomical Society held in Rochester, we were pleased to welcome back many former students, including **Jennifer Goetz** (Ph.D. '99), now an assistant professor at the College at Wooster; **Paula Turner** (Ph.D. '95), now associate professor at Kenyon College; **Steve Solomon** (Ph.D. '98), formerly of Raytheon Infrared Operations and now working as a consultant; and **Jason Pun** (B.S. '90), who is currently a research scientist at the NASA Goddard Space Flight Center in Maryland.

Doing well at the Tevatron, is former Rochester student **Rob Roser** (Ph.D. '94), currently a Wilson Fellow at Fermilab and coordinator of the installation of the CDF collider experiment. **Nikos Varelas** (Ph.D. '94), assistant professor at the University of Illinois at Chicago, is co-head with Jerry Blazey (one of our former senior research associates and currently professor and director of the Institute on Accelerator Physics at Northern Illinois University) of the trigger system for the DZero experiment. **Bob Hirosky** (B.S. '87, Ph.D. '93) is currently assistant professor at the University of Virginia, with responsibility for the second-level trigger at DZero. **David Buchholz** (B.S. '66), professor and currently chair of the physics department at Northwestern University, still finds the time to oversee the online calibration of the tracker at DZero. **Dylan Casey** (Ph.D. '97), working on the trigger system at DZero, has accepted an appointment as assistant professor at St. Johns College (of "great books" fame).

P.S. If you change your mailing address, please contact Bob Knox with your new whereabouts (rsk@pas.rochester.edu). Also let him know your current e-mail address.

Departmental Funds

The department has established several funds that greatly benefit departmental activities. They are:

The David L. Dexter Memorial Fund. Established in 1981 to honor the memory of the late Professor Dexter, this fund supports an annual lecture by an outstanding scientist.

The Robert E. Marshak Memorial Fund. This fund will be used to support the newly created postdoctoral Robert E. Marshak Research Fellowships, intended to attract the most talented young nuclear and particle physicists to Rochester to continue their research in the department.

The C. E. Kenneth Mees Observatory Fund. Established in 1977, this fund is for the discretionary use of the director of the University's Mees Observatory in support of observatory activities, such as the recent upgrade to the facility.

The Elliott W. Montroll Memorial Fund. Established in 1984 in memory of the late Professor Montroll, this fund supports the Montroll Memorial Lectures in Physics.

The Physics and Astronomy Alumni Fund. Established in 1968, this fund is for the discretionary use of the chair of the Department of Physics and Astronomy in support of departmental activities.

Contributions from alumni and friends are the dominant source of income to these funds. If you would like to support the Department of Physics and Astronomy, please mark the appropriate box on the form below and send it with your contribution. Donations may be tax-deductible, and donations of appreciated securities may also carry significant tax advantages. The department is grateful for any help you may wish to give.

I wish to contribute to the following fund:

- ❑ *The David L. Dexter Memorial Fund*
- ❑ *The Robert E. Marshak Memorial Fund*
- ❑ *The C. E. Kenneth Mees Observatory Fund*
- ❑ *The Elliott W. Montroll Memorial Fund*
- ❑ *The Physics and Astronomy Alumni Fund*

Enclosed, please find my contribution in the amount of $ _____

Name _____

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Year/Degree _____

If donating by check, please make your check payable to the "University of Rochester," indicate on the check that it is for the "Department of Physics and Astronomy," and please indicate the specific fund to which your donation should be applied. Gifts of appreciated securities are also gratefully accepted. Please send your contribution and this form to:

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