




Cross Sections



DEPARTMENT OF PHYSICS AND ASTRONOMY
UNIVERSITY OF ROCHESTER
SPRING 2003

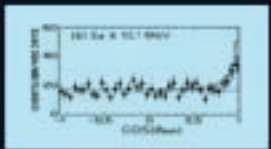
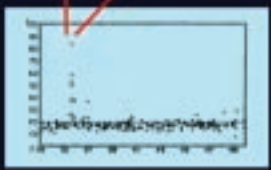
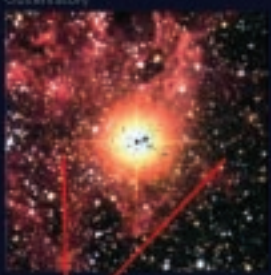
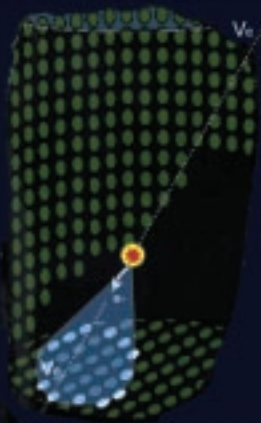
The Nobel Prize in Physics 2002



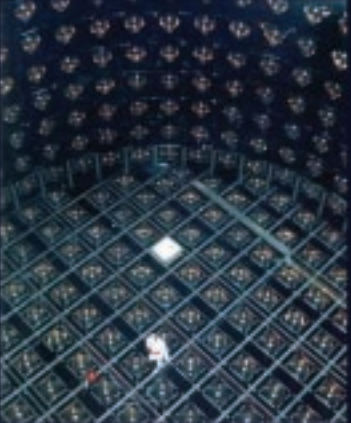
Masatoshi Koshiba
International Center for Elementary Particle Physics,
University of Tokyo, Japan

KAMIOKANDE CAPTURED NEUTRINOS IN WATER
Masatoshi Koshiba followed up on the measurements made by Raymond Davis Jr by developing a large water-filled detector, called KamioKANDE, in a Japanese mine. KamioKANDE was direction sensitive and could confirm Davis' discovery that neutrinos came from the sun. The detector was operating on 23 February 1987 and detected 12 of the 10^{14} neutrinos emitted by supernova 1987A when it exploded 170,000 light years from the earth – the first clear observation of neutrinos produced outside our galaxy.

The Supernova 1987A
The neutrinos arrived at 07:35 on 23 February 1987.
Photo: The Anglo-Australian Observatory



There is a clear increase in the signal for neutrinos coming from the sun.



The KamioKANDE water tank was lined with photomultipliers. When neutrinos enter the tank, they can interact with electrons. These produce flashes of light, which are registered by the photomultipliers.
Photo: KamioKANDE Observatory

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*Second
department
alumnus
to win the
Nobel Prize*

Message from the Chair

—Arie Bodek

Because of the great success of the sesquicentennial celebration, the University has initiated a new tradition of hosting a Meliora Weekend reunion every year (see www.rochester.edu/alumni/). The theme in fall 2003 is "Innovation," and we plan to highlight the most recent innovations and discoveries in physics and astronomy. We encourage all our alumni and friends to continue this tradition, come for the weekend, and visit us during Meliora Weekend (or anytime!).



Several of our faculty and students have received awards during this past academic year. Among the faculty, Professor Emil Wolf, received the OSA Esther Hoffman Beller Award; Professor Judy Pipher was awarded the Susan B. Anthony lifetime achievement award; Professor Manly was appointed Distinguished Brugler Teaching Professor; and Professor Kevin McFarland was awarded an NSF Career Award. Professors Das, Betti, Boyd, Foster, Meyerhofer, and Tipton were elected APS fellows in 2001/2002. Among our students, graduate student Un Ki Yang received the 2002 URA/ Fermilab Award for best Ph.D. thesis (note that last year, another University of Rochester student Michael Fitch was awarded the 2001 URA/ Fermilab Award). Among our under-

graduates, Laura Schmidt and Elizabeth Strychalski were awarded the Catherine Block and Janet Howell Prizes in 2002, and Jason Nordhaus and David Etlinger won Goldwater Scholarships.

Over the years we have given high priority to the training of our undergraduate and graduate students. This attention has not gone unnoticed and has just been recognized in a nationwide survey of U.S. graduate students conducted in 2001. The Department of Physics and Astronomy at Rochester was ranked second nationwide in overall graduate student satisfaction.

It is a pleasure to report our success in the recent recruitments (in spring 2002) of Assistant Professor Alice Quillen, an experimenter in astrophysics, and Assistant Professor John Howell, an experimenter in quantum optics. Our most recent search in experimental particle physics resulted in the recruitment of Associate Professor Regina Demina, who will join our department at the end of spring 2003.

The department suffered a major loss with the passing of Len Mandel, one of the world's leading experts in the field of quantum optics. Len was an admired teacher and a brilliant experimenter, and was elected posthumously to the National Academy of Sciences. In Mandel's honor, we are starting a fund-raising drive for a Mandel Endowment in spring 2003.

We wish to take this opportunity to thank all our alumni who have con-

tributed generously to the support of the department. By completing the form on the back cover of our newsletter, or by responding to our current drive for the Mandel endowment, you can continue (or begin) that tradition of giving that will assure the future excellence of the department.

Other ways to help our cause is to inform any promising students about our summer undergraduate research program (REU), and to encourage students interested in careers in physics or astronomy to apply for graduate study at Rochester. In summer of 2002, Professor Alice Quillen and a Rochester REU student published a paper on evidence for a new extrasolar planet. Starting in summer 2003, the Department of Physics and Astronomy, in collaboration with the Institute of Optics and the Women in Science and Engineering Program are jointly administering two REU programs, one in physics and astronomy and one in optical science and engineering.

All application material for these programs is available on our Web pages (www.pas.rochester.edu). If you know of any exceptional undergraduates whom we should consider either for our REU program or for graduate school, we would appreciate it if you would please send their names and e-mail addresses to Barbara Warren (barb@pas.rochester.edu), and we will contact them directly. Any help from our alumni along these lines would be welcomed.

Cross Sections

Editors: Ashok Das and Shirley Brignall

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On the Cover

The 2002 Nobel Prize for Physics was awarded to three who pioneered the fields of neutrino astrophysics and X-ray astronomy. Ray Davis and Masatoshi Koshiba (Ph.D. '55) share half the prize for "pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos." Riccardo Giacconi receives the other half of the prize for "pioneering contributions to astrophysics, which have led to the discovery of cosmic X-ray sources." Koshiba is the second Department of Physics and Astronomy alumnus to have won a Nobel Prize. The first University of Rochester Physics and Astronomy alumnus to win a Nobel is

Steve Chu, who is currently on the Board of Trustees at the University of Rochester. Koshiba was born on September 19, 1926, in Toyohashi City Japan. He graduated from the Physics Department at the University of Tokyo, and received his Ph.D. from the University of Rochester in 1955 (under the supervision of Professor M. F. Kaplon). Koshiba was a professor at the University of Tokyo until his retirement on March 31, 1987. He created the underground facility Kamiokande to initiate neutrino physics. His many honors include the Order of Cultural Merit from the Emperor of Japan and the Wolf Prize from the President of Israel.

New Extrasolar Planet Discovered

Using a new technique, Alice Quillen, assistant professor of physics and astronomy, has discovered a previously unknown planet. Planets around other stars have been previously detected only by the effect they have on their parent star, limiting the observations to large, Jupiter-like planets and those in very high orbits. The new method uses the patterns created in the dust surrounding a star to discern the presence of a planet that could be as small as Earth or in an orbit so wide that it would take hundreds of years to observe its effect on its star. The research by Alice, and undergraduate Stephen Thorndike, appears in the October issue of the *Astrophysical Journal Letters*. "We're very excited because this will open up the possibility of finding planets that we'd probably never detect just looking at the parent star," says Alice. "We can confirm the presence

of certain planets in five years instead of the two centuries it would otherwise take." The new planet was discovered orbiting the star Epsilon Eridani about 10 light years from Earth. It is one of the lowest mass planets yet discovered around another star and has by far the longest, largest orbit of any yet discovered. Epsilon Eridani already has one discovered planet, the size of Jupiter (our solar system's largest planet) orbiting around the star about every five years. By contrast, the new planet is roughly a 10th of Jupiter's mass and completes an orbit once every 280 years.

Traditional planet-detection methods cannot reveal the new planet, tentatively named "Epsilon Eridani C," because



those methods watch for the effect a planet has on its parent star, and low-mass planets or those in very large orbits do not dramatically affect their star. The method that has detected most of the 100+ extrasolar planets so far measures how much the parent star "wobbles" as the planet's gravity tugs on it throughout its orbit. A newer method watches for planets as they pass in front of a star and slightly dim its light. Unlike current methods, Alice's technique does not use direct light from the star, but rather light radiating from the dust surrounding it. Not all stars have large concentrations of dust, but those that do, like Epsilon Eridani, can display certain telltale patterns in their dust fields. These patterns can betray the existence of a planet.



The west side of the Bausch & Lomb wing, the site of the department graduation luncheon, where the cherry trees are just beginning to bloom.

Physicists Study the El Niño and La Niña Climate Effects

David Douglass and colleagues at the University of Rochester and David Clader at the State University of New York at



Geneseo have shown that climate data collected on El Niño and La Niña since 1967 closely fit a “resonant function” with a period of about 15 years. The researchers hope their

discovery will help climate experts to identify the geophysical mechanisms that underpin El Niño and La Niña (arXiv.org/abs/physics/0203016). El Niño and La Niña are alternating hot and cold periods in the atmosphere and ocean of the Pacific, each lasting about six months. These effects are monitored by the “sea surface temperature anomaly”—the deviation in the temperature of a certain region of the Pacific Ocean from its average temperature. El Niño and La Niña are defined as a difference of more than 0.4 degrees centigrade that lasts at least five months. The

“southern oscillation index”—the difference in atmospheric pressure between certain points in the Pacific—is also closely linked to El Niño and La Niña. Climatologists had previously noticed that adjacent El Niños and La Niñas had similar intensities. This prompted David’s team to study these effects over a longer period, and they gathered measurements of the sea surface temperature anomaly and the southern oscillation index spanning more than 30 years. The researchers showed for the first time that the intensities of both El Niño and La Niña went through a cycle lasting about 15 years, which consisted of a large peak and two successively smaller peaks. Douglass, whose background is in condensed matter physics, and coworkers realized that this pattern very closely matched a so-called Landau-Lifshitz function, an equation that describes many damped resonant systems in physics. The Landau-Lifshitz function predicted many features of the super-

Niño event detected in the climate data, together with some that have not yet been seen. The physicists—who point out that they are not climate experts—believe that climatologists could use these results to establish the nature of the force that drives the oscillations, and to predict forthcoming El Niños and La Niñas. David and colleagues based their study on data collected up to July 2000, and initially estimated the error of their model to be between 30 percent and 50 percent. But they have been encouraged by more recent data collected while writing their research paper, which closely fits their original predictions. They became involved in the study of El Niño while they were investigating how changes in the output of the Sun affect the Earth’s temperature. “The El Niño effects are ‘noise’ that has to be removed,” David said. “What was understood about El Niño was not good enough for us so we advanced the understanding ourselves.”

HONORS AND AWARDS

Mark Houk Wins Curtis Award

Mark Houk of the Department of Physics and Astronomy has won the University’s Curtis Award for Excellence in Teaching by a Graduate Student in 2002. Each recipient of the Curtis Award receives a check for \$500. In addition,

each student’s department receives \$250 for improvements in undergraduate course materials or lab equipment. Mark holds a DOE/GAANN Fellowship in the Department of Physics and Astronomy.

Manly Appointed Distinguished Teaching Professor

Steven Manly, associate professor of physics and astronomy, has been named



Mercer Brugler Distinguished Teaching Professor at the University of Rochester. The appointment is in recognition of excellence in teaching and for encouraging the development

of cross-disciplinary instructional programs. The professorship was established in 1979 in honor of Mercer Brugler, chair emeritus of the University of Rochester Board of Trustees, with support from Sybron Corporation, Mr. Brugler, and others.

Laura Schmidt and Elizabeth Strychalski Awarded the Catherine Block and Janet Howell Clark Prizes

Laura Schmidt ('03) won the 2002 Catherine Block Memorial Fund Prize awarded by the University to a woman in the junior class in recognition of her outstanding ability and achievement in the field of science. Elizabeth Strychalski (PAS '02) received the 2002 Janet Howell Clark Prize. The Janet Howell Clark Prize is an annual prize awarded by the University to the senior woman who has shown the greatest promise in creative work in either astronomy, biology, chemistry, or physics, and who has shown outstanding versatility in the mastery of allied fields.

Pipher Honored with Anthony Achievement Award

Judith Pipher is the 2002 recipient of the Susan B. Anthony Lifetime Achievement Award. Dr. Pipher, professor of astronomy, has been a member of the Department of Physics and Astronomy since 1971. She is internationally known for her work developing infrared detector technology and for her numerous publications on star formation as well as the study of dusty galaxies and galaxy nuclei.



Wolf Receives Esther Hoffman Beller Award from OSA

Emil Wolf, Wilson Professor of Optical Physics in the Department of Physics and Astronomy, has been selected by the Board of Directors of the Optical Society of America (OSA) to be the 2002 recipient of the Esther Hoffman Beller Award. Wolf's citation states, "For numerous outstanding contributions as an educator, but especially for the influence of his books, which have been educating optical scientists and engineers for more than 40 years." The Esther Hoffman Beller Medal is presented for outstanding contributions to optical science and engineering education.



McFarland Receives NSF Career Award

Professor Kevin McFarland was the recipient of the NSF Career award in 2002. Professor McFarland's proposal titled "Precision Measurements of the Top Quark and Cosmic Ray Telescopes for the Classroom" was selected for funding for a total of \$305,000 for a period of five years. This would be the fourth prestigious award for McFarland,



who has received a Sloan Foundation Fellowship, a Department of Energy (DOE) Outstanding Junior Investigator Award (OJI), and Cottrell Scholar Award from the Research Corporation.

Jason T. Nordhaus and David Etlinger Win Goldwater Scholarships

Jason T. Nordhaus has been selected to receive one of 309 Goldwater Scholarships to be awarded nationally for the academic year. Jason is majoring in astrophysics and in mathematics at the University of Rochester. David Etlinger was selected last year as one of 302 to receive a Goldwater Scholarship. David is a physics/mathematics major here at Rochester. As part of the scholarship, they each will receive a grant of up to \$7,500, which can be used to cover tuition, fees, books, and room and board.

Faculty Fellows of the American Physical Society in 2001/2002



Betti



Boyd

Professors Betti, Boyd, Das, Foster, Meyerhofer, and Tipton were elected Fellows of the American Physical Society in 2001 and 2002. Only half of 1 percent of the total APS membership is selected for fellowship in the society each year.



Das



Meyerhofer



Foster



Tipton

Fund-Raising for Mandel Endowment Fund

The department has announced the start of a fund-raising drive for an endowment fund established in memory of Professor Leonard Mandel. The fund will be used to support the Leonard Mandel Faculty Scholar Award in Physics at the University of Rochester. The award will be given for a fixed period to a faculty member at Rochester who is doing outstanding work in the field of optical science. As part of the award (assuming that the total fund-raising goal is met) the funds will be used by the Mandel Faculty Scholar to support a graduate student.

Leonard Mandel, who died at age 73 on February 9, 2001, was DuBridge Professor Emeritus of Physics and Optics at the University and one of the world's leading physicists. A recipient of the Frederic Ives Medal and Max Born Award of the Optical Society of America, the Italian National Research Council's Marconi Medal, and the Thomas Young Medal from the British Institute of Physics, Mandel was a fellow of the American Physical Society, the Optical Society of America, and the American Academy of Arts and Sciences. He was elected posthumously to the National Academy of Sciences. The Optical Society of America (OSA) held a special memorial session in Mandel's honor.

Professor Mandel was a pioneer in the branch of physics known as quantum optics, the study of the physics of light at its most fundamental level. He was known internationally for his ground-breaking experiments on the nature of light and was the first actually to observe a number of remarkable phenomena predicted by quantum theory. The research Professor Mandel conducted in this area became a landmark in the field and a signature of the entire Rochester quantum optics endeavor.

Not since the early days of quantum mechanics has one individual so intimately investigated and so dramatically advanced our understanding of the quantum aspects of light. It is for this reason that the University of Rochester can

rightfully claim to have been the birthplace of quantum optics. Within the department Mandel found a lifelong colleague and friend in Emil Wolf, whose work on coherence theory has received international acclaim, and whose text "Principles of Optics" (co-authored with Nobel Laureate Max Born) is still regarded as the definitive book on classical optics. Mandel and Wolf coauthored the well known book "Optical Coherence and Quantum Optics." Subsequently the strength of optics in the department has grown steadily, first through the work of Joseph Eberly, author of several popular texts including "Optical Resonance and Two-Level Atoms" and "Lasers," and then through vigorous, comprehensive experimental and theoretical optics programs guided by Professors Govind Agrawal, Nicholas Bigelow, Robert Boyd, John Howell, Carlos Stroud, and Ian Walmsley.

At Rochester, optical physics finds its home not only in the department but also in the Institute of Optics, an academic department that supports the nation's oldest degree-granting program in optics. Len Mandel was involved in the Institute for many years, and he held a joint appointment as professor of optics. Optical physics is not confined to these departments, however; it pervades programs across the University. The Rochester Theory Center for Optical Science and Engineering; the Departments of Chemistry, Mechanical Engineering, and Electrical and Computer Engineering; the Center for Visual Studies; the Center for Optical Manufacturing; the Laboratory for Laser Energetics; and the Center for Quantum Information are just a few of the other sources of optics research at the University of Rochester.

Len Mandel helped to shape this entire enterprise, and its impact on optics at national and international levels is profound. He was an early organizer of the international conference series "Coherence and Quantum Optics," which started in the 1960s and continues to be held on campus, while national professional societies such as the Optical Society of America regularly come to Rochester to hold their meetings. Indeed, it is hard to participate in a major conference or

attend a workshop on optics without meeting someone who has a connection to the University either as a former student, a fellow, or through training by a Rochester-educated researcher. Leonard Mandel and his colleagues at the University have taught students who are now leaders in optics in academia, in industry, and at national laboratories. In 1992, Mandel was awarded the University's Faculty Award for Graduate Teaching.

By creating an endowment at the University of Rochester in honor of the career of Leonard Mandel, one can be sure that Professor Mandel's devotion to research and education in optics—a field at the frontier of modern science and technology—will be carried on.

Colleagues and students of Len Mandel, led by Professor H. Jeffrey Kimble from Caltech (who earned his doctorate under Professor Mandel and is a member of the National Academy of Sciences), announced the start of the fund-raising at the 2003 CLEO/QELS meeting, which is jointly sponsored by the Optical Society of America and the American Physical Society. The CLEO/QELS 2003 combined the 23rd annual Conference on Lasers and Electro-Optics (CLEO 2003) and the 11th Quantum Electronics and Laser Science Conference (QELS 2003). It was held at the Baltimore Convention Center in Baltimore, Maryland, in June.

Professor Peter Knight, head of the physics department at Imperial College in London (and also fellow of the Royal Society and president-elect of the Optical Society of America) states, "I regard Leonard Mandel as one of the truly great figures of the 20th century in optics."

The goal for the endowment fund is \$500,000. The department is hoping to raise the funds over the next three years to support fully the professorship and graduate fellowship components.

For additional information, contact the department at (585) 275-4344.

Contributions can be mailed to:

Leonard Mandel Fund
Department of Physics and Astronomy
University of Rochester
P.O. Box 270171
Rochester, NY 14627-0171



New Faculty

Professor Howell joined the University of Rochester in 2002, as assistant professor of physics. He received his B.S. in physics (1995) with a minor in mathematics, from Utah State University, and his M.S. and Ph.D. in physics (2000) from Pennsylvania State University. He then took a postdoctoral research position at the Centre for Quantum Computation at Oxford University. Professor Howell's research interests are in the areas of quantum optics and quantum physics.



Student News

- Miss Hadiyah Nicole (Green), a physics REU student, has published a book on poetry and was chosen as Miss Alabama at A&M University for 2002–2003. The photograph shown is from the cover page of her book "I Flow."
- For the second year in a row, a doctoral student from the University of Rochester, Un Ki Yang, has won the Universities Research Association, Inc. (URA) honor for the best doctoral thesis work done at Fermilab in Batavia, Illinois, a particle physics laboratory housing the world's highest-energy particle accelerator.



The First Astronomy Student

by John M. Greene

Perhaps someday somebody will be curious about how it was that astronomy came to Rochester? How did it become a viable, established institution? I was there and participated. So in the interests of preserving the past, I will take these few minutes to tell about how it was.

In the beginning the most important factor was Marshak's thesis. His advisor was Hans Bethe. They solved the aged problem of how the sun stays so hot for so long. I arrived at the University of Rochester physics department in the fall of 1950. I forget the details, but for the next two years every time he saw me, he would have something to say about somehow bringing astronomy to Rochester. It sounded like a project that would never fly so I didn't hesitate to agree with him.

The early 50s were a bad time for astronomy. I had met people who worked at Mount Wilson for no money, nothing, for 10 years or more, hoping that some day salvation would come. Can you imagine an astronomer who never traveled anywhere?

Anyway, one day Marshak's tune had changed. The department had agreed to hire Professor Savedoff, and he was happy to accept. He was finishing a stay in the Netherlands and was having difficulty obtaining a position back here through the primitive communications system they had in those days.

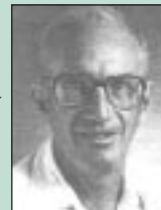
Now there was a new problem. Savedoff needed a graduate assistant. None of the other students were interested. If they had been that interested, they would have gone elsewhere. I had been telling the truth in my expressions of interest in astrophysics; my problem was that it was inconsistent with my longer-range goals. So it was arranged that I would spend a year pretending to be a professional astronomer with a guarantee that it would not cost more than one year of my time. Savedoff got a graduate assistant, and Marshak got his astronomy program.

We can now look back on this from a 50-year perspective. Far from being a year off, that year turned out to be crucial to my career. I solved my first non-linear differential equation, got my name as an author on my first paper (ApJ 122.477, 1955), and obtained my first position, in the Thermonuclear Fusion Energy program entirely through Savedoff's assistance.

Editor's note: John M. Greene received his B.S. degree in physics from Caltech in 1950 and his Ph.D. in theoretical particle physics from the University of Rochester in 1956 (with Professor David Feldman). He worked at the Princeton Plasma Physics Laboratory (1956–1982) and at General Atomics from 1982 until his retirement in 1995. He held an appointment as Adjunct Professor of Physics at University of California, San Diego (1983–1995).

In 1992, Greene was awarded the James Clerk Maxwell Prize from the Division of Plasma Physics of the American Physical Society (see article in Physics Today, December 1992). The citation states: "For outstanding contributions to the theory of magnetohydrodynamic equilibria and ideal and resistive instabilities. For the discovery of the inverse scattering transform leading to soliton solutions of many nonlinear partial differential equations, and for the invention of the residue method of determining transitions to global chaos."

John and his wife Alice currently reside in San Diego, California.





Donald C. Winter (B.S. '69), president and chief executive officer of TRW Systems, has been elected a member of the National Academy of Engineering, one of the highest professional

honors accorded to engineers. The honor recognizes Winter's "pioneering contributions to high-powered laser technologies and defense applications."



Author and cryptographer **Bruce Schneier** (B.S. '85) is both a founder and the Chief Technical Officer of Counterpane Internet Security, Inc. Counterpane provides

Managed Security Monitoring services to organizations worldwide. Schneier is the author of six books, including, *Secrets and Lies: Digital Security in a Networked World*. He was featured in a multipage article in the September 2002 issue of *Atlantic Monthly*. The Special Report titled "Homeland Insecurity" by Charles C. Mann begins with: "One of the nation's top security experts, the cryptography guru and cyberhero Bruce Schneier, warns that the nation's approach to protecting itself is all wrong, and could actually make America more vulnerable than ever. This misguided approach is rapidly being hardened into law."



Kirsten Anne Tollefson (Ph.D. '97) joined Michigan State University as assistant professor in the fall of 2002. Kirsten received her Ph.D. in experimental particle physics under the supervision of Professor Paul Tipton. While a student at Rochester,

Kirsten won the 1994 Graduate Teaching Award in the department.



Ilene J. Busch-Vishniac (B.S. '76) currently Dean of Engineering at Johns Hopkins and formerly professor of Mechanical Engineering at the University of Texas at Austin, was

named among Maryland's *Top 100 Women in 2002*. Busch-Vishniac who graduated with a bachelor's degree in physics and mathematics from the University of Rochester in 1976 was recently awarded the 2001 Silver Medal in Engineering by the Acoustical Society of America at the January 2002 meeting held at Ft. Lauderdale, Florida. She was recognized for her "development of nevel electret microphones and of precision microelectromechanical sensors and positioners."



Esther Conwell (M.S. '44, advisor V. Weisskopf), professor of chemistry at the University of Rochester has been named one of the Top 50 Female Scientists by *Discover Magazine*.



H. Jeffrey Kimble (Ph.D. '78), the William L. Valentine Professor of Physics at the California Institute of Technology, was elected to the National Academy of Sciences in 2002. Kimble

received his B.S. degree (summa cum laude) from Abilene Christian University in 1971, and his M.A. ('73) and Ph.D. ('78) in physics from the University of Rochester working with the late Professor Leonard Mandel in the field of experimental quantum optics. After leaving Rochester, Kimble was a research physicist at General Motors Research Laboratories (1977-78) and a member of the physics faculty at the University of Texas at Austin (1979-89). Kimble held the Sid Richardson Regents' Chair of Physics at Texas prior to joining the Physics Department at Caltech in 1989. He was appointed William L. Valentine Professor at Caltech in 1997. Numerous awards and honors have already recognized Kimble's achievements. He is a fellow of both the American Physical Society and the Optical Society of America. He is the recipient of the International Award on Quantum Communication of the Research Institute of Tamagawa University (1998), the Max Born Award of the Optical Society of America (1996), the Albert A. Michelson Medal of the Franklin Institute (1990), and the Ein-

stein Prize for Laser Science (1989). Kimble was an NSF Presidential Young Investigator (1984-89) and is an Honorary Professor at Shanxi University, Taiyuan, China.



Harvey Richer (Ph.D. '71) has led a team of investigators at the University of British Columbia that confirms the age of the universe —13 to 14 billion years old. "The remarkable

thing is that our estimate of the age of the universe, based on burned-out stars, agrees very well with the estimate based on the measured expansion rate," says Richer. "The two methods are absolutely unrelated to each other yet they give the same result—it's amazing."

Obituaries



Professor **J. Bruce French**, the Andrew Carnegie Professor Emeritus of Physics at the University of Rochester, and one of the world's leading nuclear theorists, died on February 1, 2002. His daughter Carol Wasala, and two sons John and Roger survive him. A native of St. Johns, Newfoundland, Professor French received his B.Sc. in physics from Dalhousie University in 1942, and then served in the Royal Canadian Navy, performing acoustical studies for antisubmarine warfare. He completed his Ph.D. from the Massachusetts Institute of Technology in 1948, continuing there as a Research Associate until 1950. French joined the University of Rochester as a Jewett Research Fellow in 1950, was promoted to assistant professor of physics in 1951, to associate professor in 1956, and to professor in 1960. He became the Carnegie Professor of Physics in 1965. On July 1, 1992, he became emeritus professor of physics, following a career of 42 years on the faculty at the University of Rochester. French's work, starting from his calculation of the Lamb Shift, has influenced the field tremendously. At Rochester, his main interest was in theoretical nuclear physics. Among other things, he largely created the area of statistical spectroscopy which is heavily used at

present. His frequent visits to research centers around the world, as well as academic leaves in Utrecht, Mexico City, Princeton, and Ahmedabad (India) have influenced research at all these institutions. His lectures at summer schools in Italy, India, Mexico, and Pakistan, as well as further review articles, influenced the development of the fields to which French has contributed. In his death, the department has lost an invaluable friend.



Morton F. Kaplon (Ph.D. '51) died on July 4, 2002. Kaplon was a professor of physics and earned both his B.S. and M.S. degrees in physics from Lehigh University. He earned his Ph.D. in

physics from the University of Rochester in 1951 under the supervision of Professor Robert E. Marshak. Kaplon was chairman of the Department of Physics

and Astronomy at the University of Rochester (1964–69) where he taught from 1951–1969. He was Vice Provost, then Vice President of Administrative Affairs at the City College of New York before retiring in 1982. Kaplon was internationally known for his research in primary cosmic radiation, ultra-high energy interactions and elementary particles. Many of Kaplon's students went on to achieve notable careers in physics themselves; one of his students, Masatoshi Koshiha, shared the Nobel Prize in physics for 2002. Kaplon is survived by his wife Anita, who lives in Pennsylvania, his son Keith of New York City, his daughter Bryna (and her two children Shane and Kyle), his daughter Drea (both daughters live in New Jersey), and his sister Bernice of Cincinnati, Ohio.

Professor Bunji Sakita, distinguished professor of physics at the City College of New York (CCNY), passed away on August 31, 2002, while in Japan, after a



yearlong struggle with cancer. Sakita was born in 1930 in the Toyama area of Japan. He received his first degree from Kanazawa University in 1953, and his master's from Nagoya

University in 1956 as part of Sakata's group. He was among several students recruited by Robert Marshak to come to the University of Rochester, and received his doctorate here in 1959 under Charles Goebel. He went on to a postdoctoral position and a professorship at the University of Wisconsin. When Marshak assumed the presidency of City College in 1970, he invited Sakita to join as a distinguished professor. Sakita accepted and built a strong theory group at City College. Sakita made very important theoretical contributions in the areas of SU(6), super symmetry, collective coordinates, and stochastic quantization among others.

Thank You!

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