SPECTRA

THE NEWSLETTER OF THE CARNEGIE INSTITUTION (SPRING 2003

New Horizons for Science


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The Challenges of **Changing Leaders**

In April, Carnegie welcomes its ninth president, Richard A. Meserve—a longtime Carnegie trustee, scientist, lawyer, and most recently the chairman of the Nuclear Regulatory Commission.

As in any organization, each new Carnegie president has to face an institution molded by his or her predecessors, and each has to adapt to outside forces beyond his or her influence or control. But Carnegie leaders have also had the privilege of a long tenure; an average presidential term is about 12 years. And this has given each new appointee an opportunity to develop a particular vision for Carnegie's growth. This pattern has served us well.

Robert Woodward came into office in 1904. He led the organization for 16 years and has been called the first modern manager of science. He was able to balance the fiscal and intellectual sides of the job, which established the template for our future presidents. He also set the course for the fledgling institution to support exceptional people with proven abilities who would thrive in a managed setting—he sculpted an organization that became preeminent in world science.

Woodward was succeeded by John Merriam in 1921. Merriam inherited a very strong institution. Yet he too had his own vision, and was able to apply it over his 17 years of service. He believed in interdisciplinary science and fulfilled his dream by supporting big projects, such as Carnegie's archaeological excavations and the Seismological Laboratory, both of which yielded astonishing results that continue to reverberate today.

With a poor economy and war in the air, Vannevar Bush, president from 1939 to 1955, was confronted with perhaps the biggest demands of any of our presidents to date. He reacted to the circumstances by staking out new ground. He changed the prevailing notion that science was purely academic and marshaled researchers at Carnegie, and all over the U.S., to advance the war effort. Moreover, he bolstered the institution's finances through creative reorganization and by initiating collaborative efforts with outside organizations—a strategy that pooled scarce resources and advanced intellectual exchanges.

I could go on with examples from other presidencies— those of Daniel Gilman, Caryl Haskins, Philip Abelson, and James Ebert. Every one had to deal with unique situations dictated by the times. But now we look to our future and the next administration.

Maxine Singer has left our house in excellent order. Through her tireless work she upgraded facilities at all the departments, fostered the construction of our new telescopes in Chile, launched science-education and outreach programs in the Washington area, and supervised the institution's endowment, making it one of the healthiest in the nation—even in today's uncertain world. As a crowning achievement, she was the driving force in establishing the first new department in over 80 years, the Department of Global Ecology.

Although our new president will confront challenges that we can only begin to imagine, the work of his predecessors has provided him with a solid foundation on which to carry out his goals. He has also inherited the elastic and amazingly effective mandate of Andrew Carnegie, who bade his trustees "to encourage, in the broadest and most liberal manner, investigation, research, and discovery, and the application of knowledge to the improvement of mankind." I am confident that this strong legacy and our new leadership will keep Carnegie thriving through the uncharted territory of the years to come.

—Tom Urban
Chairman

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Vera Rubin Awarded *Gruber Cosmology Prize*

Dr. Vera Rubin of the Department of Terrestrial Magnetism received the 2002 Cosmology Prize of the Peter Gruber Foundation on November 18, 2002. The gold medal and the $150,000 award were presented in the gardens of the Carnegie Observatories in Pasadena, California, at noon. Rubin, who confirmed the existence of dark matter—the mysterious unseen material that dominates the universe—was chosen for "her pioneering studies of deviations of galaxy motions from classic Hubble theory," which "demonstrated that large-scale structure existed in the universe." The citation additionally noted, "By example and gentle voice she has championed equal rights and revealed the incredible beauty of the universe."

Rubin has spent her career as an observational astronomer looking at the spectra, or light signatures, of galaxies to determine their motions. She arrived at Carnegie's Department of Terrestrial Magnetism in Washington, D.C., in 1965. A Washington native, Rubin graduated from Calvin Coolidge High School and went on to receive a B.A. from Vassar College. She obtained her M.A. from Cornell University and her Ph.D. from Georgetown University, where she then taught for 10 years. Rubin was the first woman allowed to observe at the Palomar Observatory.

In 1993 Vera Rubin received the National Medal of Science—the nation's highest scientific award. The Gruber Prize recognizes individuals "who have contributed to fundamental advances in the field of cosmology." It is presented annually to a leading cosmologist, astronomer, astrophysicist, or scientific philosopher in recognition of his or her frontier work. An international selection committee determines the recipient. Allan Sandage, Staff Member Emeritus at the Carnegie Observatories, won the prize in 2000.

Vera Rubin *(far left)* and her husband, Bob, pose with Pat and Peter Gruber en route to a tour of the Mount Wilson Observatory in November. The outing was in connection with the ceremony where Rubin was awarded the prestigious Cosmology Prize of the Peter Gruber Foundation.

TRUSTEE News

The board of trustees met at the Broad Branch Road Campus in Washington, D.C., on December 5 and 6. In addition to the full board, the Audit, Finance, Development, Research, and Nominating Committees met.

After a luncheon on Thursday, members of the scientific staff showed the trustees various ongoing experiments at the Geophysical Laboratory. Later that evening the trustees and their guests met at the administration building on P Street for cocktails and a dinner honoring outgoing president Maxine F. Singer.

On Friday, December 6, the board officially appointed Richard A. Meserve the ninth president of the Carnegie Institution of Washington. His term begins in April 2003. Michael Gellert, trustee and partner of Windcrest Partners in New York City, was voted acting president in the interim. Trustee John Diebold was approved a trustee emeritus, and outgoing Carnegie president Maxine Singer was voted a board member.

The board also approved committee assignments and the appointments of Dr. Wendy L. Freedman as the Crawford H. Greenewalt Director of the Carnegie Observatories and Dr. Wolf Frommer as a new Staff Member at the Department of Plant Biology.

Past Connections Yield **a Gift for the Future**

When Carnegie trustee Jaylee Mead was a graduate student in astronomy at Georgetown University, her Ph.D. advisor was a young woman professor, a rare combination in the sciences of the early 1960s. Dr. Mead is honoring that professor—Carnegie's Vera Rubin of the Department of Terrestrial Magnetism—by establishing a $1 million endowed fellowship in Rubin's name.

The Vera Rubin Postdoctoral Fellowship in Astronomy will allow a young astronomer to work at either the Department of Terrestrial Magnetism, where Rubin continues her 30 years of research, or at the Carnegie Observatories in Pasadena, California.

"As a student I benefited so much working with Vera," Mead said. "She taught me the right way to write a paper and document my research. Those are not the things you learn in the classroom; it's important to have someone take you under their wing early in your career." Mead thinks that Rubin is also "a wonderful example of a good scientist and a good person"—so much so that she felt a fellowship seemed an appropriate gift when Rubin became a senior fellow.

Rubin is very interested in encouraging young students, especially women, toward careers in science. She has four children of her own, each of whom now has a doctorate. "I am enormously honored by this fellowship," she said. "It is remarkably generous and it is quite nice that she is a Carnegie trustee as well."

Climate Affects Recent Crop Yields

Scientists at Carnegie's Department of Global Ecology in Stanford, California, have found that climate trends significantly affect corn and soybean yields. David Lobell and Gregory Asner analyzed 17 years of data on crop yields, temperature, precipitation, and solar radiation throughout the U.S. for their study and published their results in the February 14, 2003, issue of *Science*.

The investigation showed that gradual increases in temperature cause significant decreases in productivity for the two major United States crops, corn and soybean. "We found that climate is a surprisingly important factor in crop yield trends," said Lobell.

Most studies on climate changes and crop production have not looked at these kinds of data over this many years. Christopher Field, director of the Department of Global Ecology, stated: "What makes this study unique is that they looked at several regions that have experienced the same changes in technology, but different changes in climate. This allowed them to separate the contributions of climate and technology to yield trends, which has been hard to do in the past."

When the investigators factored in climate changes over the study period, they found that the gains in crop yield from improved management practices were about 20% lower than previously believed. "Most future projections of food supply are based on recent trends in crop yield growth, ignoring the effects of climate," said Lobell. "But our study shows that recent trends in climate have actually helped farmers' yields, so in terms of management we may not be doing as well as we thought."

Asner added, "Our results also suggest that global warming will affect food production. If the principal corn and soybean areas of the Midwest see rising temperatures, we will likely see negative impacts on crop yields there. According to our calculations, we can expect a 17% decline in yield of these crops for a one-degree increase in growing-season temperature."

"The continuing growth of the human population already challenges the agricultural sector, and climate change may make efforts to increase yields even more difficult. It will take further research and collaboration between land managers, decision makers, and scientists to meet these challenges," concluded Lobell.

"Lucky Carnegie!"

Wendy Freedman

Named Crawford H. Greenewalt Director of the Observatories

Wendy Freedman, the tenth director of the Carnegie Observatories.

On March 1, 2003, longtime staff astronomer Wendy L. Freedman became the tenth director of the Carnegie Observatories, which was founded in 1904 by George Ellery Hale. She succeeds Augustus Oemler, Jr., who will return to research as a Staff Member.

"Wendy integrates all the elements that make for the heroic scientist: persistence, imagination, a leader, a role model," remarked Nobel laureate Leon Lederman upon hearing the news. "Her work on the Hubble Constant is a classic illustration of her taste for important science and the need for extraordinary care in understanding the hazards and responsibility for precision—a brand-new element in astrophysics. Lucky Carnegie!"

After earning a Ph.D. in astronomy and astrophysics from the University of Toronto, Freedman joined the Carnegie Observatories in Pasadena as a postdoctoral fellow in 1984 and became a faculty member of the scientific staff there three years later. Studies of the extragalactic distance scale, galactic evolution, and stellar populations have won her such honors as the Marc Aaronson Lectureship and Prize, the Centennial Lectureship of the American Physical Society, the Darwin Lectureship of the Royal Astronomical Society, and the Cosmos Club Award. Last year she received the American Philosophical Society's Magellanic Prize for her leadership in bringing observational cosmology into the 21st century.

Among other scientists saluting Freedman on her new assignment was Nobel laureate Joe Taylor, Princeton astrophysicist and former dean of the faculty. "Wendy Freedman is a superb choice as director—an extremely capable and imaginative scientist with immense energy and good judgment."

Global Ecology Off to a **Great Start!**

The Department of Global Ecology recently received two major grants totaling more than $5 million. The funds will help establish and maintain a state-of-the-art oceanographic program and aid in the construction of a unique "green" building located on the campus the department shares with Plant Biology in Palo Alto.

A seven-year $4.26 million grant for oceanographic research comes from the Gordon and Betty Moore Foundation in San Francisco. "With this funding, Carnegie's Department of Global Ecology will be able to pioneer a new kind of integrated science," said Chris Field, director of the new department. Mick Seidl, who heads the foundation's environmental program, believes that "Carnegie is a terrific institution, and the interdisciplinary nature of the new department, under the able leadership of Chris Field, is definitely deserving of support."

The second award, a $1 million gift from the David and Lucile Packard Foundation, also based in California, is dedicated to the construction of a new home for the department adjacent to the Department of Plant Biology. Construction on the project will begin this summer. The new facility will incorporate the latest methods for conserving energy and protecting the environment.

Supported by the Moore Foundation grant, the Carnegie researchers will address questions such as how the mix of plankton species affects the way in which the greenhouse gas carbon dioxide is removed from circulation, and how events such as the El Niño/La Niña cycles affect ocean food chains. "Most of the environmental problems that threaten the future interact with land, atmospheric, and oceanic processes," said Field. "It's wonderful to see an investment in understanding the processes and their interactions—key steps in finding solutions."

The Gordon and Betty Moore Foundation was established in November 2000 by Intel cofounder Gordon Moore and his wife, Betty, and is primarily interested in higher education and the environment. The David and Lucile Packard Foundation was founded in 1964 and supports science, conservation, and other programs.

Until recently, scientists thought that molecular hydrogen (H_2) was too small to be contained in clathrate hydrates—crystalline solids in which a framework of water molecules encloses molecules of gas. Recently, researchers at Carnegie's Geophysical Laboratory, the University of Chicago, and Los Alamos National Laboratory were able to trap the gas inside water-ice structures, forming hydrogen hydrate. According to team member Ho-kwang (Dave) Mao, "This result could be a first step toward an alternative way of storing environmentally friendly hydrogen gas. It also points to the possibility that hydrogen might exist in icy bodies in our solar system, which we thought were incapable of retaining it." The investigators reported their findings in the September 27, 2002, issue of *Science*.

Scientists Trap Hydrogen Gas in Ice "Cages"

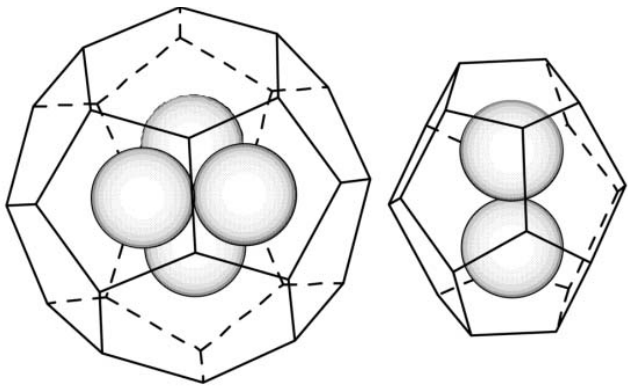
Implications for Fuel Cells and Space Science

Hydrogen is the most abundant gas in the universe, and the race has been on to find a cost-efficient, practical way to store it for fuel. Using a diamond-anvil cell, the team subjected a mixture of hydrogen and water to a pressure equivalent to about 2,000 times the atmospheric pressure at sea level (220 megapascals) at room temperature (300 K, or 80°F). Two regions formed—an H_2 bubble and liquid water. When the mixture was cooled to minus 11°F (249 K), the two regions reacted and formed one solid compound.

Unlike most clathrate hydrates, where only one molecule of a gas can be trapped in each H_2O cage, multiple hydrogen molecules were entrapped in this material—two molecules in small cages and four in larger ones. The synthesized material "showed remarkable stability," persisting when warmed to about 45°F (280K). Upon cooling to liquid-nitrogen temperature (77 K, -321°F)and releasing pressure completely, the clathrate remained.

"Many microorganisms that appear to be ancient 'breathe' hydrogen," said Wesley Huntress, director of Carnegie's Geophysical Lab. "The ability of water to trap hydrogen may also be significant for biology on the early Earth, providing a potential mechanism to supply this gas to the atmosphere at a time when life was just beginning on this planet."

Researchers on the project were Wendy Mao, of the University of Chicago and the Carnegie Institution of Washington; Ho-kwang Mao, Alexander Goncharov, Viktor Struzhkin, Quanzhong Guo, Jingzhu Hu, Jinfu Shu, and Russell Hemley, of Carnegie; Maddury Somayazulu, from the HPCAT Advanced Photon Source, Argonne, Illinois; and Yusheng Zhao, of Los Alamos National Lab.

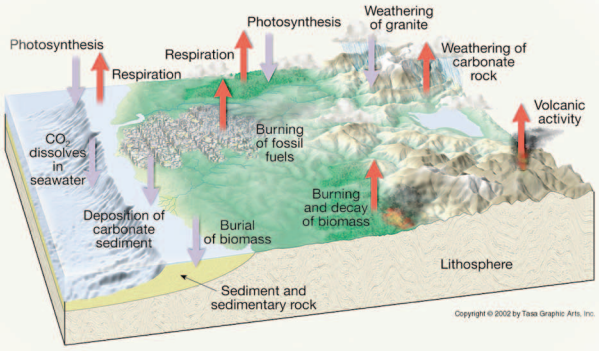


Clathrate *(cage)* molecular structures in ice are shown with water molecules located at the corners of the polyhedra. This structure forms an internal cage that can hold two hydrogen atoms *(right)* or as many as four *(left)*.

THE CO_2 PUZZLE

What's Man-made and What's Not?

Until recently, scientists have been unable to measure how much of the heat-trapping greenhouse gas carbon dioxide (CO_2) escapes from the Earth's interior through lava—an important piece of information for determining how much atmospheric CO_2 comes from man-made sources instead of natural ones. Using a new technique that is able to measure the concentration of different elements in incredibly tiny samples of rock, researchers determined for the first time how much CO_2 the molten material contains. "Among other things," said study researcher Erik Hauri of Carnegie's Department of Terrestrial Magnetism, "it's now possible to estimate precisely the sources of carbon in the volcanic part of the planet's carbon cycle." Hauri and colleagues published their results in the October 3, 2002, issue of *Nature*.



Both sources of carbon and of carbon "sinks" in the global carbon cycle are illustrated by this schematic.

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The researchers analyzed bits of magma entrapped in crystals called olivine from samples collected from the midocean Siqueiros transform fault, which is offset from the East Pacific Rise off the coast of Mexico. Some 85% of the world's volcanoes are located on such midocean rises. Typically, CO_2 and other volatiles bubble away into the atmosphere as they reach the surface during eruptions and thus elude measurement. The trapped particles of magma that the scientists collected, however, contained the original amount of volatiles because the surrounding crystal prevented volatile loss. Using a device called an ion microprobe, the researchers determined the abundance of different isotopes and measured the volatiles present. They found that other nonvolatile elements, notably potassium and niobium, were correlated with the CO_2, providing added evidence that the CO_2 concentrations are original.

"It's always eye-opening," said Hauri, "to find quantitative connections between the deep interior of the Earth and the chemistry of the oceans and atmosphere. I believe that this new technique, applied to other volcanic areas, will help scientists better define how much volcanoes are contributing to the greenhouse effect." In addition to helping scientists learn more about the planet's carbon cycle, the study is also important for advancing our understanding of the convection process of the Earth's deep mantle, its chemical composition, and the behavior of the overlying crust. •

New Milestone **for Gene Silencing**

The world of biomedical research has been abuzz over the last several years with reports of more and more uses of gene silencing by double-stranded RNA. In 1997, Andrew Fire of Carnegie's Department of Embryology in Baltimore, Maryland, and Craig Mello of the University of Massachusetts Medical School and their teams found that by specially designing RNA with two strands they could silence targeted genes. Their discovery, called RNA interference (RNAi), was recently patented (U.S. Patent 6,506,559 B1). Through a broad nonexclusive licensing arrangement, this technology is being made available to a large and expanding group of researchers in the U.S. and abroad.

"Dr. Fire's work has excited every one of us here at the institution," said Tom Urban, chairman of the Carnegie board. "It is a vivid example of how Carnegie's commitment to basic research in unique areas yields extraordinary results, which can benefit humankind."

The singled-stranded RNA molecule is commonly known for its role shuttling the genetic code contained in DNA from the cell's nucleus to the cytoplasm, where proteins are made. The first strand of the scientists' double-stranded RNA molecule has the ribonucleotide sequence that matches the nucleotide sequence in the targeted gene. The second strand of RNA has a complementary sequence to that in the target gene. When the two strands are mixed, a double-stranded RNA is formed. Double-stranded RNA is not a part of normal cell function, but is a necessary step in the life cycle of most viruses. When artificially produced double-stranded RNA is introduced to an organism, the organism believes that it has been infected by a virus: it responds by finding any messenger RNA (mRNA) molecule with a similar sequence and degrading it. The ability to harvest the cell's own antiviral mechanism opens up the possibility of treating various types of diseases by either shutting down the disease-causing gene or directing researchers to appropriate pathways for effective drug development.

Paul Kokulis, counsel for Morgan Lewis, the firm involved in obtaining the patent, stated: "This is the first of several U.S. patents that Carnegie and the University of Massachusetts expect to obtain on various aspects of this important invention. It has been extensively licensed and it is being widely used both as a research tool and for the development of products, including drugs that will combat diseases such as cancer and HIV."

Fire is particularly looking forward to the applied-research discoveries that he hopes will result from his team's work. •

MIKE—Up and *Running* and Working Hard

The first observations with the new Magellan Inamori Kyocera Echelle spectrograph (MIKE) were made on November 28, 2002. The instrument was mounted on the east platform of the Clay telescope. It was then moved to the Baade telescope and, by the end of February, it had been used for more than 50 nights.

Rebecca Bernstein, a Hubble Fellow at the Observatories and now a faculty member at the University of Michigan, and Steve Shectman led the effort to build the spectrograph. They began their work in November 1997 and shipped the instrument to Las Campanas in August 2002. Bernstein and Shectman made four trips to Chile between August and November to reassemble MIKE and prepare it for the telescope.

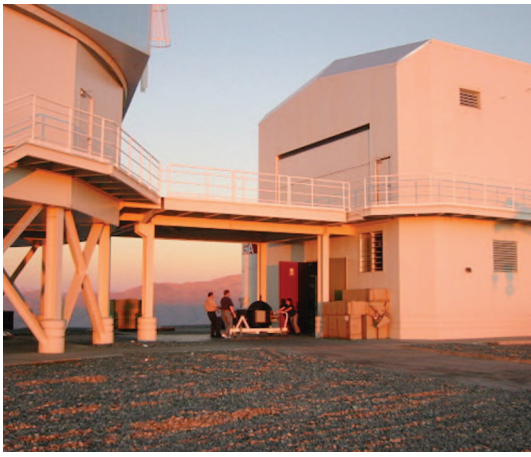
Ian Thompson and Greg Burley built MIKE's two CCD cameras. Consulting engineer Steve Gunnels did the mechanical design, and Stefan Mochnacki built the control system while he was at the Observatories on sabbatical from the University of Toronto.

MIKE is a very efficient high-resolution spectrograph that can observe the spectra of even relatively faint objects in great detail. It is used to study the heavy-element content of stars in our own galaxy and in nearby galaxies, to examine the properties of absorbing gas clouds along the lines of sight to distant quasars, and to search for extrasolar planets.

MIKE has two complete spectrographs that are used to observe the red and blue portions of the spectrum of an object at the same time. The double arrangement allows the optical components to be optimized for use in only one-half of the spectrum, which results in higher efficiency and resolution. The optical design is also very compact and requires only a few moving parts, yielding a reliable and affordable instrument.

Mario Mateo at the University of Michigan is building a fiber-optic system to use with MIKE. It will allow the instrument to observe up to 200 stars at a time, but over a much more limited spectral range. The system is scheduled to be ready in the second half of 2003. ◗

MIKE designer Rebecca Bernstein, formerly a Hubble Fellow at the Observatories and now a faculty member at the University of Michigan, is shown here in the elevator with the instrument during its commissioning last November.



Steve Shectman, Ian Thompson, and Rebecca Bernstein *(left to right)* move MIKE from the auxiliary building to the telescope.

Record-Breaking Start for HPCAT

Working for just eight days around the clock, researchers at the High Pressure Collaborative Access Team (HPCAT) used 40 high-pressure cells to take more than 500 diffraction spectra of a wide range of samples. This Herculean effort was undertaken to commission the first two stations of HPCAT's four-beamline, nine-enclosure complex at Sector 16 of the Advanced Photon Source in Argonne, Illinois. Groups from each of Carnegie's member institutions—Lawrence Livermore National Laboratory, the University of Nevada-Las Vegas, and the University of Hawaii—participated. They subjected beryllium, plutonium, heavy fermion compounds, iron compounds, cuprate superconductors, and more to different pressure and temperature conditions for their analyses. The marathon session forged the way the facility will commission the remaining seven stations as 2003 unfolds. Among other accomplishments, the team pioneered offline alignment for faster turnaround time and made the first use of bimorph mirrors in a U.S. synchrotron radiation facility.

HPCAT is dedicated to the study of materials under extreme pressure (high) and temperature (low and high) conditions. It uses a range of techniques including microdiffraction from powders and single crystals, nuclear spectroscopy, and inelastic scattering (see *Spectra*, fall 2002). Two stations are now in use. The first, ID-A, is an optics station rendered unique in the world by its custom-designed flexible-wavelength branching monochromator. The monochromator feeds the other station, ID-B, a second beam that is offset by one meter from the main line. A microdiffraction experiment station, using a Kirkpatrick-Baez pair of bimorph mirrors, delivers a size-tunable focal spot of X-rays to minute high-pressure samples. These mirrors are the first installed in the United States. Each one is 300 millimeters (mm) long and has eight electrodes that shape the mirror according to the incoming beam profile, so that each section perfectly focuses that part of the beam it receives onto the same focal spot. This ability to adjust is known as adaptive optics, and the optical quality and performance obtained so far from the fully illuminated ID-B pair (2 x 300 mm) is the best recorded to date on any synchrotron radiation source in the world.

With CCD detector exposure times of 10 to 15 seconds in most cases (even with the tiniest low-scattering samples, thanks to the brilliance of the ID-B beam), online alignment time has to be reduced to a minimum to maximize beam-time use. To achieve this efficiency, a microscope-based offline alignment and pressure measuring system was developed to prealign the cell on a kinematic mount identical to the one integrated in the X-ray sample stage. With a positional reproducibility below five microns, this technique greatly reduced cell-changing and online alignment times to be closer to the X-ray exposure times.

The HPCAT members and staff wish to thank their funding agencies (Department of Energy Defense Program and Basic Energy Science, National Science Foundation, Department of Defense, Carnegie Institution of Washington, Vetlesen Grant, Keck Foundation, and Hewlett Trust) for their trusting support, and all the APS/ANL staff who helped make this record possible.

Daniel Häusermann, HPCAT Project Manager

Maxine F. Singer
RETIRES

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Maxine Frank Singer, Carnegie's eighth president, retired December 31, 2002, after 15 years at the helm. "Singer has changed the face of this organization," said Tom Urban, chairman of the Carnegie board. "Her unstoppable energy has provided Carnegie scientists with the state-of-art resources they need to build on our tradition of independent, groundbreaking research."

During her tenure Singer appointed new directors to each of the six research departments; rebuilt labs; erected new buildings; financed and managed the construction of Carnegie's new 6.5-meter telescopes in Chile; initiated science-education and outreach programs in the Washington area; bolstered the institution's endowment, making it one of the healthiest in the nation; and established the first new department in more than 80 years—the Department of Global Ecology.

A biochemist, Singer came to the institution in 1988 from the National Institutes of Health, where she was chief of the Laboratory of Biochemistry at the National Cancer Institute. There she led 15 research groups. She retained her association with the institute as scientist emeritus during her decade and a half at Carnegie.

Alan Dressler, longtime astronomer at the Carnegie Observatories, stated, "With both feet planted in the life sciences, Maxine Singer has nevertheless been a tireless student, enthusiast, and promoter of the physical sciences—surely Carnegie astronomy has not enjoyed such solid support since the founding of the Mount Wilson Observatories by George Ellery Hale."

In addition to promoting scientific research, Singer has worked hard to combat the deficiencies in math and science education in the U.S. and the underrepresentation of women and minorities in the sciences. In 1989 she introduced the First Light Saturday science school for Washington, D.C., public elementary school students at Carnegie's administration building. She expanded the program in 1994 to include the Carnegie Academy for Science Education (CASE), which helps public elementary school teachers learn the art of teaching science, mathematics, and technology.

Singer has also been both a spokesperson and leader on matters that affect the nation's science policy, including, most recently, issues relating to stem cell research and human cloning. In addition, a report issued by the National Academies Committee on Science, Engineering, and Public Policy, which Singer chairs, has had a profound effect on improving the treatment and status of postdoctoral scientists in the United States—another of her concerns.

In 1992 Singer was awarded the nation's highest scientific award, the National Medal of Science. Her long list of honors includes the 1996 AAAS William D. Carey Lectureship Award for Leadership in Science Policy and the 1999 Vannevar Bush Award for her lifetime contributions to science and engineering.

Looking to the future, Arthur Grossman, senior scientist at the Department of Plant Biology, remarked, "As president of the Carnegie Institution, Maxine has been an enormous scientific and social force…she is not a 'retiring' person, and one step down as president of the institution may lead to two steps up in arenas that shape scientific education and policy in our country."

Singer received an A.B. from Swarthmore College in 1952 and a Ph.D. from Yale in 1957. She will continue with CASE as senior scientific advisor and maintain her associations with numerous societies and organizations. She will also chair the board of directors of the Whitehead Institute and serve on the Carnegie board of trustees. •

Richard A. Meserve
becomes ninth Carnegie president

On December 12, 2002, the board of trustees announced the appointment of Dr. Richard A. Meserve, chairman of the U.S. Nuclear Regulatory Commission (NRC) and decade-long Carnegie trustee, to president of the institution. He is the ninth president and succeeds Maxine F. Singer.

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Meserve brings an unusual range of experience to the institution. "His unique qualifications in physics and law and his decade on the Carnegie board are a winning combination that will only make us stronger," said Tom Urban, chairman of the Carnegie board.

"I am extraordinarily pleased to have the opportunity to lead this important institution," said Meserve. "Although the Carnegie Institution is small in terms of the number of Carnegie scientists, it has made immense contributions to science over the years. I am eager to further Carnegie's tradition of excellent research."

Meserve will assume the Carnegie presidency in April. Michael Gellert, Carnegie trustee and general partner of Windcrest Partners in New York, has been acting president in the interim.

In October 1999, Meserve began his tenure as chairman of the NRC. Among his accomplishments at that post, he has been instrumental in devising an effective response to the threat posed by terrorism to the nation's nuclear facilities.

Before joining the NRC, Meserve was a partner in the Washington, D.C., law firm of Covington and Burling. With his Harvard law degree, received in 1975, and his Ph.D. in applied physics from Stanford, awarded in 1976, he devoted his legal practice to technical issues arising in environmental and toxic tort litigation, counseling scientific societies and high-tech companies, and nuclear licensing. Early in his career he served as legal counsel to the President's science advisor, and was a law clerk to Justice Harry A. Blackmun of the U.S. Supreme Court and to Judge Benjamin Kaplan of the Massachusetts Supreme Judicial Court.

Meserve has served on numerous legal and scientific committees over the years, including many chartered by the National Academies of Sciences and Engineering. Among other affiliations, he is a member of the American Philosophical Society and a fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the American Physical Society. In addition, Meserve serves on the board of directors of the American Association for the Advancement of Science. •

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[1] Maxine Frank Singer, with her husband, Dan, stands next to her official presidential portrait on the night of her retirement party, December 5, 2002.

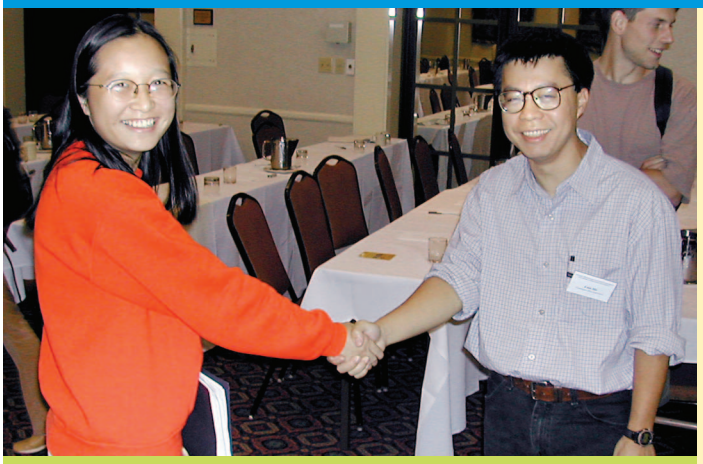
[2] Outgoing Carnegie president, Maxine F. Singer *(left)*, talks with incoming Carnegie president, Richard A. Meserve, during a dinner celebrating Singer's retirement in December 2002.

[3] Carnegie astronomer and Senior Fellow Vera Rubin *(left)* presents a telescope to outgoing Carnegie president Maxine Singer.

[4] Acting President Michael Gellert, Maxine Singer, and new president Richard Meserve *(foreground, left to right)* applaud portrait artist Jon Friedman.

Photos courtesy Richard W. Holden Photography; portrait (shown in photo 1) by Jon Friedman.

Out and About at the Observatories



Observatories astronomer Luis Ho *(right)* poses with Lei Hao, a Ph.D. student from Princeton, at the first symposium celebrating a century of Carnegie astronomy.

Staff astronomer Barry Madore and Starr Fellow Paul Martini answer questions about astronomy at the fall open house.

Observatories director Wendy Freedman appears with space tourist Dennis Tito at the Women of Passadena lecture and reception in January. Shown from left are Amanda Stonnington, Dennis Tito, Wendy Freedman, and Gail Berendzen.

Outreach efforts at the Carnegie Observatories continue to gain momentum. And as Carnegie is becoming better known, news sources such as the *Pasadena Star-News* and the *San Marino Tribune* regularly carry stories about Carnegie people, events, and community involvement.

Santa Barbara Street opened its doors and gardens to the more than 350 guests who attended the first Observatories open house last fall. Local and state civic leaders, area educators, and neighbors learned about what's been happening at the Observatories over the last 100 years.

In January, Wendy Freedman, Observatories director, appeared with the first-ever commercial space traveler, Dennis Tito, at the spectacular home of Amanda and Nick Stonnington for a meeting of the Women of Pasadena. Freedman spoke first about her scientific work using the Hubble Space Telescope. Tito then took the podium and talked about his megamillion-dollar tour to the International Space Station in May 2001. Guests and speakers mingled after the talks at a beautiful dinner reception.

Observatories Staff Member Luis Ho took the lead in organizing four Carnegie-sponsored international symposia, held at the Sheraton Pasadena Hotel, to celebrate 100 years of astronomy. All the conferences featured prominent invited speakers, poster sessions, and social events. The Cambridge University Press will publish the proceedings as part of the Carnegie Observatories Astrophysics Series, of which Ho is the chief editor.

The first symposium, "Coevolution of Black Holes and Galaxies," took place October 20-25. Ho was the host for the event, which was limited to 150 participants. More than 100 scientists attended the second symposium, "Measuring and Modeling the Universe," which was led by Wendy Freedman November 17-22. Symposium number three, "Clusters of Galaxies: Probes of Cosmological Structure and Galaxy Evolution," was held January 27-31. John Mulchaey, Alan Dressler, and Gus Oemler presided. Andrew McWilliam and Michael Rauch were the masters of ceremonies for the final symposium, "Origin and Evolution of the Elements," which took place February 16-21. About 150 scientists attended each of the latter two events. More information about these symposia is on the Observatories Web site at ***http://www.ociw.edu/ociw/symposia/***.

A series of public lectures, by Carnegie scientists, began this spring at the Huntington Library. Wendy Freedman talked about the expansion of the universe on March 13; John Mulchaey will speak on how the impacts of comets and asteroids have changed the planets and life on Earth, April 10; the Department of Terrestrial Magnetism's Paul Butler will talk about the search for planets outside our solar system on May 1; and on May 22 Alan Dressler will address the mysteries of black holes.

Lithium Becomes **a Superconductor**

Theorists may have to go back to the blackboard to explain what happens to compressed lithium under high-pressure and low-temperature conditions. Experiments have transformed this lightest metallic element into a superconductor under pressures that are consistent with theory, but with temperatures that are much lower than predicted. The results, reported in the October 17, 2002, issue of *Science*, suggest that similar theories on superconductivity in solids should be reexamined.

Superconductivity occurs when a material is cooled to a specific low temperature, eliminating all electrical resistance and allowing electrons to flow freely. The lead author of the study was Viktor Struzhkin of the Geophysical Laboratory (GL). Others researchers came from the Max Planck Institut für Chemie in Mainz, Germany. Kevin Wei Gan, a student intern at GL from Thomas S. Wootton High School in Rockville, Maryland, also participated in the work. His role in the study won him second place in the Siemens Westinghouse science competition, coverage in the December 10 *Washington Post*, and a feature in the January 3 *Science*.

The group subjected the element to pressures of 23 to 80 gigapascals (200,000 to 800,000 times the atmospheric pressure at sea level) and temperatures of 9 K to 16 K (about -444°F to -430°F)—a critical temperature that is among the highest thus far discovered for an element. These conditions led to the superconducting state.

Lithium is difficult to work with in these experiments because it is highly reactive and hard to contain under the extreme conditions. Using a combination of techniques, the scientists were able to measure both the electrical resistance and the magnetic properties of the element for the first time. It appears that there are multiple transitions in the structure of the compressed material.

Pressure as a variable is unfolding as a new phenomenon in condensed matter. This finding would not be possible without continued advances and innovations in high-pressure techniques. The new data add to the recent body of information about lithium and have led to a reevaluation of the element. It appears that seemingly simple metals may not be so simple after all. "These experiments provide theorists with a new critical benchmark for understanding dense matter," Struzhkin stated.

A Surprising Ecosystem Response to Combined Environmental Changes

Scientists at Carnegie's Department of Global Ecology, the Nature Conservancy, and Stanford University have discovered that elevated atmospheric carbon dioxide (CO_2) can suppress plant growth when increases of this major greenhouse gas are combined with a broad suite of already-occurring environmental changes. According to Christopher Field, project leader and director of the Carnegie department, "The traditional view that elevated CO_2 always stimulates plant growth simply isn't correct." The research was published in the December 6, 2002, issue of *Science* and was covered by NewYorkTimes.com, Washingtonpost.com, MSNBC News, and the Associated Press, among other news sources.

Many past studies of global-change impacts on plants and ecosystems have focused on responses to increases in atmospheric CO_2. But realistically, the term *global change* means much more than just elevated CO_2. Other such changes are global warming, altered rainfall, and increases in biologically available nitrogen compounds produced during fossil-fuel combustion. These other global changes can have major impacts on plants and ecosystems. And the study shows, for the first time, how they alter the response of a natural ecosystem to increased atmospheric CO_2. According to lead author Rebecca Shaw, "In the third year of the experiment, plant growth increased in the plots treated with CO_2 alone, as in many other experiments. It also increased in plots exposed to warming, increased precipitation, and nitrogen fertilization—alone or in combination. But, when we added carbon dioxide, the effect of the other treatments was suppressed: the elevated CO_2 pushed the response back toward the initial conditions."

> "The traditional view that elevated CO_2 always stimulates plant growth simply isn't correct."

Over the last hundred years, the concentration of CO_2 in the atmosphere has increased by more than 30%. The planet has warmed by about 1°F. Rainfall has increased in some regions and decreased in others. And human actions have more than doubled inputs of biologically available nitrogen. Elevated atmospheric CO_2 increases plant growth in many experiments, but most past experiments have studied the impacts of CO_2 alone or in combination with one other factor. The results of the Carnegie-led experiment in the California grassland at Stanford's Jasper Ridge Biological Reserve reveal new dimensions of ecosystem responses to global change. As Field noted: "When we look at impacts of realistic global changes on whole ecosystems, we see a broad range of responses. We do not yet know whether responses will be similar in other ecosystems, but our wide range of treatments helps open the door to understanding global-change impacts on ecosystems not yet studied."

IN Brief

Trustees

Euan Baird was named chairman of Rolls-Royce plc in Oct. 2002. **Charles Townes,** trustee and Nobel laureate, will receive the SETI Institute's 2002 Frank Drake Award later this spring.

Administration

In his capacity as chairman of the Nuclear Regulatory Commission, Carnegie president **Richard Meserve** was interviewed on the Feb. 26 NOVA show about dirty bombs.

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The Oct. 10 issue of *Nature* contains a letter to the editor from former Carnegie president **Maxine Singer,** Observatories' **Augustus Oemler,** and **Mark Phillips** about the Chilean policy to control light pollution. Singer also spoke on the politics of stem cells at the National Academy of Sciences in Nov.

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In the Office of External Affairs, **Claire Hardy** was appointed database and communications coordinator and **Linda Feinberg** became manager of external affairs.

Embryology

Marnie Halpern was selected for the H. W. Mossman Award in Developmental Biology by the American Association of Anatomists (AAA). She will present the award lecture at the annual AAA meeting in San Diego in April.

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Andrew Fire has received numerous awards (and nominations) for his discovery, with Craig Mello and teams, that double-stranded RNA (RNA interference) can silence gene expression. Among his honors is the Award in Molecular Biology from the National Academy of Sciences and the GSA Medal from the Genetics Society of America.

—

After completing her Ph.D. research in the Fire lab in Oct., **Susan Parrish** became a postdoctoral fellow in the lab of Dr. Bernard Moss at the National Institute of Allergy and Infectious Diseases in Bethesda, MD.

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Svetlana Deryusheva has joined the Gall lab as a Visiting Scientist for six months beginning Feb. 1. She comes from the Biological Institute of St. Petersburg U., Russia, and will work on the trafficking of macromolecules inside the cell nucleus—specifically, macromolecule movement into and out of a structure known as the Cajal body.

—

Christian Brösamle and **Marnie Halpern** were recently awarded a new grant from the Maryland Board of Spinal Cord Injury Research to support Brösamle's studies on myelination of the zebrafish nervous system. Brösamle has been serving as a mentor to high school intern **Lani Martinez,** who is also working on this project.

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Postdoctoral fellow **Rachel Brewster** and husband, Mark Van Doren, had a baby girl, Jordan Mae, on Oct. 29. Brewster will start her own lab at U. Maryland, Baltimore County.

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Halpern laboratory technician **Michelle Macurak** completed her M.Sc. degree in biotechnology at the Johns Hopkins.

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David Coyle recently joined the Halpern laboratory as the fish facility technician.

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In Nov. **Allan Spradling** presented the Hugh Clark Distinguished Lecture at U. Connecticut. Spradling lab technician **Dianne Williams** and her husband, Reynaldo, had a baby boy, Carlos Julian, on Dec. 24.

Observatories

Patrick McCarthy gave colloquia at the Space Telescope Science Institute and at UC-Santa Barbara last fall.

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Hubble Fellow **Mario Hamuy** gave talks at U. Chile and U. Católica de Chile in Nov., and at UC-Irvine and UC-Santa Barbara in Dec.

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Andy McWilliam gave a colloquium at UC-San Diego Nov. 5.

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Luis Ho gave a colloquium talk at U. Católica in Santiago, Chile, in Nov. He also attended a summer conference in Meudon, France, on active galaxies.

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On Sept. 18 **Daniel Kelson** was interviewed on BBC World Service about the latest findings on black holes in old galaxies. Reuters also interviewed him.

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In Oct. **Paul Martini** gave an invited review at the first Carnegie Observatories Centennial symposium, "Coevolution of Black Holes and Galaxies." In Nov. he contributed a talk at the Centers of Galaxies meeting in Ringberg, Germany. In Jan. he spoke at the Baryonic Universe Conference in Aspen, CO. Also in Jan., he spoke at the third Carnegie Observatories Centennial symposium, "Clusters of Galaxies: Probes of Cosmological Structure and Galaxy Evolution."

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François Schweizer gave an invited talk at the conference "Globular Clusters: Formation, Evolution, and the Role of Compact Objects," held at the Kavli Institute of Theoretical Physics in Santa Barbara, CA.

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S. Michael Fall (Space Telescope Science Institute) was a Scientific Visitor during the fall. He presented two talks about cosmic star formation history and the evolution of globular clusters.

Sylvain Veilleux (U. Maryland) arrived in late Jan. for a one-year sabbatical at the Observatories and Caltech. Part of his time will be devoted to work on the Maryland Magellan Tunable Filter proposed for IMACS.

—

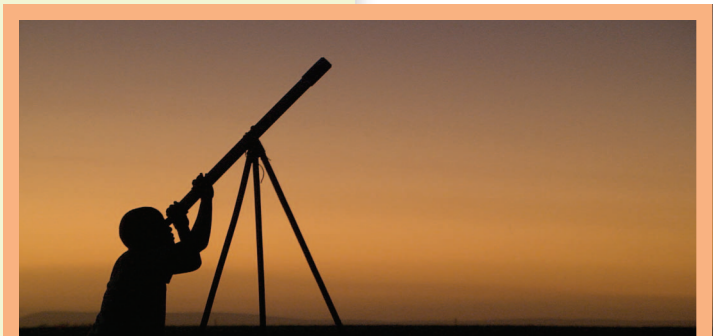
Guinevere Kauffmann and **Simon White** (both from the Max Planck Institut für Astrophysik, Munich) and their son Jonathan arrived in Feb. for five weeks. They will present the opening review at the fourth Carnegie Observatories Centennial symposium, "Origin and Evolution of the Elements."

—

Elsa Luna joined the department as the new business manager last fall.

Plant Biology

On Oct. 9 and 10 the department hosted a visiting committee consisting of Natasha Raikhel, UC-Riverside; Maarten Chrispeels, UCSD; Ken Keegstra, Michigan State U.; Kris Nyogi, UC-Berkeley; and trustees **Michael Gellert, Philip Abelson, Tom Urban,**



CARNEGIE FILM FEST

Fronts—the masses of air indicated by serrated arcs we see on weather maps—make up the "weather's face." Norwegian scientist Vilhelm Bjerknes was the first to study these phenomena and coin the term. A new film tells how he did it, with the help of the Carnegie Institution.

The film, *The Weather's Face: How Meteorology Became a Science,* was shown in a world-premiere screening as part of the Capital Science Lecture series on December 9. It was cohosted by the Royal Norwegian Embassy.

Bjerknes (1862-1951) integrated mathematics and atmospheric dynamics to lay the foundation for modern meteorology. Carnegie supported his work for four decades ending in 1945. While basic weather instruments were available, Bjerknes was the first to organize data collection throughout Norway and use his knowledge of mathematics and physics to analyze and predict the weather.

The lecture series also included a second film premiere, this one on astronomical observation. *Cosmic Africa,* shown on January 16, features South African astrophysicist Thebe Medupe in a journey across his continent as he examines indigenous mythologies and cosmologies throughout history, and explores how these beliefs and practices connect with modern astronomy.

❶ Kathryn Barton, Staff Member at Plant Biology.

❷ Wolf Frommer is the newest Staff Member at Plant Biology.

Bill Rutter, and **Gary Ernst.**

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❶ Staff Member **Kathy Barton** was elected a fellow of the American Association for the Advancement of Science in Oct.

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❷ The department welcomed new Staff Member **Wolf Frommer** in Jan. Frommer came from U. Tübingen, Germany.

—

On Sept. 17 **Chris Somerville** gave a talk in Bristol, England, at the Long Ashton Centennial Symposium, and on Sept. 19 he presented a talk at a symposium at York U. He also gave the Richard and Elizabeth Hagemann lecture at Kansas State U. on Oct. 23, and presented a talk at the Foundation for Science in Santiago, Chile, on Nov. 21. On Jan. 18 he spoke at the Riverside Spring Symposium at UC-Riverside. With Elliot Meyerowitz (Caltech), Somerville cohosted a Dept. of Energy–sponsored workshop on plant systems biology at UC-Riverside on Jan. 20. A report on the meeting will be published in the June issue of *Plant Physiology*. On Feb. 5 he presented a seminar on genetic dissection of cell wall synthesis at U. Arizona.

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Zhi-Yong Wang presented a talk on Sept. 19 at the Gene Expression Center, UC-Berkeley, and another on Sept. 26 at the Dept. of Biology, San Francisco State U. In Oct. he traveled to China to present lectures at the College of Life Sciences, Lanzhou U., and the Center for Cell Biology, Hebei Normal U., Shijiazhuang. He also presented a talk at the International Symposium on Plant Genomics and Biotechnology in Beijing on Oct. 19. In Jan. Wang attended the 22nd Symposium in Plant Biology at UC-Riverside.

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In Dec. **Winslow Briggs** gave two invited talks at the International Conference on Plant Blue Light Receptors, in Okazaki, Japan. In Jan. he presented two talks at U. Florida-Gainesville, one for the general public and the other a research seminar.

—

Qing Fang He left the Grossman lab at the end of July for a position in the Dept. of Applied Science at U. Arizona. **Wing-On Ng** left the lab at the end of Aug. for a position at Stanford U.

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Olivier Vallon joined the Grossman lab in Aug. as a Visiting Investigator. He comes from U. Paris 6, France.

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After a brief break taken upon receiving her Ph.D., **Dafna Elrad** joined the Grossman lab as a postdoctoral research associate.

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Falefasa Tagaloa joined the staff as grants administrator in Aug. Tagaloa will work for both Plant Biology and Global Ecology.

—

Sue Rhee's TAIR group had numerous new arrivals. **Gabe Lander** joined the group in Aug. as lab assistant. In Sept. the group welcomed **Yigong Lou,** a new postdoc, and **Nick Moseyko,** a new curator. **Rashmi Nunn,** a new curator, and **Shijun Li,** a new postdoc, arrived in Oct. **Aisling Doyle** left to return to her home country, Ireland.

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Jennifer Milne (U. York, UK) joined Chris Somerville's lab as a postdoctoral research associate in Sept.

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Thorsten Hamann (U. Tübingen, Germany) joined Chris Somerville's lab in Jan. as a postdoctoral fellow.

—

Postdoc **John Sedbrook** left in Dec. to become an assistant professor in the Dept. of Biological Sciences at Illinois State U. **Dario Bonetta** also left in Dec. to return to Canada for a position with Agriculture Canada in London, Ontario.

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In Jan. Shauna Somerville's lab welcomed two new postdocs: **Matt Humphry,** from U. Queensland, Australia, and **Marta Berrocal-Lobo,** from Spain.

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Lalitha Subramanian left Shauna Somerville's lab in Dec. to find a job in industry.

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Genevieve Guzman joined the Bhaya lab in Oct. as a lab assistant.

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In Jan. Kathy Barton welcomed postdoc **Brenda Reinhart** to her lab.

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After the departure of lab assistant **Aden Habteab** on Oct. 31, the Somerville labs added two new lab assistants in Nov.: **Radhika Garlapati** and **Azam Noorani Vatani.**

—

The Briggs lab welcomed three new people to the lab. In Sept. **Eirini Kaiserli,** from Greece, arrived from U. Glasgow, Scotland, to work as a predoctoral research assistant, and **Tong-Seung Tseng,** a new postdoc, arrived from U. Minnesota. In Jan. **Christophe Tissier,** a French native, arrived from U. Warwick, UK, as a postdoc.

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In Sept. **Soo-Hwan Kim** joined the Wang lab as a postdoc, arriving from U. Texas-Austin. In Dec. the lab welcomed **Nadia Marinova,** a new lab assistant from Stanford U. In Jan. **Ying Sun,** a senior postdoc-Visiting Investigator from Hebei, China, joined the lab for a yearlong stay.

Global Ecology

Plans for the new greenhouses and research buildings at Global Ecology are essentially complete, and construction is scheduled to start in Mar. or Apr. **Peggy Woodring,** who has worked with Carnegie as a construction manager on past projects, joined Global Ecology to help manage the building project.

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Greg Asner met with Brazilian government officials in Sept. and Dec. to develop a plan for monitoring illegal logging and forest-canopy damage throughout the Amazon Basin.

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Robin Martin, a student in Asner's lab, presented findings showing that woody vegetation invasion increases nitrogen trace gas emissions to the atmosphere at the annual meeting of the AGU in Dec. **David Lobell,** a Stanford student who joined the Asner lab on Aug. 1, presented results that U.S. agricultural yields have been affected by climate changes during the past two decades.

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David Lobell and **Greg Asner** presented new remote-sensing results on Mexican agriculture in San Carlos, Mexico, in Oct.

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Amanda Warner, a technician in Asner's lab, worked with Greg in the Brazilian Amazon in Nov. on satellite detection of forest logging and structural damage.

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Kathy Heidebrecht, an Asner lab technician, attended the NASA Earth Observing-1 Science Team workshop in Hilo, Hawaii, in Dec.

—

Jeff Hicke, a postdoctoral research associate in the Asner lab, presented results at the meeting of the AGU in Dec., describing how changes in the frequency of fires affect biogeochemical cycles throughout the world.

—

Winston Wheeler, a graduate student, joined the Asner lab in Sept. The lab also welcomed **Amanda Cooper** (Boston U.) as its new lab technician. In Jan. 2003 two postdoctoral research associates joined Asner's group, **Lydia Olander,** from Stanford, and **Andrew Elmore,** from Brown.

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Joe Berry's lab welcomed new senior lab technician **Robert Haxo** in Sept. He had been working for a technology company in the Silicon Valley.

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Chris Field's lab had a number of lab assistants during the summer to help with the harvesting during July and Aug.: **Mackenzie Cooper, Emily Keenan, Duncan Menges, Jennifer Ayers, Melissa Roth, Claire Phillips, Pamela Olson,** and **Scott Loarie.** Harvesters staying on to help with lab work were **Susan Finlayson** and **Susan Gere.**

—

Stanford students joining the Field lab in Sept. to work under the direction of Chris Field were **John Juarez, David Kroodsma,** and **Duncan Menges. Julia Silvis** became a new lab technician.

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Two small newcomers arrived: Laurel Hicke, born Jan. 23 and Albert Thomas Harris IV, born Feb. 6.

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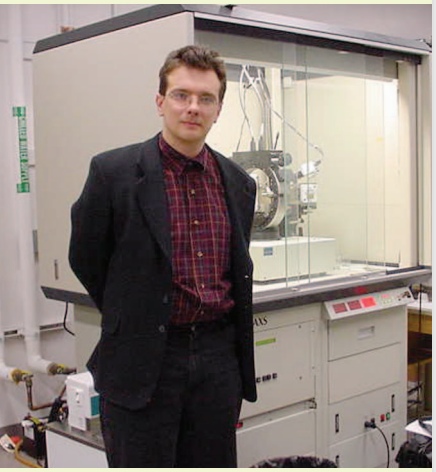
Bob Haxo of the Berry lab was married to Jayah on Jan. 30, 2003.



❸ Przemyslaw Dera is a new Staff Associate at the Geophysical Lab.

Geophysical Lab

John Frantz, a valued member of the senior scientific staff of GL since July 1, 1972, retired Oct. 31.

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Marilyn Fogel was elected a fellow of the Geochemical Society.

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Russell Hemley received the Hillebrand Prize of the American Chemical Society on Mar. 13.

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Ronald Cohen was elected a fellow of the American Physical Society last fall.

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Ho-kwang (David) Mao presented an invited lecture at the 2002 Euroschool, "New Materials and their Dynamics—Advances through Synchrotron Radiation," held in Rostock-Warnemünde, Germany, Sept. 29-Oct. 10. He also gave an invited talk at the fall AGU special session, "Applications of Neutron Scattering in Earth Sciences," in San Francisco Dec. 6-10. On Dec. 11 he presented an invited talk at COMPRES, in Berkeley, CA.

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❸ Former Barbara McClintock Fellow **Przemyslaw Dera** has been appointed a Staff Associate.

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Eugene Gregoryanz, former postdoctoral research associate, is now a research scientist. He will be working with the high-pressure physics group.

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Simon Clarke, U. Colorado, was appointed laboratory technician in Marilyn Fogel's lab. He will analyze samples recently collected in Australia.

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Michael Furlanetto, UCLA-Berkeley, has been appointed postdoctoral research associate. He will work with **Rus Hemley** and others in the high-pressure group who are planning a series of experiments to study hydrogen-rich molecular solids at high pressures and temperatures using new laser techniques.

—

Former research scientist **Alexander Goncharov** has accepted a position at the Lawrence Livermore Laboratory, but will continue collaborating with GL scientists as a Visiting Investigator.

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James A. Hall, Queen's U. Belfast, N. Ireland, has been appointed postdoctoral research associate. He will work with **Andrew Steele** and others on investigating microbial proliferation and activity in the shallow and deep subsurface. The work will provide a fundamental insight into subsurface microbial ecology, particularly as it applies to astrobiology research.

—

Holger Hellwig and **Jie Li** left GL on Mar. 15, 2003. They will be working at the Dept. of Geology at U. Illinois-Urbana Champaign. Li has a tenure-track faculty position, and Hellwig will be a research scientist. Li will be a Visiting Investigator at GL for one year starting in the middle of Mar.

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Former postdoctoral research associate **Yanzhang Ma** has accepted a position at U. Texas.

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Jaime Marian, from the Graduate Aeronautical Laboratories, Caltech, has been appointed a Visiting Investigator. He will work with Ronald Cohen on tight-binding molecular dynamics of iron.

—

Sébastien Merkel (summer intern with Rus Hemley, May-July 1996; predoctoral fellow, Sept. 1997-Sept. 1999; and Visiting Investigator, 1999-present) made numerous trips to GL from the Ecole Normale Supérieure in Lyon to complete his Ph.D. He has recently accepted a postdoctoral position at the Institute for Solid State Physics in Tokyo with Prof. Yagi.

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Former postdoctoral research associate **Habib O. Moltaji** (Ph.D., physics, Illinois Institute of Technology) returned to Illinois in Oct.

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Simon Nicholas Platts, who is working toward his Ph.D. in chemistry at Rensselaer Polytechnic Institute, has been appointed a predoctoral fellow. He is exploring the role of metallic meteorites as potential primordial catalysts for prebiotic chemistry on the early Earth.

—

On Feb. 24 **Charles T. Prewitt** gave the 2002-2003 Ernst Cloos Memorial Lecture at Johns Hopkins University. He also gave a seminar on Feb. 26 at Hopkins.

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Gerd Steinle-Neumann, former Carnegie Fellow and recipient of the Ralph B. Baldwin Prize in Astrophysics and Space Sciences from U. Michigan, has accepted a position at Bayerisches Geoinstitut, U. Bayreuth, Germany.

Terrestrial Magnetism

George Wetherill will receive the Henry Norris Russell Lectureship of the American Astronomical Society this year. It is the society's highest honor and is given in recognition of a lifetime of preeminence in astronomical research.

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The 2002 Carl Sagan Memorial Award, given jointly by the American Astronautical Society (AAS) and the Planetary Society, was awarded in Jan. to the California and Carnegie Planet Search Team, a group that includes DTM's **Paul Butler,** UC-Berkeley's Geoffrey Marcy and Debra Fischer, and UC-Santa Cruz's Steven Vogt. This was the first year the award was given for purely scientific accomplishments, and the first time it was awarded to a team. GL's director, Wesley Huntress, received the award in 1998.

—

Alycia Weinberger was elected a councilor of the American Astronomical Society for a three-year term.

—

The AGU has announced that the 2003 James B. Macelwane Medal will go to **Lianxing Wen,** a former Carnegie Fellow (1998-2000) who is now an assistant professor of geophysics at State U. New York-Stony Brook. The prize is given annually and "recognizes significant contributions to the geophysical sciences by an outstanding young scientist."

—

Sean Solomon delivered lectures on the MESSENGER mission to Mercury at the World Space Congress in Houston in Oct., the Colorado School of Mines in Nov., and NASA headquarters in Jan. He chaired the NASA Solid Earth Science Working Group, which published "Living on a Restless Planet," a long-term strategy for solid-Earth science at NASA, late last year. Solomon recently accepted appointments to the Committee to Visit the Department of Earth and Planetary Sciences at Harvard U., the Advisory Committee to the Center of Integrative Planetary Science at UC-Berkeley, and the Advisory Council of the Southern California Earthquake Center.

—

Vera Rubin gave a colloquium at the NASA Goddard Space Flight Center in Jan. and visited U. Texas-El Paso in Feb., where she met with students and gave a Millennium Lecture. In Feb. she visited the Science Museum of Virginia in Richmond for a planetarium show in which she was featured.

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Alan Boss gave the summary talk at the Workshop on Planetary Systems and Planets in Systems, held in Saas-Fee, Switzerland, in Sept. He spoke about giant planet formation at U. Texas-Austin in Sept. and at UC-Santa Cruz in Nov. In Oct. he delivered the opening talk at the First Iberian Congress of Meteorites and Planetary Geology, held in Cuenca, Spain. He also delivered the Benjamin Dean Lecture at the California Academy of Sciences, San Francisco, in Nov. In Jan. Boss spoke on the formation of planetary systems at the Symposium on Astrobiology, held as part of the inauguration of the Centro de Astrobiología in Madrid.

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Rick Carlson was appointed a member of the EarthScope Science and Education Committee, which provides oversight and advice on the science and education activities of the EarthScope program.

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Sara Seager gave an invited talk at the International Society for Optical Engineering conference "Future Research Direction and Visions for Astronomy," held in Kona, Hawaii, in Aug. She also gave colloquia at U. Maryland and at the Institute for Astronomy, U. Hawaii. Seager was interviewed in Nov. for *Discoveries and Breakthroughs inside Science,* a news series presented by the American Institute of Physics. She delivered a plenary talk at the AAS meeting held in Seattle in Jan.

—

Shown *(from left)* playing at the fall picnic held at Broad Branch Road on October 25 are GL's Andrew Steele and Bert Collins and DTM's Larry Nittler. The picnic featured a buffet prepared by BBR staff.

Richard Carlson and **Sean Solomon** were DTM participants at the Geological Society of America annual meeting in Denver in Oct.

—

DTM participants at the AGU fall meeting in San Francisco in Dec. included **Mark Behn, Richard Carlson, Erik Hauri, Petrus le Roux, Alan Linde, Selwyn Sacks, Mark Schmitz, Paul Silver,** and **Sean Solomon.**

—

Eiichiro Araki, a visiting fellow from the Japan Marine Science and Technology Center (JAMSTEC), arrived in early Dec. Araki has focused on marine seismology, particularly on the interpretation of data recorded by broadband borehole seismometers. He has worked with Selwyn Sacks and Alan Linde on the installation of borehole strainmeters seaward of the Japan Trench, and one of his goals at DTM will be to work on the first data from those installations.

—

Research scientist **James Cho** arrived in late Oct. to work with Sara Seager on extrasolar planets. Cho, an expert on fluid dynamics and complex computer codes, has worked on problems in aeronautics and global dispersion of aerosols. His recent focus is on the atmospheres of extrasolar planets and the possibility for testing atmospheric dynamical models with future astronomical observations.

—

Carnegie Fellow **Lucy Flesch** arrived in Jan. from State U. New York-Stony Brook, where she completed her Ph.D. in geophysics in May 2002. At DTM she plans to continue her work on continental deformation and will incorporate shear wave splitting observations to investigate lithosphere-mantle interaction.

—

Saad Haq, a graduate student at State U. New York-Stony Brook, arrived this Jan. and will complete his dissertation this spring. He uses analytical solutions and numerical and quantified analogue models to investigate partitioning at convergent margins. At DTM he hopes to incorporate detailed seismological observations into the analysis of such regions.

—

Carnegie Fellow **Kaspar von Braun** arrived in late Sept. after receiving his Ph.D. in astronomy and astrophysics at U. Michigan. He has carried out photometric and spectroscopic observations of galactic globular cluster stars to detect eclipsing binary stars in the clusters. These stellar systems can be used to determine cluster distances and main sequence turn-off ages for low-metallicity stars. The analysis of all cluster stars in the observed fields may further reveal the existence and clumpiness of interstellar extinction along the line of sight at a resolution of minutes of arc. At DTM he will work with Sara Seager, carrying out a search for planetary transits in galactic open clusters.

—

Predoctoral fellow **Darrell Hyde,** an M.Sc. student in the Dept. of Earth Sciences at Memorial U., Newfoundland, arrived in early Feb. for a monthlong stay with the geochemistry group. As part of his thesis he worked with Steven Shirey on gold-hosting banded iron formation from the Churchill Province of the Canadian Shield.

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Predoctoral fellow **Hong Soo Park,** a graduate student in the astronomy program of Seoul National U., began a five-month visit in early Nov. He worked with Prof. **Myung Gyoon Lee,** his advisor from Seoul, who is a Visiting Investigator at DTM while on sabbatical. They worked together on problems of the structure and evolution of star clusters and galaxies.

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Predoctoral fellow **Violet Simlane,** an M. Sc. student of Prof. Lew Ashwal in the School of Geoscience, U. Witwatersrand, arrived in early Feb. for a six-week visit to work with Rick Carlson and Steve Shirey on diamond inclusions from the South African Palmietgat Mine.

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Karl Kehm, a Carnegie Fellow and NASA Astrobiology Institute Fellow, left DTM at the end of July to become assistant professor of physics and Earth and planetary science at Washington College in Chestertown, MD. At DTM he led a search for isotopic variability of transition metals in terrestrial rocks and meteorites to document the baseline of abiotic isotope variability and to search for "isotopic biomarkers."

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Brooke Hunter became an administrative assistant in early Sept. After receiving a B.A. in English from Loyola U. in 1999, she worked for two years at Goldman, Sachs and Co. in New York, where she received the Distinguished Services Award. She is a founding member of Ballroom Studios, a nonprofit center for emerging artists in Atlanta.

Joshua Cai was born on Nov. 10 to **Alison** and **Derek Schutt.** After two years as a Harry Oscar Wood Fellow at DTM, Derek left in Feb. for a postdoctoral fellowship to study western U.S. seismology at U. Wyoming.

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Daniel Elias Rosentover was born Dec. 6 to DTM Staff Member **Alycia Weinberger** and her husband, Todd Rosentover.

DTM/GL

DTM/GL Visiting Investigator **Bruce Jakosky,** a professor on sabbatical from the Dept. of Geology and the Laboratory for Atmospheric and Space Physics at U. Colorado, arrived in late Sept. An expert on planetary surface-atmosphere interactions and, more recently, astrobiology, Jakosky is the principal investigator for the NASA Astrobiology Institute team led by U. Colorado.

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Librarian **Shaun Hardy** was appointed to a three-year term on the American Geological Institute's GeoRef Advisory Committee in Jan. The committee develops ideas for information products and services for the geoscience community, and makes recommendations on the policies of the GeoRef Information System—the world's leading database of Earth science literature.

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The Water on Mars Symposium, organized by GL's **Nabil Boctor** and DTM's **Conel Alexander,** was held on Sept. 20. Following introductory remarks by Maxine Singer, speakers included Boctor and Alexander; Michael Mumma (NASA, Goddard); Robert Novak (Iona College); Michael Smith (NASA, Goddard); William Feldman (Los Alamos National Laboratory); Bruce Jakosky, Ruth Ley, and Michael Mellon (U. Colorado); John Chambers (NASA, Ames); Allan Treiman (Lunar and Planetary Institute); Edward Vicenzi (Smithsonian Institution); **Jianhua Wang** and **Erik Hauri** (DTM); and James Farquhar (U. Maryland).

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DTM-GL Visiting Investigator **Kevin Burke** is teaching in the Dept. of Geosciences, U. Houston, this semester. A professor emeritus at the university, he divides his time between his homes in Washington, DC, and Houston.

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Visiting Investigator **James A. Van Orman** announced the birth of Isaac Saylor Van Orman on Feb. 7. Mother, Beverly Saylor, and baby are doing fine.

Shown *(from left)* at the site of a strainmeter installed in Aug. at Chi Mei, Taiwan, are Amigo Wang (drilling contractor), Chi-Ching Liu (Academia Sinica), DTM's Selwyn Sacks, Nelson McWhorter, Michael Acierno, Brian Schleigh, and Alan Linde, and Min Lee (Taiwan Geological Survey). They are seen in front of the drilling rig, with part of the strainmeter (a stainless steel cylinder with cable attached) visible in front. A second installation will be completed in early 2003 as part of a program planned in collaboration with the Academia Sinica to investigate tectonics near the eastern coast of Taiwan.

Carnegie Campaign for Science

More Than **Halfway There!**

The $75 million *Carnegie Campaign for Science* reached 55% of its goal as of March 1, 2003, with more than $41 million in pledges, gifts, and grants from individuals and foundations. Most of the funds contributed thus far are without restrictions and may be used for any of the campaign's projects. The effort is scheduled for completion at the end of 2006.

The *Campaign for Science* is an ambitious fund-raising endeavor that will help the Carnegie Institution continue its century-long tradition of pursuing science at the frontiers of knowledge. Some of the major components are the construction of a new home for the Department of Embryology in Baltimore and a "green" building to house the Department of Global Ecology in Palo Alto. The initiative will also provide for instrumentation at other departments and the support of postdoctoral fellows.

Carnegie is grateful to the many generous individuals and philanthropists who support its fundamental philosophy that basic research is vital to progress and that independence is vital to basic research.

Moody's Assigns **Highest Rating** to Carnegie for Revenue Bonds

On October 21, 2002, Moody's Investors Service assigned an impressive rating of Aaa/VMIG1 to Carnegie's $30 million of Series 2002 Revenue Bonds, issued through the Maryland Health and Higher Educational Facilities Authority. The bonds will be used to finance the construction of Embryology's new Maxine F. Singer Building on the Johns Hopkins University campus. An Aaa rating is the highest level that Moody's assigns. The long-term Aaa rating is based on the institution's very healthy financial reserves to cover operations and debt; high-quality operations from low-risk business endeavors; growth in funding from outside sources; and limited future borrowing plans.

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