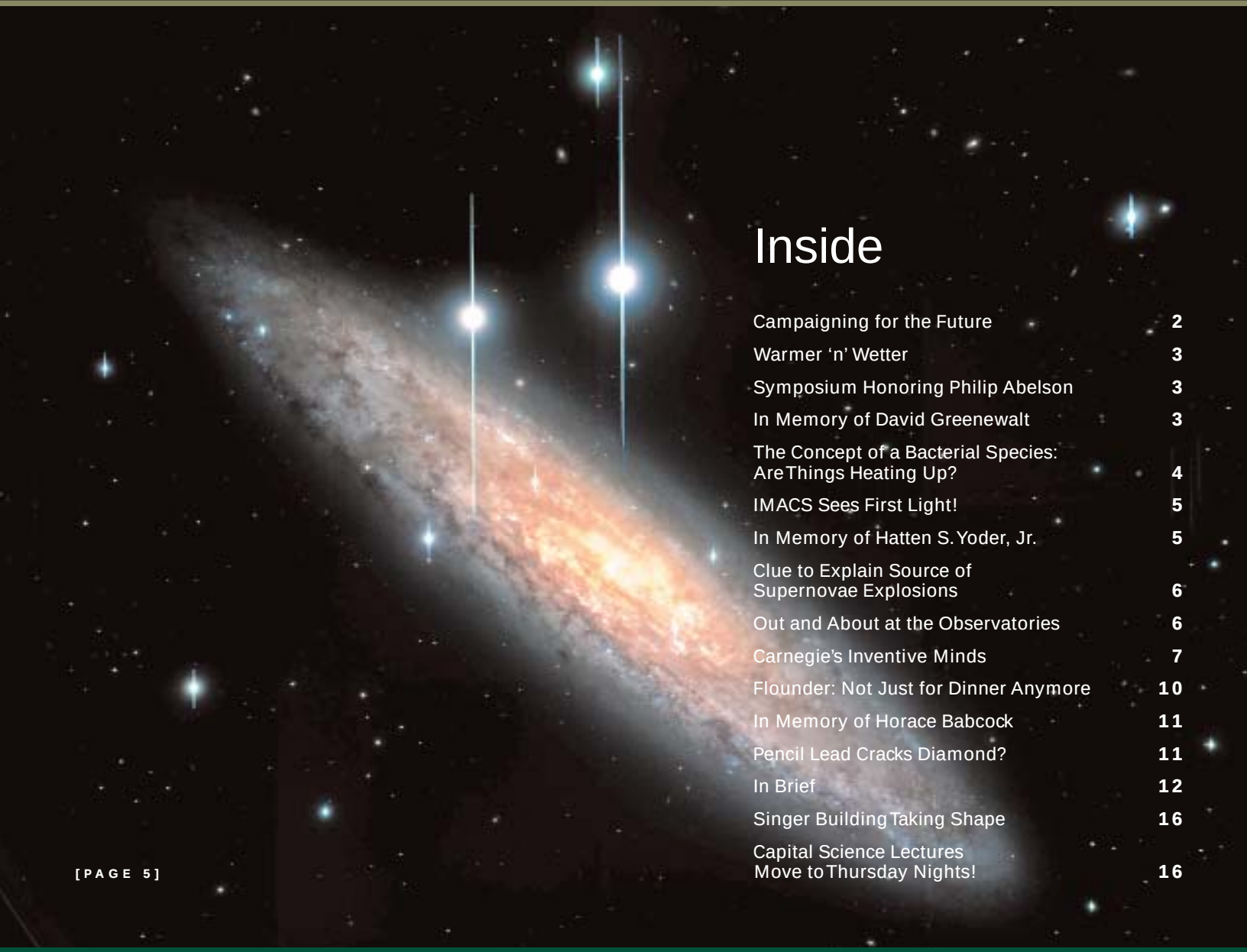
SPECTRA

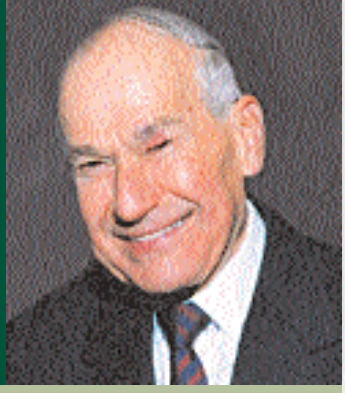
THE NEWSLETTER OF THE CARNEGIE INSTITUTION (WINTER 2003

New Horizons for Science



[PAGE 5]

Inside



(Photo courtesy Richard Hadden Photography.)

Campaigning for the Future

We are almost halfway through the most ambitious fund-raising campaign in the institution's history—the $75 million *Carnegie Campaign for Science*—and we have already raised 60% of our goal, $45 million. This achievement is particularly impressive in the current climate of fiscal restraint, and we are all very grateful for the outstanding support received from our trustees, longtime Carnegie friends, and the philanthropists who have made this milestone possible. But there is still much work to be done.

The campaign has five major components: the *Global Ecology Initiative Fund*, to raise $20 million to endow the newest department and $5 million to house it; the *Embryology Facility Fund*, to raise $5 million to supplement a $30 million construction bond for the Maxine F. Singer Building and $15 million to support operations and maintenance; the *Observatories Enhancement Fund*, to raise $15 million for new scientific staff and instrumentation; the *Earth and Planetary Science Innovation Fund*, to raise $11 million for facilities renewal and instrumentation; and the *Postdoctoral Fellowship Fund,* to raise $4 million to endow named fellowships. I am pleased that most of the campaign contributions thus far have been unrestricted, which allows us tremendous flexibility in funding these undertakings.

Beyond the ledger, the progress we are making is perhaps most obvious in our construction projects. Construction for both the Global Ecology building at Stanford and the Singer building in Baltimore is well under way. The greenhouses for Global Ecology were ready this summer, and the main structure is expected to be available for occupancy in spring 2004. The Singer building is also taking shape; it is targeted for completion in early 2005. Our third construction project—renovations to the old experiment building on the Broad Branch Road campus—is also progressing. The refurbished structure is expected to be habitable within about a year. It will be named after David Greenewalt, a loyal trustee who recently passed away.

Bricks, mortar, and instrumentation aside, another major aspect of this campaign has been our ability to extend our reach in new ways and into different communities. In September, as one example, we joined forces with the Carnegie Corporation of New York to host an event in New York to pay tribute to President Emerita Maxine F. Singer. Old friends and new assembled for the first gathering of its type in our 101-year history. It was a resounding success and has helped spread the word of Carnegie's groundbreaking science to many who were unfamiliar with our work.

Outreach efforts at the Observatories are cultivating new friends on that coast, too. Two open houses held at Santa Barbara Street have attracted hundreds of Pasadena neighbors who have been delighted to learn that their own backyard is the site of 100 years of world-class achievement in astronomy. The Observatories series of public lectures will begin its second season this spring, and these, in addition to the department's ongoing educational efforts in the Pasadena community, are all helping to raise our profile there.

We at Carnegie know that our science is distinct from that of many other research institutions, where investigations typically conform to the aims of federal or private-sector interests. Carnegie science receives significant support from our endowment, and this independence is key to our ability to pursue our often-unconventional research, which has led to major discoveries in the past and will do so in the future. Our efforts to convey the Carnegie formula to a wider circle will help foster new support and thus ensure that our tradition of independence, innovation, and excellence continues.

—Michael E. Gellert, *Chairman*

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Warmer 'n' Wetter:

Another Surprise from the Global Change Project

Results of a recent study from the Jasper Ridge Global Change Project at Carnegie's Department of Global Ecology and Stanford University defy the expectations of numerous climate-change models as to the relationship between increased temperatures and soil moisture. The study was published in the August 5 online edition of the *Proceedings of the National Academy of Sciences*.

Since warming promotes evaporation, scientists have generally thought that warmer temperatures would result in drier ecosystem conditions. Apparently not, according to the recent experiment. It is one of a series of studies looking at the combined effects of multiple environmental factors that are projected to occur over the long term as increases of the greenhouse gas CO_2 continue through human use of fossil fuels (see *Spectra*, Summer 2003).

The new study, which was coauthored by Global Ecology's Greg Asner and Chris Field, among others, showed that warming increased soil moisture by 5% to 10% under ambient conditions and conditions with elevated CO_2. The scientists also found that the increased temperature led to the early death of many plants. They suspect that this plant loss reduced the number of pathways for the water to exit the system via transpiration and was thus responsible for the excess water in the soil.

Symposium Honoring **Philip Abelson**

Philip Abelson poses in front of a portrait of Andrew Carnegie.

(Photo by Yoichi R. Okamoto.)

From Rocks to Genes and Back, a symposium honoring Philip H. Abelson for his 90th birthday, was held at the administration building on October 21. Abelson was a staff scientist at the Department of Terrestrial Magnetism beginning in 1939 and became director of the Geophysical Laboratory in 1953. From 1962 to 1985 he was editor of *Science*. During part of that period, he simultaneously served as Carnegie president. Abelson is currently an active trustee.

President Richard Meserve welcomed the symposium participants, and Melvin Simon of the Agouron Institute, the symposium's sponsor, introduced the four speakers: John Grotzinger of MIT, Andrew Knoll of Harvard, Sean Carroll of the University of Wisconsin, and Dianne Newman of Caltech. The scientists discussed evolution and the connections between minerals and life. The symposium concluded with a dinner in the rotunda.

DAVID GREENEWALT

Trustee

David Greenewalt, secretary of the board of trustees, geophysicist, oceanographer, and Carnegie benefactor, died of cancer on October 21, 2003, at his home in Washington, D.C., with family members at his side. He, his father, Crawford H. Greenewalt, and his mother, Margaretta, have generously supported the Carnegie Institution for over half a century. Services were held for Greenewalt on November 3 at Christ Church in Greenville, Delaware.

David Greenewalt was born in 1931 in Wilmington, Delaware. He received a B.A. from Williams College in 1953 and a Ph.D. in geophysics from the Massachusetts Institute of Technology in 1960. He then served as an instructor and lecturer at MIT until 1966, when he joined the Naval Research Laboratory in Washington, D.C.

Greenewalt became a member of the Carnegie board in 1992, continuing his family's strong affiliation with the institution. His father, Crawford, an engineer and former president and chairman of E.I. du Pont de Nemours and Company, joined the Carnegie board in 1952. He became particularly interested in Carnegie astronomy and, with his wife, Margaretta, gave the institution a generous grant to build the Irénée du Pont telescope at Las Campanas, Chile, which was named after Mrs. Greenewalt's father. Crawford H. Greenewalt was also honored with the establishment of the Crawford H. Greenewalt chair at the Observatories, which is currently held by Director Wendy Freedman.

In addition to serving as Secretary to the board, David Greenewalt served as a member and chairman of the Department of Terrestrial Magnetism's Visiting Committee and as a member of the Employee Affairs, Audit and Research Committees. He and his wife, Charlotte, regularly attended the Capital Science Lectures and other events held at the institution's headquarters building in Washington. He particularly enjoyed visiting the departments and chatting directly with researchers.

In recognition of Greenewalt's service and generosity toward the institution, his love for science, and his enthusiasm for the Earth sciences in particular, the refurbished experiment building at the institution's Broad Branch Road campus in Washington, D.C., will bear his name. Greenewalt is survived by his wife, six children and six grandchildren, a brother, and a sister.

David Greenewalt (shown above). Architectural rendering of the building that will bear his name (shown pg 2, top right). The building is part of the Broad Branch Road campus, where the Department of Terrestrial Magnetism and the Geophysical Laboratory are located.

The Concept of a Bacterial Species: Are Things Heating Up?

A new study may revolutionize the concept of a species—at least in the world of bacteria. On September 24, the National Science Foundation announced its award of a $5 million, five-year grant to a group of scientists, including investigators at the Carnegie Institution's Department of Plant Biology in Stanford, to study some of the tiny photosynthetic creatures that live in near-boiling pools in Yellowstone National Park. The organisms, known as cyanobacteria, are among the microbes that inhabit the thick, colorful mats found in the thermal pools.

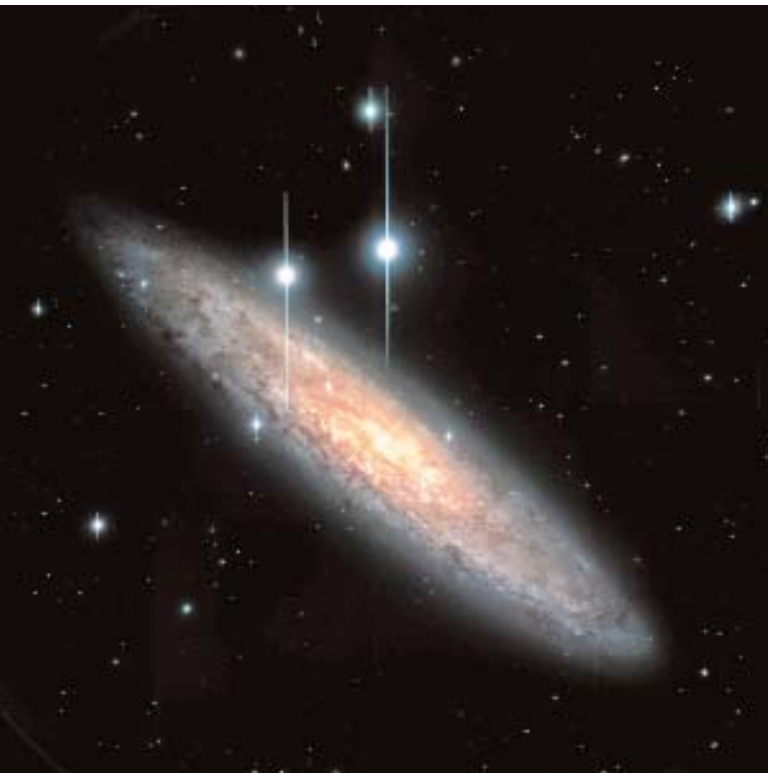
Plant Biology Adjunct Staff Member Devaki Bhaya, one of the researchers on the team, explains: "It's easy to think that microbes that *look* the same under the microscope are all the same genetically. Yet we know that even within these simple microbial mats there are tremendous differences generated over thousands of years of evolution. This raises several questions: Have the same species undergone genetic radiation to populate relatively different microenvironments? Have different, but morphologically similar, species become specialized for specific niches within the mats? Is evolution of the mat structure linked to the flow of genetic information between organisms?" By using a host of sophisticated molecular and genomic tools, the team will look for genetic differences among bacteria found in the microbial mats. They will then determine the extent to which the different species promiscuously exchange genetic information and from these data try to understand how the community became structured over time. They hope the results will clarify some of the controversies surrounding the concept of what constitutes a bacterial species, or determine if the term *species* should even be applied to bacteria.

In addition, Plant Biology Staff Member Arthur Grossman hopes to learn how a photosynthetic organism can survive in temperatures that scald the human hand. "Developing an understanding of the different cyanobacterial 'ecotypes' that populate the hot springs will provide us with clues of what constitutes fitness and what limits that fitness within the confines of a highly structured environment," he said.

The scientists believe that local environmental differences are the major driving force behind the different genetic groups of the cyanobacterium *Synechococcus*, which is dominant in the hot springs. The interdisciplinary team will probe the problem from a variety of perspectives including genomics, microbial physiology, environmental science, bioinformatics, and mathematical modeling to untangle the complex interactions that occur within this environment. Carnegie researchers will use DNA microarrays and other technology to get a glimpse of genes that are turned on in these cyanobacteria as they acclimate to changing mat environments over daily and seasonal cycles. The possible discovery of genetically and physiologically separable ecotypes will broadly affect thinking in microbial evolution and bacterial ecology.

The National Science Foundation's Frontiers in Integrative Biological Research (FIBR) study "Do Species Matter in Microbial Communities?" is led by Principal Investigator Dr. David Ward at Montana State University. The study's interdisciplinary team is made up of scientists from the following institutions: Montana State University, Wesleyan University, the Institute for Genomic Research, the University of Copenhagen, Stanford University/Carnegie Institution of Washington, and Lockheed Martin.

Yellowstone National Park is home to scalding hot, richly colored thermal pools. Much of the color in these pools comes from algal mats made up of microorganisms such as the cyanobacterium *Synechococcus*. The genetic diversity of these organisms calls into question the notion of what constitutes a species in the world of bacteria. A new grant from the National Science Foundation awarded to a group of scientists, including researchers at the Department of Plant Biology, will help decipher who's related to whom and how in this complex environment.



IMACS
SEES FIRST LIGHT!

The first sky image was taken with the Inamori Magellan Areal Camera and Spectrograph (IMACS) on the Baade telescope on Tuesday morning, August 19, at about 2:00 a.m. The target was the nearby dusty Sc galaxy NGC 253, which stretches for nearly half a degree over the sky. The first exposure was a guided 300 s V-band 1x1 image with the f/2 camera and the full 8k x 8k Mosaic CCD camera. About 18 people crowded into the control room to watch the image scroll down the screen. •

Galaxy NGC 253 (above), the brightest member of the Sculptor group of galaxies, was the first object imaged with the Inamori Magellan Areal Camera and Spectrograph (IMACS).

From left to right, Bruce Bigelow, Alan Dressler—principal investigator of IMACS—and Brian Sutin watch the detectors read out...and galaxy NGC 253 appears!

HATTEN S. YODER, JR.

Renowned Petrologist and Director Emeritus of the Geophysical Laboratory

Hatten S. Yoder, Jr., the robust and hearty director of the Geophysical Laboratory between 1971 and 1986, died on August 2, 2003, at Suburban Hospital in Bethesda, Maryland, from surgical complications. He was 82 years old and had been an active member of the scientific staff until just weeks before his death.

An internationally known geologist and experimental petrologist, Yoder was one of the most influential petrologists of the 20th century. He was also passionate about history and a prolific writer, and he cared deeply about social issues, fighting against segregation as early as the 1940s.

Yoder was born on March 20, 1921, and raised in Cleveland, Ohio. He received his B.S. from the University of Chicago in 1941 and completed graduate work in meteorology at the University of Minnesota in 1942. He served in the U.S. Navy during World War II, rising to the rank of lieutenant commander. Among his duties during the war was serving as a meteorologist for a joint U.S.-Russian Siberian expedition to monitor the weather before the planned invasion of Japan. He documented the experience in his book *Planned Invasion of Japan (1945): The Siberian Weather Advantage*.

Yoder resumed his education after the war at the Massachusetts Institute of Technology, where he received his Ph.D. in 1948. He joined the Geophysical Lab staff as an experimental petrologist that same year. A leading expert on the origin of volcanic rocks such as basalt, he was also a pioneer in the development and use of high-pressure, high-temperature research for Earth and materials sciences. Recently Yoder conducted research into the origins of life by looking at the synthesis of organic compounds under the high-pressure, high-temperature conditions found at deep-sea hydrothermal vents.

In 1958 Yoder became the youngest Earth scientist elected to the National Academy of Sciences. He was a member of a number of other societies including the American Philosophical Society and the American Academy of Arts and Sciences. He also won many of Earth science's most prestigious awards, the Arthur L. Day Medal, the Arthur L. Day Prize, and the Roebling Medal among them.

Yoder contributed to some 100 articles that were published in scientific journals. He also served on many editorial boards and national scientific advisory committees, and as an expert witness. He was active in a variety of nonscientific organizations including the Sons of the American Revolution, General William Smallwood Chapter.

Yoder's passion for history is evidenced by his authorship of more than 30 historical books and articles and some 20 biographies of famous geologists and petrologists. At the time of his death he was finishing the history of Carnegie's Geophysical Laboratory, which will be part of a five-volume set on the history of the Carnegie Institution, to be published by the Cambridge University Press in 2004.

He was married to Elizabeth Marie Yoder for 42 years. Mrs. Yoder died in 2001. Their son, Hatten S. Yoder III, died in November 1998. Yoder is survived by his daughter, Karen M. Wallace; her husband, Keith A. Wallace; and a granddaughter, Brianna Elizabeth Wallace. •

Hatten S. Yoder, Jr., experimental petrologist at the Geophysical Laboratory 1948-1971; director of GL from 1971 to 1986; director emeritus, 1986-2003.

Clue to Explain Source **of Supernovae Explosions**

Exploding stars, known as type Ia supernovae, are handy tools used by astronomers to measure a variety of celestial phenomena including the presence of dark energy—the force that is believed to be driving the increasing rate at which the universe is expanding. "A great worry in this work has been that astronomers do not understand exactly how these supernovae are produced," said Mario Hamuy, Hubble Fellow at the Carnegie Observatories and lead author of an article on the subject published in the August 7, 2003, issue of *Nature*. The study, on which Mark Phillips, other colleagues at the Observatories, as well as scientists at other organizations collaborated, has provided an essential clue to what may trigger these supernovae events.

Astronomers generally agree that Ia supernovae are dense, massive white dwarf stars that live in binary star systems. They end their lives as thermonuclear explosions, creating many of the heavy elements found in the universe today. The theory behind these explosions is that there is a transfer of mass between the companion star and the white dwarf, which sparks the event. But the processes behind the explosions and the role the companion stars play remained elusive until Supernova (SN) 2002ic was observed at Carnegie's Las Campanas Observatory in Chile between November and December 2002.

The scientists discovered hydrogen-rich circumstellar gas associated with SN 2002ic—the first evidence of such gas in a type Ia supernova. Adding to this observation, the amount of gas was found to be surprisingly large. Based on the data, the scientists think that the companion star was a type known as an asymptotic giant branch (AGB) star, a fairly normal star whose mass is about three to seven times the mass of our Sun. It likely lost its hydrogen gas as a product of strong pulsations, which wafted to the white dwarf, increasing its mass to the point of explosion. This represents the first time researchers have witnessed a progenitor Ia supernova.

Hamuy and this research were featured in a two-page article that appeared in the Chilean newspaper *El Mercurio* and in the *Pasadena Star-News*, among other outlets.

Out and About **at the Observatories**

Art and Science Synergize

The 100th anniversary of the Mount Wilson Observatory was commemorated with an art exhibition, Artists Celebrate the Cosmos: The 100th Anniversary of the Mount Wilson Observatory, held at the Carnegie Observatories on October 19. Some 50 artists from the California Art Club took to the mountain in July to capture the essence of the famous observatory and its grounds. The resulting paintings were displayed in the gardens of the historic Santa Barbara Street building, where artists and close to 400 guests gathered. The exhibition was part of an event that also featured a large display of solar telescopes set up by the Mount Wilson Institute, a raffle whose prize was a telescope donated by Meade Instruments, and a highly popular "Ask the Astronomer" table, where Carnegie astronomers were on hand to answer questions from the public. The event was covered on the front page of the October 20 *Pasadena Star-News*.

Artists and guests—including Pasadena Mayor Bill Bogaard (left) and Art Commissioner Jerri Price—gather in the gardens of the Observatories for Artists Celebrate the Cosmos: The 100th Anniversary of the Mount Wilson Observatory.

Year Two for the Lecture Series

The 2004 spring Observatories Centennial Lecture Series will kick off its second season with a talk by Stephen Shectman on March 30 at the Huntington Library in San Marino, California. Shectman, who has led the Magellan telescope project since its beginning, will talk about building large telescopes. Three other lectures by Observatories astronomers will follow: Patrick McCarthy will talk about the birth of galaxies on April 13; George Preston will discuss the biological aspects of stardust on April 27; and Michael Gladders will peer back into time from a cosmological perspective on May 11. The lectures, free and open to the public, will start at 8:00 p.m.

Alan Alda of M*A*S*H Fame Visits Las Campanas

Alan Alda, longtime friend of Observatories astronomer Alan Dressler and host of the PBS *Scientific American Frontiers* TV series, visited Las Campanas in October to film a segment of a *Frontiers* show about dark matter and dark energy. Alda and his crew were particularly intrigued with the Baade telescope. Alda also interviewed Dressler and Observatories astronomer Pat McCarthy. According to Dressler, "The interviews were good...they loved the place." The program is expected to air in mid-2004.

From left to right: Alan Dressler, principal investigator of the IMACS project, Alan Alda, and Miguel Roth, director of Las Campanas Observatory.

CARNEGIE'S INVENTIVE MINDS

"Gentlemen...you seek to expand known forces,
to discover and utilize unknown forces for the benefit of man.
Than this there can scarcely be a greater work."

REMARKS BY ANDREW CARNEGIE ON PRESENTING HIS TRUST DEED, JANUARY 1902

"This was my first project in high pressure," said Wendy Mao about her patent application with Ho-kwang (Dave) Mao for their method for hydrogen storage. "It served as a bridge between my materials science background at MIT and the transition into Earth and planetary science at the University of Chicago."

Sometimes an invention arises as part of scientific research. At other times a scientist creates a new tool to conduct his or her research. And at still other times the creation itself drives the research, as was the case with Wendy Mao of the University of Chicago and the Geophysical Laboratory (GL) and her colleague and father, Ho-kwang (Dave) Mao, also of GL. These coinventors recently applied for a patent entitled, "Composition and method for hydrogen storage," an important contribution to today's quest for cleaner, safer energy sources. And, as it turns out, the work has also contributed to a better understanding of the icy worlds that populate our solar system.

Andrew Carnegie's original intent was to establish an institution of discovery and use the accomplishments of its researchers for the benefit of humankind. Over the last century, the institution has carried out this commitment by encouraging research in unique and sometimes high-risk areas. This approach has, as a matter of course, inspired a number of innovations by Carnegie staff, many of which have been patented in the United States and abroad. Although the institution has received income from patent licensing, royalties have never been the primary focus at Carnegie. Rather, in keeping with Andrew Carnegie's original intention, the institution typically engages in the patent process only when research conducted to advance scientific knowledge happens to yield a creation that is generally beneficial to society.

The first U.S. patent by a Carnegie researcher assigned to Carnegie is believed to have been to Paul Cook of the Department of Plant Biology in 1953. The patent related to a process and device for producing algae. Several other algae-related patents followed. In 1962 a different type of invention was patented by Vannevar Bush, the institution's fourth president (1939-1955). Although Bush was an electrical engineer known for his role in creating the Differential Analyzer, as well as the holder of 49 electronics patents, his Carnegie patent was for a method of binding glass fragments to form a strong, solid sheet.

In 1985 Carnegie adopted an official policy regarding patenting. That policy was amended in 1995 and remains in force today. It covers patenting of "inventions conceived or reduced to practice in the course of research by Staff Members, associates, fellows, and students of the Carnegie Institution." It applies to research that is fully supported by Carnegie, and research that is funded in part by Carnegie and in part by others, including U.S. government-granting agencies, outside organizations such as foundations, for-profit organizations, and collaborations with other research institutions.

What exactly is a patent? Simply stated, a patent in the U.S. is a right granted by the federal government to the inventor that **excludes** others from making, selling, or using the invention without the patent owner's permission. U.S. patent law provides that "[a]ny new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof may obtain a patent." Chemical compositions are examples of "compositions of matter." Mechanical devices, instrumentation, plants, chemical processes, methods of making and using genetically engineered products and the products themselves, new compounds, and new life forms are all types of patentable inventions. An invention can have more than one inventor, but all inventors must make conceptual contributions to the effort.

An invention can be patented via the U. S. Patent and Trademark Office and in equivalent organizations in other countries. There are a number of steps in the application process for Carnegie inventors, including record keeping and the application itself, which are outlined in the institution's patent-and-invention information statement. The institution can grant licenses to an invention as soon as the inventor has disclosed it. A variety of licensing agreements are made between Carnegie and other organizations. The institution currently engages the services of Morgan Lewis & Bockius LLP in Washington, D.C., to shepherd patent applications through the process and to negotiate licenses. Gloria Brienza and John Lively in Carnegie's administration office coordinate the effort between the inventors, partner organizations, and the law firm.

Any income to Carnegie that results from licensing patents, after expenses and overhead, is distributed by the following formula: 35% to the inventor(s); 50% to the department; and 15% to the president's contingency fund. The primary use of Carnegie patent income has been from the beginning and will remain "to support further educational and research activities."

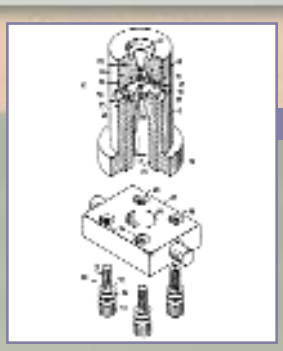
CONTINUED

A POTPOURRI OF CARNEGIE INVENTIONS

The patents below, listed with their Carnegie inventors, have been granted by the U. S. Patent and Trademark Office. A variety of pending U.S. applications are also listed, by their filing dates. Since June 8, 1995, patents have been issued for 20-year terms from the first filing date. Patents granted before that time, or that are still active on that date, have terms that expire either 17 years from the date of issue or 20 years from the earliest filing date—whichever is longer.

PB PLANT BIOLOGY
GL GEOPHYSICAL LABORATORY
DTM TERRESTRIAL MAGNETISM
EMB EMBRYOLOGY

IN THE CASE OF INVENTIONS WITH MORE THAN ONE INVENTOR, ONLY CARNEGIE COINVENTORS ARE LISTED. ILLUSTRATIONS ARE EXTRACTED FROM THE PATENT DOCUMENTS.



GL

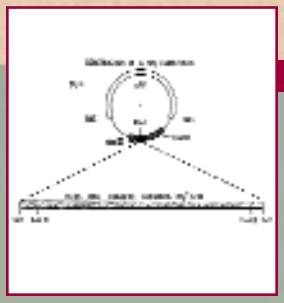
JULY 1982
Apparatus for producing solid hydrogen.

PETER BELL
HO-KWANG MAO

GL

JUNE 1983
Method and apparatus for producing solid hydrogen.

PETER BELL
HO-KWANG MAO



EMB

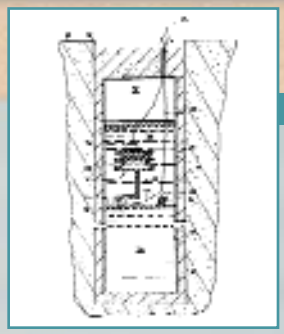
JUNE 1987
Method of incorporating DNA into genome of *Drosophila*.

GERALD RUBIN
ALLAN SPRADLING

PB

SEPTEMBER 1997
Use of plant fatty acyl hydroxylases to produce hydroxylated fatty acids and derivatives in plants.

CHRISTOPHER SOMERVILLE



DTM

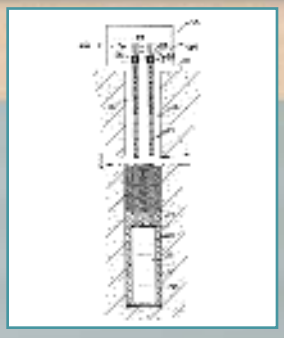
APRIL 1998
Two-stage strain-sensing device and method.

I. SELWYN SACKS

PB

APRIL 1999
Application—Interconversion of desaturases and hydroxylases.

CHRISTOPHER SOMERVILLE
ET AL.



PB

FEBRUARY 2000
Methods and tools for transformation of eukaryotic algae.

ARTHUR GROSSMAN
KIRK APT
ET AL.

PB

FEBRUARY 2000
Plant fatty acid hydroxylase.

CHRISTOPHER SOMERVILLE
ET AL.

PB

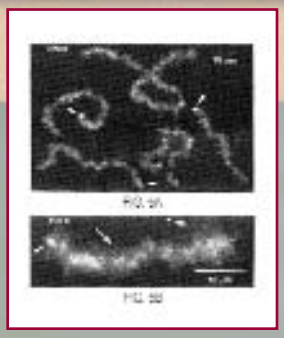
OCTOBER 2000
Application—Engineering disease resistance with pectate lyase-like genes.

JOHN VOGEL
SHAUNA SOMERVILLE
ET AL.

EMB

OCTOBER 2000
Application—RNA interference pathway genes as tools for targeted genetic interference.

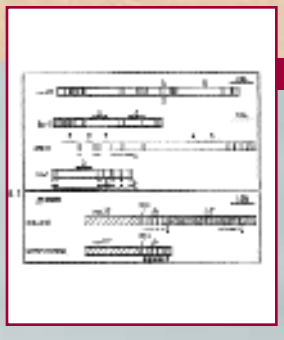
ANDREW FIRE
ET AL.



GL

NOVEMBER 2002
Application—Apparatus and method for diamond production.

RUSSELL HEMLEY
HO-KWANG MAO
CHIH-SHIUE YAN
ET AL.



EMB

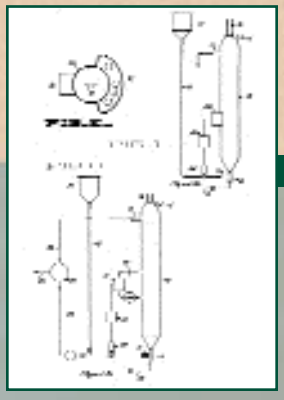
JANUARY 2003
Genetic inhibition by double-stranded RNA.

ANDREW FIRE
MARY MONTGOMERY
LISA TIMMONS
SIQUN XU
ET AL.

EMB

JANUARY 2003
Application—High throughput genetic screening of lipid and cholesterol processing using fluorescent compounds.

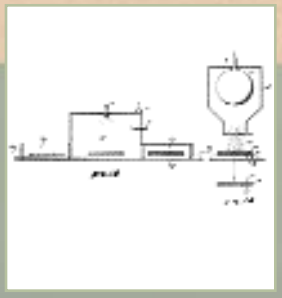
STEVEN FABER
MARNIE HALPERN, ET AL.



PB

NOVEMBER 1953
Apparatus and process for the production of photosynthetic micro-organisms, particularly algae.

PAUL M. COOK



MAY 1962
Process of forming a sheet from glass fragments and plastic.

VANNEVAR BUSH
(CARNEGIE PRESIDENT)

GL

SEPTEMBER 1981
Separation of amino acids by liquid chro-matography using chiral eluants.

P. EDGAR HARE

EMB

MARCH 1988
Transposable elements and process for using same.

NINA FEDOROFF

DTM

JUNE 1993
Multiple ion multiplier detector for use in a mass spectrometer.

LOUIS BROWN
RICHARD CARLSON
STEVEN SHIREY

EMB

MAY 1997
Method of controlling viral growth.

STEVEN MCKNIGHT

EMB

JULY 1997
Method for constructing an oligonucleotide concatamer library by rolling circle replication.

ANDREW FIRE
SIQUN XU

DTM

MAY 1999
Strain monitoring system.

I. SELWYN SACKS
ET AL.

EMB

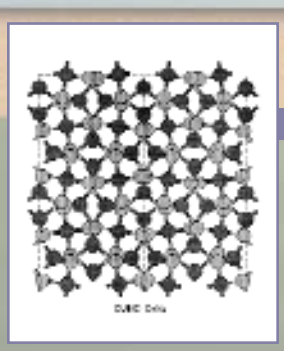
JULY 1999
Application—Method for maintenance and division of germline stem cells using members of the TGB-B family of growth factors.

ALLAN SPRADLING
TING XIE

PB

OCTOBER 1999
Strong early seed-specific gene regulatory region.

PIERRE BROUN
CHRISTOPHER SOMERVILLE



GL

NOVEMBER 1999
Low compressibility carbon nitrides.

DAVID TETER
RUSSELL HEMLEY

EMB

MARCH 2001
Production of lamp-brush chromosome.

JOSEPH GALL
CHRISTINE MURPHY

PB

SEPTEMBER 2001
Production of hydroxy-lated fatty acids in genetically modified plants.

CHRISTOPHER SOMERVILLE
PIERRE BROUN, ET AL.

EMB

FEBRUARY 2002
Human hairless gene and protein.

CATHERINE THOMPSON

EMB

MARCH 2002
Application—Use of FLP recombinase in mice.

SUSAN DYMECKI

GL

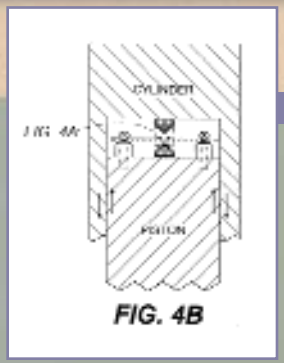
OCTOBER 2002
Application—Composi-tion and method for hydrogen storage.

WENDY MAO
HO-KWANG MAO

EMB

MARCH 2003
Application—Monitoring circadian activity.

JIMO BORJIGIN



GL

APRIL 2003
High pressure anvil and optical window.

JI-AN XU
HO-KWANG MAO

GL

JUNE 2003
Optical devices having a wavelength-tunable dis-persion assembly that has a volume dispersive diffraction grating.

ALEXANDER GONCHAROV
VIKTOR STRUZHKIN

EMB

JULY 2003
Application—A hetero-chromatic gene encoding poly (adp-ribose) polymerase (PARP).

ALLAN SPRADLING
ET AL.

Note how an eye of the flatfish moves from one side of the body to the other during development (left). Three stages of frog and flatfish metamorphosis are paired to show roughly equivalent stages. On the top are premetamorphic larvae; in the middle are metamorphosing animals; at the bottom are postmetamorphic juveniles.

Alex Schreiber (above) stands with an adult summer flounder in his new fish facility at Embryology.

FLOUNDER

Not Just for Dinner Anymore

by Audrey M. Huang

There is nothing like a flatfish," says Alex Schreiber, the newest Staff Associate to join the Department of Embryology. Schreiber is taken with creatures like flounders because they undergo extremely dramatic changes during their development. They hatch from eggs into bilaterally symmetric larvae, which swim just like any other fish. But as they grow, one eye moves across the face to join the other eye, and when they reach adulthood they swim flat on the ocean bottom, eyeless side down. According to Schreiber, "This is the most dramatic example of left-right asymmetry in the animal kingdom."

Schreiber studied flatfish gill development as a graduate student in oceanography at the University of Rhode Island. His postdoctoral work in the Brown lab at Embryology focused on how thyroid hormone changes the gut when a tadpole turns into a frog during metamorphosis. Thyroid hormone also controls metamorphosis of flatfish, which led Schreiber to wonder how the same molecule can generate such extreme asymmetry. The development of asymmetry has been studied in mice and zebrafish, but no one has studied asymmetry in flatfish.

In fact, very little developmental biology research has been conducted on flatfish. Currently, flatfish research focuses on improving farming techniques to raise the fish for human consumption. Although Schreiber likes to eat flounder, his interests lie in understanding how asymmetry develops. "Really what we're interested in is the genes involved in craniofacial and brain remodeling; what genes are expressed and when and where they are expressed," he says. Schreiber will use standard molecular approaches to look for genes that are responsive to thyroid hormone and are asymmetrically expressed, perhaps on only one side of the head.

To better visualize where and when such genes act in the changing fish head, Schreiber also plans to build a digital atlas of developmental stages depicting both external structures, such as the migrating eye, and internal structures—the brain, bones, and cartilage—using 3-D computer modeling software originally developed for Hollywood movies. These high-tech computer models will provide a valuable reference system with detail never before so easily acquired in any other model organism.

Since no one has ever tried to cultivate flatfish as a model organism before, Schreiber currently acquires flounder larvae from collaborators who run fisheries at the University of North Carolina. In addition to several tanks of flounder, he keeps a few tanks of a local flatfish species commonly called the hog choker, which he acquired from a trawling expedition on a government research ship and hopes to raise in the lab. If Schreiber and colleagues can coax the hog chokers to breed in captivity, these fish hold promise as a model system for studying gene function.

This inland-based marine research is quite challenging, says Schreiber, and he is extremely grateful for the opportunity that Carnegie has given him. "That the Carnegie is going to support me in this, and they're aware of the risks, that's music to my ears because it allows me to do something I would never be able to do anywhere else." •

HORACE BABCOCK

Former Observatories Director and Champion of Las Campanas

Horace Welcome Babcock, astronomer, inventor, former director of the Mount Wilson and Palomar observatories, and founder of Carnegie's Las Campanas Observatory, died on August 29 at age 90 in Santa Barbara, California. Babcock was born on September 13, 1912. An only child and the son of Mount Wilson Observatory astronomer Harold Babcock, he grew up surrounded by some of astronomy's greatest figures, including Edwin Hubble and Milton Humason, the discoverers of the expanding universe.

As a teenager Babcock worked in the Mount Wilson optical shop, learning how to make lenses and mirrors. After enrolling at the California Institute of Technology in 1930, he continued to work at the observatory, using the 150-foot solar tower for his research. This work led to a series of papers he coauthored with his father. Babcock received his B.S. in physics from Caltech in 1934. He debated remaining at Caltech to pursue mechanical engineering, but the culture of astronomy won him over and he opted for the University of California, Berkeley. (At that time, Caltech did not have an astronomy department.) He received his Ph.D. in 1939. In his thesis, on the rotation of the Andromeda galaxy, he discovered the flat rotation curve and was thus the first to show the requirement of "dark matter" in individual galaxies.

Intrigued with instrument making as well as with the mysteries of the cosmos, Babcock, like many Carnegie astronomers, invented a variety of research tools. Among his creations was the solar magnetograph, which allowed detailed observations of the Sun's magnetic field. With it he and his father discovered the general magnetic field of the Sun, which had eluded detection since Hale's initial search in 1914. Six years before the discovery of the solar polar field, Babcock discovered the strong magnetic fields in the stars. He was also head of the Mount Wilson grating laboratory, which produced diffraction gratings of a quality superior to any. Babcock's gratings were often given as gifts to other observatories and physics laboratories around the world.

Babcock was known to be self-effacing. As Allan Sandage, Staff Member Emeritus at the Observatories, notes in his upcoming history of the department, "Babcock's reluctance to advance his own agenda kept him from achieving the renown he deserves as one of the great minds of his generation. On the other hand, his inability to indulge in self-aggrandizement made him an extremely effective director of the joint Mt. Wilson and Palomar observatories." Babcock was director of the combined observatories from 1964 to 1978.

Babcock believed that his crowning achievement was the establishment of Carnegie's Las Campanas Observatory in Chile. He was the instigator of a Southern Hemisphere observatory and, with the support of Carnegie president Caryl Haskins, selected the Andean site and negotiated with the president of Chile to acquire the land. He then oversaw the development of the first two telescopes at Las Campanas, the 40-inch Swope and the 100-inch du Pont. His legacy will be felt by generations of astronomers to come. ◆

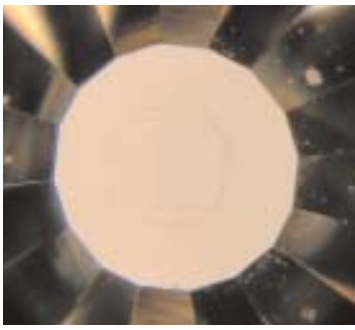
Horace Babcock joined the staff of the Mount Wilson Observatory in 1946 and was director of the Mount Wilson and Palomar observatories, operated jointly by Carnegie and Caltech, from 1964 to 1978.

Pencil Lead Cracks Diamond?

It is hard to imagine that graphite, the soft "lead" of pencils, can be transformed into a form that competes in strength with its molecular cousin diamond. Using a diamond anvil to produce extreme pressures and the ultrabrilliant X-ray beams at the Advanced Photon Source to observe the material, scientists with the High Pressure Collaborative Access Team (HPCAT)* have surmounted experimental obstacles to probe the changes that graphite undergoes to produce this unique, superhard substance. The study is reported in the October 17, 2003, issue of *Science*.

Graphite and diamond are both made of carbon. The geometric arrangement and spacing of the carbon atoms is what makes the materials differ in appearance and strength. The atoms in graphite are arranged in layers that are widely spaced. The atoms in diamond, on the other hand, are tightly linked, producing a strongly bonded structure.

"Researchers have speculated for years on the extreme conditions that might change the molecular structure of graphite into a superhard form that rivals diamond," said the study's lead author, Wendy Mao of the Geophysical Laboratory and the University of Chicago. "This experiment is the first to determine quantitatively how the bonding in graphite changes under high-pressure conditions. Conventional methods limited our observations to surface studies of the material. Now, with the super-high-intensity X-rays at the Advanced Photon Source and the HPCAT facility, and with the team's technology to focus the entire beam to a small spot, we've been able to look at the material in the diamond-anvil cell while under high pressure. We've overcome the obstacles of the past."



This photomicrograph shows a ring crack (inner circle) on the diamond anvil caused by the new form of graphite.

(Reprinted with permission from Science, 302,426. Copyright 2003, AAAS.)

The HPCAT scientists subjected graphite to pressures equivalent to 170,000 times the pressure at sea level (17 gigapascals). "We were able to see how the structure changed at the atomic level when the graphite was squeezed into the superhard form," said coauthor and director of HPCAT, Dave Mao of the Geophysical Laboratory. "The graphite that resulted from our experiment was so hard that when we released the pressure we saw that it had actually cracked the diamond anvil." The superhard form of graphite opens the door to a myriad of applications in industry, particularly as a structural component. ◆

*HPCAT is made up of researchers from the Carnegie Institution's Geophysical Laboratory; the High-Pressure Physics Group of the Lawrence Livermore National Laboratory; the High Pressure Science and Engineering Center of the University of Nevada, Las Vegas; and the University of Hawaii Institute of Geophysics and Planetology. Use of the HPCAT facility at Argonne National Laboratory for this work was funded by the Department of Energy, the National Nuclear Security Administration, the National Science Foundation, the Department of Defense, the W. M. Keck Foundation, The G. Unger Vetlesen Foundation, and the Carnegie Institution.

IN Brief

❶ Wes Huntress (left) at a lunch with summer interns.

❷ Marilyn Fogel (far left) and two others receive their certificates of election from the president of the Geochemical Society, Judith MacKenzie.

Trustees

Astronomer and trustee Sandra Faber was quoted in the July 29 *New York Times* about her team's progress in surveying 60,000 galaxies using the Keck II telescope in Hawaii.

Administration

President Richard Meserve was profiled in the Oct. 2003 *Physics Today*. The article can be found at http://www.physicstoday.org/vol-56/iss-10/p30.html. Between Oct. 27 and 30 he also visited various nuclear facilities in Russia in connection with a study being conducted by the National Academies of Sciences and Engineering concerning the protection, control, and accounting of weapons-useable nuclear material.

—

Operations manager Sonja DeCarlo gave birth to twins, Nicholas and Stephen, in mid-July. She left Carnegie in Sept. to be home with her boys.

—

Greg Taylor left CASE in Aug. to teach fourth grade at the Arlington, VA, Glebe Elementary School, where he is also lead science teacher. He will remain as teacher and coordinator for First Light.

Embryology

The department hosted the Mid-Atlantic Regional Zebrafish Meeting on Oct. 3. About 120 participants attended.

—

Allan Spradling received the E. G. Conklin Medal and delivered the Conklin Lecture at the Society for Developmental Biology meeting in Boston in Aug.

—

Marnie Halpern lectured in the Marine Biological Laboratory embryology course at Woods Hole in July. Postdoctoral fellow Joshua Gamse ran the zebrafish component of the laboratory techniques section, assisted by Halpern lab technician Michelle Macurak.

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Staff Associate Jimo Borjigin is now assistant professor in the Dept. of Physiology at U. Michigan School of Medicine.

—

Staff Associate Erika Matunis has taken an assistant professorship in the Dept. of Cell Biology at Johns Hopkins U. School of Medicine.

—

Alex Schreiber was appointed Staff Associate. He studies the development of left-right asymmetry during metamorphosis in flatfish.

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Christian Brösamle received the Barbara McClintock postdoctoral award for 2002-2003.

—

Julia Pak (U. Toronto) started her postdoctoral studies in the Fire lab.

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Kiran Kumar, a postdoc from India, joined the Halpern lab in Sept. Lea Fortuno joined the lab as a new technician in May. Mpepera Simango, a high school student from the Baltimore Polytechnic Institute, will intern for one year.

—

Ademola Borode is a Visiting Investigator from the Federal U. of Technology in Akure, Nigeria, in Schreiber's lab. He studies osmoregulatory development during flatfish metamorphosis and the development of left-right asymmetry.

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Postdoctoral fellow Hongjuan Gao left the Gall lab to continue postdoctoral studies in the laboratory of Barbara Sollner-Webb at Johns Hopkins U. Former Ph.D. graduate student and postdoctoral fellow Olivia Doyle left for Seattle to work in science and health-care policy.

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Javier Lopez, assistant in the Fire lab, received his B.A. from Johns Hopkins U. School of Arts and Sciences and has taken a position at the Hopkins School of Medicine.

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Rachel Brewster of the Halpern lab, a recipient of a United Negro College Fund Merck Postdoctoral Science Research Fellowship, has taken a job as an assistant professor at U. Maryland, Baltimore County.

Geophysical Laboratory

❶ Wesley Huntress testified as an expert witness at a House Science Committee hearing on Oct. 16 and at a Senate Commerce, Science, and Transportation Committee hearing on Oct. 29 on the future of the human space flight program. He also wrote an article on the subject that appeared in the Aug. 8 issue of *Science.*

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Robert Hazen was elected vice president of the Mineralogical Society of America. He was also appointed to the Committee for the Public Understanding of Science of AAAS, and to the board of directors of the National Philharmonic.

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❷ Marilyn Fogel was elected a fellow of the Geochemical Society. She was also recognized for outstanding contributions in research at the Goldschmidt Conference, held in Kurashiki, Japan, Sept. 6-12.

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❸ Geophysical Lab and Astrobiology Institute members and alumni participated in a symposium on mass-independent isotope effects at the Goldschmidt Conference in Kurashiki, Japan, Sept. 6 - 12. Following the symposium a party was organized by Geophysical Lab postdoc Shu-hei Ono.

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Rus Hemley gave the Plenary Talk at the 2003 American Physical Society Shock Compression in Condensed Matter Conference, Portland, OR, in July. He also gave invited talks at the National Synchrotron Light Source at Brookhaven National Lab, and at the 12th International Materials Science Congress in Cancun in Aug., at the Spallation Neutron Source Workshop in Tallahassee in Sept., and at Los Alamos National Laboratory and the National Research Facilities Workshop at the Naval Research Laboratory in Oct.

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Ho-kwang (Dave) Mao and colleague/daughter Wendy Mao were featured in a Sept. 5 *Science* article about parents and offspring working in the same earth science field.

—

❹ Andrew Steele joined the Arctic Mars Analogue Svalbard Expedition to sample hot springs in the Arctic. The two-week expedition, organized by Hans Amundsen of U. Oslo Center for the Physics of Geological Processes, was an interdisciplinary effort to test instruments for life detection and geological characterization at a Mars analogue site to prepare for human exploration of Mars.

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Nabil Boctor presented a paper at the Meteoritical Society Meeting in Münster, Germany, in Aug.

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Burkhard Militzer has been appointed a Staff Associate beginning Aug. 1, 2003. He comes from the Quantum Simulations Group at Lawrence Livermore National Laboratory and will work on the quantum mechanical theory of warm, dense matter relevant to planetary interiors. He is collaborating with Rus Hemley, Dave Mao, and Ron Cohen.

Hopkins faculty member **Peter Agre,** winner of this year's Nobel Prize in Chemistry, has a Carnegie connection. He was a sabbatical visitor at Embryology during the 1988-1989 school year in former Staff Member and current trustee Steven McKnight's lab.

❸ GL researchers, alumni, and Astrobiology Institute members gather at a Japanese restaurant banquet arranged by Shu-hei Ono during the Goldschmidt Conference in Kurashiki, Japan.

❹ This heavily clothed group consists of Andrew Steele, Hans Amundsen, Alan Treiman (Lunar Planetary Institute), and Maia Schweizer during the Arctic Mars Analogue Svalbard Expedition to sample hot springs in the Arctic.

❺ Olga and Valentina Degtyareva appear with their posters at the 19th International Union of Crystallography Congress and General Assembly in Geneva in Aug. 2002. Mother and daughter are both high-pressure crystallographers.

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Postdoctoral associate Michael Furlanetto gave a talk at the American Chemical Society meeting in New York City on Sept. 9.

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Post doc Gudmundur Gudfinnsson and Visiting Investigator Dean Presnall attended the recent Penrose Conference, "Plume IV: Beyond the Plume Hypothesis," in Hveragerdi, Iceland, Aug. 25-29. Both gave invited keynote presentations.

—

❻ Olga Degtyareva joined GL as a postdoctoral fellow on July 30. She is a high-pressure crystallographer and is studying complex crystal structures in elements using diamond anvil cell and synchrotron radiation. Her mother, Valentina Degtyareva, also a high-pressure crystallographer, is studying metal alloys at the Institute of Solid State Physics (Russian Academy of Sciences) in Chernogolovka. At the invitation of Rus Hemley, Valentina visited GL for one month to work on structural stability of high-pressure metals and alloys.

—

Xiaojia Chen (Kent State U.) has been appointed a postdoctoral research associate and will be working with Viktor Struzhkin in the high-pressure laboratories.

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Narayani Choudhury (U. Bombay, India) has been appointed a postdoctoral research associate. She will be working on first-principles multiscale modeling of relaxor ferroelectrics.

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Haozhe Liu (SUNY-Stony Brook) was appointed a High Pressure Collaborative Access Team (HPCAT) postdoctoral fellow starting Aug. 1.

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Silvia Pella (Florida Atlantic U., Boca Raton) has been appointed a postdoctoral research associate. She will be working on iron at high pressures and temperatures and on iron alloys.

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Zizheng Gong (Laboratory of High Pressure Physics, Southwest Jiaotong U., China) was appointed a Visiting Scientist and research associate starting on Aug. 1.

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Shantanu Keshav (Florida International U.) has been appointed Visiting Investigator. Keshav will do research relevant to the origin of the Earth's mantle and core and will be working with Yingwei Fei.

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Arunkumar Bommannavar has accepted an appointment as beamline control scientist at the HPCAT at the APS. He has worked in a synchrotron-radiation-related environment for over 16 years as a beamline scientist.

—

Paul Chow (Taiwan Beamline Office at SPring-8 Synchrotron, Japan) joins HPCAT as a beamline scientist. He received his Ph.D. in physics from U. Illinois, Urbana.

—

Pamela Conrad, a former GL postdoc, has been appointed a Visiting Investigator and will do collaborative research with GL staff. She is currently the lead scientist in the Astrobiology Research Element/Center for Life Detection in the Division of Earth and Space Sciences at the NASA Jet Propulsion Laboratory.

—

Daniel Errandonea (HPCAT) left his position as CIW/HPCAT research associate after two years.

—

Former Carnegie Fellow Kenji Mibe has accepted a position at the Earthquake Research Institute at U. Tokyo.

—

Mark Frank has joined the faculty of the Dept. of Geology and Environmental Geosciences at Northern Illinois U.

Global Ecology

Staff Member Greg Asner and Asner lab member Robin Martin were invited to attend the NASA Northern Eurasia Environmental Science Program meeting in Yalta, Ukraine, in Sept.

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Kathleen Brizgys, who just completed her undergraduate degree at Stanford U., joined the Field lab as a research assistant, and David Kroodsma, just back from his cross-country bicycle trip, rejoined the lab as a research assistant.

—

The lab welcomed two other additions: Claire Lunch, a first-year Ph.D. student in Stanford's Dept. of Biological Sciences, and Kim Cahill, a first-year Ph.D. student in Stanford's Interdisciplinary Program in Environment and Resources.

The new building for the Department of Global Ecology is progressing well. This image shows the construction site in mid-October.

Observatories

Wendy Freedman gave an invited colloquium at the 2003 Summer Program of the Aspen Center for Physics. At the invitation of the Royal Irish Academy, she presented the McCrea Lectures at the Academy House in Dublin and at Queen's University, Belfast, on Sept. 15 and 16. *Sky and Telescope's* Special Issue for Oct. features her article "The New Cosmology," written by Freedman in collaboration with Michael Turner.

—

Staff Astronomer and Magellan director Stephen Shectman participated in the preliminary design review of the High Resolution Spectrograph for the Southern African Large Telescope in Southampton, England, in Sept. He and Matt Johns, associate director of the Observatories, traveled to southern Sweden to present a paper at the second Bäckaskog Workshop on Extremely Large Telescopes.

—

Staff Member Andrew McWilliam hosted a Key Project Meeting for the Space Interferometry Mission (SIM) at Santa Barbara Street on Aug. 1 and 2.

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Observatories postdoctoral fellow Dan Kelson has been appointed Staff Associate.

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Optical scientist Brian Sutin gave a talk at Lawrence Berkeley Lab about IMACS on June 27.

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Research associate Alex Athey is now working with Stephen Shectman developing an adaptive optics sensor package to be tested on the Magellan 6.5-meter telescopes. This is part of a program to investigate ground-layer adaptive optics concepts.

—

Carnegie Fellow Jeremy Darling gave

❻ Eva Hausam, Carnegie friend from the Museum of Jurassic Technology, is positioned at the eyepiece of the 60-inch telescope at Mt. Wilson to view Mars.

(Photo courtesy Scott Rubel.)

an invited review talk at the conference "Future Directions in High Resolution Astronomy: The 10th Anniversary of the Very Long Baseline Array (VLBA)" in Socorro, NM, this summer.

—

Carnegie Fellow Michael Gladders gave colloquia at Pontificia Universidad Católica de Chile on Aug. 21 and at McMaster University, Canada, on Sept. 10. On Sept. 17 he gave an invited talk at the conference "Cosmology with Sunyaev-Zeldovich Cluster Surveys" at U. Chicago Center for Cosmological Physics.

—

❻ Scott Rubel, on the Observatories support staff, organized three observing sessions on Mt. Wilson to allow staff, their families, and friends to view Mars while it was the closest to Earth in 60,000 years. They used the 60-inch telescope built in 1908 for their observations.

—

Piero Madau (UC-Santa Cruz) was a Scientific Visitor during Mar.-May and Sept., during which time he presented two colloquia about the formation of galaxies and the merging history of supermassive black holes. Bohdan Paczynski (Princeton U.) visited the Observatories in May-June and presented a colloquium on the latest results from the Optical Gravitational Lensing Experiment (OGLE) conducted at Las Campanas. Douglas Richstone (U. Michigan) visited for two weeks in July-Aug. Christopher Sneden (U. Texas) was a Scientific Visitor in Aug. and collaborated with George Preston and Stephen Shectman on the analysis of Magellan spectra of metal-poor halo stars.

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Arrivals to the Observatories include Carnegie Fellow Kurt Adelberger, Hubble Fellow Marla Geha, Magellan manager Alan Uomoto, and research assistant Pamela L. Wyatt.

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Departures from the Observatories include Bruce Bigelow, now with U. Michigan; Stephen Helsdon, now with U. Birmingham, UK; and Paul Martini, now with the Harvard-Smithsonian Center for Astrophysics.

Plant Biology

The Biochemical Society named Chris Somerville the Sir Frederick Gowland Hopkins Memorial Lecturer for 2004. He will present his lecture at a meeting in Glasgow, Scotland, in fall 2004. Somerville also presented a symposium talk at the meeting of the International Society for Plant Molecular Biology in Barcelona on June 23, and a talk at U. Florida in Sept.

—

Wolf Frommer was elected a fellow of AAAS for "distinguished contributions to the field of membrane transport proteins and characterization of their role in plant physiology." He also presented an invited talk at Stanford U., Dept. of Biology Sciences, on Oct. 6.

—

Kathy Barton spoke at a plenary session at the 2003 meeting for the American Society of Plant Biologists in Hawaii. She also taught the *Arabidopsis* molecular biology course at Cold Spring Harbor.

—

Winslow Briggs was the invited speaker at the International Plant Photobiology Meeting, Marburg, Germany, in Sept. He also presented seminars at the universities of Regensburg, Würzburg, and Freiburg. In addition, he presented a seminar at San Francisco State U. in Oct. All talks summarized his research on phototropins, plant photoreceptors that Briggs and his lab have recently characterized.

—

Dave Ehrhardt presented a talk in Aug. at the SEB Symposium, "Membrane Trafficking in Plants," held in Glasgow, Scotland.

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Arthur Grossman received support to organize a jamboree for the annotation of the *Chlamydomonas* genome, held on Dec. 8. He also received major awards as a member of multidisciplinary consortia to examine gene function in *Chlamydomonas* in the genomic and postgenomic era and explore the concept of species in microbial communities in the bacterial mats in Yellowstone National Park's hot springs. Devaki Bhaya, Adjunct Staff Member, is a principal investigator on the project. Among other activities, Grossman gave a seminar on May 19 at U. Oregon, and on Apr. 2 he gave a seminar at Brown U., and on Apr. 4 at U. Connecticut. He organized a one-day meeting at Berkeley on July 3 on "Genomic and Post-Genomic Research with *Chlamydomonas reinhardtii*."

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Shauna Somerville spoke at the South Dakota Plant Physiology/Plant Biochemistry Symposium, Brookings, SD, on Aug. 7. On Aug. 14 she presented a talk at SemBioSys, Calgary, Canada, and repeated the talk as an invited speaker at UC-Berkeley on Sept. 8. She also spoke on Sept. 17 at the NSF-RCN retreat on microarray analysis, Mohonk, NY.

—

Zhi-Yong Wang was an invited speaker at the 14th International Conference on *Arabidopsis* Research on June 20-24 in Madison, WI, and an invited lecturer on Aug. 14 at the Summer Graduate Course on Plant Biology at Beijing U., China. He also gave a talk at the Summer Symposium on Plant Molecular Biology at Beijing U. on Aug. 16, and a seminar at the Institute of Plant Physiology and Ecology in Shanghai on Aug. 25.

—

Ted Raab, a postdoctoral research associate in Chris Somerville's lab, served as an instructor at the CAMD summer workshop, "Biological Applications of Synchrotron Radiation," held in Baton Rouge, LA, June 2-6.

—

Chris Somerville's lab has three new postdoctoral research associates: Stefan Bauer (U. Münster) arrived on June 1, Sonja Vorwerk (Max Planck Institute for Plant Breeding Research, Cologne) on July 1, and Ginger Brininstool (Louisiana State U.) on Sept. 1.

—

Shauna Somerville's lab welcomed Kelly Wetmore back on July 1 as a lab technician and bade farewell to postdoc Marjorie Santamaria on June 30.

—

Sue Rhee's TAIR group had two new arrivals: Brandon Zoeckler, an assistant curator, and on Sept. 23 Jessie Cui who replaced Rashmi Nunn as programmer. Also leaving the group in June was Lucas Mueller, who left for a job at Cornell U.

—

Devaki Bhaya welcomed Fariba Fazeli as her new lab assistant on Aug. 18.

—

Kathy Barton welcomed three new postdocs to her lab: Debbie Alexander arrived from Oxford on Aug. 16; Meghan Sharp, an American Cancer Society Fellow, arrived on Sept. 1 from UC-San Francisco; and John Emery arrived on Sept. 8 from UC-San Diego.

—

The Frommer lab welcomed a new lab assistant, Renata Csihonye Doczi, on July 17. Joergen Persson, a new postdoc from the Swedish U. of Agricultural Sciences, joined the lab on July 24.

—

The Wang lab was joined by Nathan Hsu, a laboratory assistant, on June 16. Also joining the lab were two new postdocs, Zhiping Deng (Purdue U.) on July 10, and Yu Sun (U. Texas, Austin) on Aug. 1. Nadia Marinova, lab technician, left on Aug. 22 for the graduate program at Stanford.

—

On Aug. 19 the administration staff welcomed Jennifer Johnson as grants administrator. In Sept. Dana Parmenter and Ismael Villa joined the facilities staff. They will share the position vacated by César Bautista, who retired on Oct. 31 after 15 years of managing the greenhouses and keeping the grounds.

—

On July 20 the Briggs lab said good-bye to Eirini Kaiserli, who returned to U. Glasgow, Scotland.

—

The Grossman lab had some departures: Olivier Vallon, a Visiting Investigator, returned to France after a year working with Grossman. Christopher

In Aug. 2003 the DTM strain group installed a new version of the Sacks-Evertson strainmeter at a site directly above the magma reservoir in the Long Valley Caldera in California. Shown here are DTM's Jay Bartlett and Richard Bartholomew (on top of metal enclosure), Nelson McWhorter (on ladder), and Selwyn Sacks positioning a device for straightening the hydraulic tubes during installation. Alan Linde was also on-site for the installation.

❼ The BBR Olympics sack race heats up with (left to right) Linda Warren, Peter Burkett, Mark Behn, Christian Ostertag-Henning, and Alexis Clements.

Tang left on Aug. 31 to resume his studies at Stanford. Chiung-Wen Chang, a lab technician, left for Stanford but will remain a part of the lab. Steve Pollock, a new postdoc, arrived on Sept. 1 from Louisiana State U.

—

Postdoc Jane McConnell left the Ehrhardt lab on July 31 and postdoc Marcella Pott (U. Rostock, Germany) arrived on Aug. 21.

—

Bi-Huei Hou, a lab technician in Shauna Somerville's lab, and her husband, Ke-Jung Huang, welcomed their first child, Steven, on Aug. 23.

Terrestrial Magnetism

Sean Solomon delivered the annual A. O. C. Nier Memorial Lecture at U. Minnesota in early Oct. He served on visiting committees to the Earth Sciences Directorate of the NASA Goddard Space Flight Center in Sept. and to the Dept. of Geology at U. Maryland, College Park, and the School of Earth and Atmospheric Sciences at Georgia Tech in Oct. He also attended a meeting of the Advisory Council to the Southern California Earthquake Center (SCEC) in Sept., and in Oct. he chaired a meeting of the Advisory Committee to the Institute of Earth Sciences, Academia Sinica, in Taiwan.

—

Paul Butler was one of five winners of the *Discover* Magazine Award for Innovation in Science and Technology for his work on identifying extrasolar planets. A profile was published in the Nov. issue of *Discover*.

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Vera Rubin introduced and moderated a press conference at the National Press Club in Sept. to introduce NEC Extreme Science, a science program for middle school students and teachers. The program will bring leading scientists into the classrooms. In early Oct., Rubin visited the Lowell Observatory and presented a colloquium on the history of dark matter. In Nov. she spoke on the "Frontiers of Astrophysics" at a celebration of the centennial of Marie Curie's first Nobel Prize. At the U. North Carolina, she met classes and spoke in the chancellors Science Seminar Series.

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Alan Boss gave an invited talk on giant planet formation at the American Astronomical Society Meeting in Nashville, TN, in May. He presented work on magnetized star formation at the Center for Star Formation Studies Workshop, held in June at Lake Tahoe, CA. He also presented work on planet formation in binary star systems at the Gordon Conference on the Origins of Solar Systems, held in Bristol, RI, in July, and at the Division for Planetary Sciences meeting in Monterey, CA, in Sept., where he also participated in a press conference. He gave an invited colloquium in Sept. on gas and ice giant planet formation at the National Radio Astronomy Observatory in Charlottesville, VA.

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Rick Carlson gave keynote lectures at the Gordon Conference on the Earth's Interior, held at Mt. Holyoke College, MA, in June, and at the 4th South American Symposium on Isotope Geology, held in Salvador, Brazil, in Aug. In June he also attended the 8th International Kimberlite Conference in Victoria, BC.

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In Oct. Sara Seager and Boss were panel participants at the NSF symposium for the public and media, "The Universe from the Ground Up: Ground-Based Astronomy in the 21st Century," in Wash., DC. Later in the month Seager attended the Terrestrial Planet Scientific Working Group meeting at USNO, Wash., DC, and was an invited speaker at the 14th Annual Maryland Astrophysics Conference, "The Search for Other Worlds."

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Larry Nittler gave an invited talk at a NASA-sponsored workshop on Cometary Dust in Astrophysics, held in Crystal Mountain, WA, in Aug. He gave a colloquium at the Dept. of Geological Sciences at Brown U. in Oct., and also gave an invited talk at the Symposium on Presolar Grains and Nuclear Astrophysics at the Enrico Fermi Institute at U. Chicago in Oct.

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Alycia Weinberger gave invited talks at the Gordon Conference on the Origins of Solar Systems in Bristol, RI in July, and at the Oct. Astrophysics Conference in Maryland, as well as a colloquium at the NRAO in Charlottesville, VA, in Nov.

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Michael Acierno and Brian Schleigh were carrying out fieldwork on Montserrat on July 12 when the Soufriere Hills Volcano erupted; they were not hurt. Their visit was part of the CALIPSO Project, a collaboration between Duke U., U. Arkansas, Penn State, DTM, and the Montserrat Volcano Observatory to install strainmeters and other borehole instruments on Montserrat's andesitic volcano.

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Maud Boyet started her Carnegie Fellowship at DTM in Nov. The goal of her work is to better understand the mantle source regions that contain a record of early global differentiation.

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Saavik Ford began a Carnegie Fellowship in Oct. She completed her Ph.D. in astronomy this spring at Johns Hopkins U. At DTM she is building on her thesis work to search for evidence of OH, H_2CO, and additional possible cometary indicators around carbon-rich stars, with the goal of assessing the frequency of cometary systems around nearby stars in our galaxy.

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Katherine Kelley arrived as a new Carnegie Fellow in Sept. At DTM she is tracing the cycling of carbon in the deep Earth by making C isotope measurements with DTM's ion microprobe of melt inclusions in rocks from back-arc basins, hotspots, and midocean ridges. Her project has relevance to the recycling of carbon by plate tectonics and its role in regulating atmospheric CO_2 and climate.

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Maria Schönbächler began as a postdoctoral associate in Nov. She is working on the ^{107}Pd-^{107}Ag radiometric system measureing the Ag isotopic composition of a wide variety of terrestrial and extraterrestrial material by multiple collector ICP-MS to explore the possibility that the Pd-Ag system can be used to reveal the detailed chronology of Earth formation and core-mantle separation.

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Alison Shaw joined DTM as a postdoctoral associate in Sept. She is studying volatiles trapped in melt inclusions in volcanic rocks from the Izu-Bonin-Mariana arc system. Her analyses can provide new information on the nature of such melts and the role of volatiles in melt generation.

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Linda Warren began a Carnegie Fellowship in Oct. She recently completed her Ph.D. in seismology at the Scripps Institution of Oceanography. At DTM she will continue her work on the directivity of earthquake ruptures, concentrating on deep-focus earthquakes to understand why they occur.

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Alexis Clements joined DTM as administrative assistant in early Oct., coming to Carnegie from the Kreeger Museum. She has a B.A. in playwriting from Emerson College in Boston and is a member of the Playwright's Forum in Washington.

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Postdoctoral associate Christopher McCarthy left DTM in Sept. to take a position at San Francisco State U.

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Seismic field technician Peter Burkett married Mary Haine on Aug. 2 in St. Louis.

DTM/GL

Charles Hargrove began a two-year stint as Carnegie Legacy Project archivist at Broad Branch Road in early Aug.

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❼ DTM and GL held their annual fall picnic on Oct. 8. The first BBR Olympics were a focal point of the event and included a DTM vs. GL tug-of-war, sack races, horseshoes, and a soccer accuracy competition. The grand champion of the Olympics was Alison Shaw, a DTM postdoctoral associate.

Singer Building Taking Shape

Construction of the new Maxine F. Singer Building at the Department of Embryology in Baltimore, is progressing well as indicated. The building will house more than 100 Embryology scientists, lab technicians, postdoctoral fellows, graduate students, and administrative staff. Besides its 13 modern and well-equipped laboratories, the building will contain a library, meeting rooms, animal quarters, supply rooms, and an auditorium. Watch the construction progress via Web cam at http://128.220.24.226/.

(Image courtesy Bill Kupiec.)

Capital Science Lectures Move to Thursday Nights!

All Capital Science Lectures are free and open to the public at the Carnegie Institution, located at 1530 P Street, NW (corner of 16th and P streets). Lectures are on Thursday nights at 6:45 p.m. For recorded information on the 2003-2004 Capital Science Evenings, please call 202.328.6988, send Ellen Carpenter an e-mail at ecarpenter@pst.ciw.edu, or visit our Web site at www.CarnegieInstitution.org.

October 23, 2003	John Allen Paulos, Mathematics Department, Temple University | *A Mathematician Plays the Stock Market*
November 20, 2003	Irving Weissman, Department of Pathology and Developmental Biology, Stanford University School of Medicine; Director, Institute for Cancer/Stem Cell Biology and Medicine, Stanford University Medical Center | *Stem Cells: Biology, Medicine, and Beyond*
February 5, 2004	Wendy Freedman, Crawford H. Greenewalt Director, Carnegie Observatories | *Exploring the Universe in the New Millennium*
March 11, 2004	John Holdren, John F. Kennedy School of Government, Harvard University | *Meeting the Energy-Climate Challenge*
April 1, 2004	Eric Kandel, Center for Neurobiology and Behavior, Columbia University, Howard Hughes Medical Institute | *The Long and Short of Long-Term Memory*
April 29, 2004	Dava Sobel, Author | *Galileo's Life and Times*
January 26, 2004 *6:30 p.m.	Join Carnegie astronomer Alan Dressler as he discusses *"The First Stars and Galaxies in the Universe"* as part of the Smithsonian Resident Associates Program at the Carnegie Institution. Registration is required. Call 202.357.3030 or visit www.ResidentAssociates.org for details.

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