SPECTRA

THE NEWSLETTER OF THE CARNEGIE INSTITUTION (SUMMER 2003

New Horizons for Science


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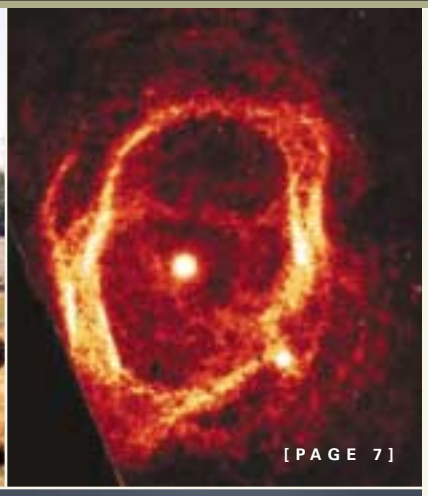
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INSIDE

(Photo courtesy Richard Holden Photography.)

Andrew Carnegie surely could not have imagined that his mandate—to support exceptional individuals and their often unorthodox research—would yield a century's worth of extraordinary discoveries and significantly influence the world of science. I am honored, as the new chairman of the board of trustees, to inherit this legacy.

In my eighth year as a Carnegie trustee, I continue to marvel at the ingenuity of our scientists. I credit each of the department directors with promoting innovation through careful selection of the scientific staff. When placed in an environment free of the obligations typical of academic life, these extraordinary individuals produce phenomenal results.

The two newest members of the Department of Terrestrial Magnetism staff, Alycia Weinberger and Sara Seager, are a case in point. Their focus is extrasolar planets—the newly discovered worlds orbiting nearby stars. Weinberger examines the disks surrounding young stars to learn how planets form. Her inventive techniques are allowing us to begin to witness planetary birth for the first time. Sara Seager constructs highly accurate models to predict atmospheric signatures of these new worlds. The successful detection of an extrasolar planet atmosphere in November 2001 was an impressive endorsement of her theoretical work.

Understanding the enigma of life on this planet is as intriguing as looking for life on others, as the research of David Ehrhardt at Plant Biology illustrates. Ehrhardt's original, live studies have shown that plants are surprisingly active at the cellular level. His three-dimensional, real-time imagery is revealing previously unknown and dynamic events in cell communication and organization.

To comprehend the complexity of life at varying scales, Greg Asner, at Global Ecology, uses an unusual collection of methods to quantify the impact of humans on the natural world. He analyzes satellite data to study terrestrial ecosystems over enormous areas and, at the opposite end of the spectrum, scrutinizes individual plants in the field. His array of tools allows him to integrate information from these disparate levels. This new approach to ecology has become the hallmark of the department.

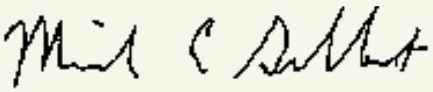
The high-pressure creations of Russell Hemley, Dave Mao, and colleagues at the Geophysical Lab also exhibit a fresh approach and are helping to solve a very important problem—understanding the behavior of materials in U.S. nuclear stockpiles. Their one-of-a-kind techniques will be used to evaluate what happens to these aging substances under the extreme conditions typical of stockpile environments.

Technical advances abound at the Observatories, too. Unlike most in their field, Carnegie astronomers design and build the instruments they need to further their research. Steve Shectman, with colleague Rebecca Bernstein, led the effort to build MIKE—a high-resolution spectrograph that can observe even faint objects in detail. Alan Dressler is the driving force behind IMACS, an instrument that is able to view hundreds of galaxies at once and will tell us what went on in the early universe. To observe molecular clouds and distant objects, Eric Persson and team developed an infrared camera called PANIC, whose first images are unparalleled. Each of these ingenious devices is exceeding even the most optimistic projections.

One of the most important breakthroughs in modern molecular biology comes from the Department of Embryology. In 1997 Andrew Fire and his team, with Craig Mello and colleagues at the University of Massachusetts, discovered that they could silence specific genes by introducing specially designed double-stranded RNA into an organism. Known as RNA interference, this work has enormous implications ranging from broadening our knowledge of biological processes to the possibility of treating HIV, cancer, and a myriad of other diseases.

The more I learn about Carnegie science, the more I realize how essential our fundamental premise of freedom in research has been to our success. As these few examples show, the institution is in a particularly vibrant phase. Our basic mission is responsible for this achievement, and I look forward to many surprising results to come.

—Michael E. Gellert, *Chairman*



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Michael Gellert **Chairman** of the Carnegie Board

Michael Erwin Gellert, a partner in the private investment company Windcrest Partners in New York City, was elected chairman of the Carnegie board of trustees on Friday, May 2. "I'm honored to succeed Tom Urban as chairman, and I'm particularly looking forward to working with President Richard Meserve," said Gellert. "Dick and I are committed to continuing our 100-year-old tradition of scientific excellence and innovation." Tom Urban, formerly chairman and CEO of Pioneer Hi-Bred, will remain an active board member after finishing his 11-year term as board chair.

Gellert, a Carnegie trustee since December 1995, was born in Czechoslovakia in 1931. He graduated from Harvard University and received an M.B.A from the Wharton School of the University of Pennsylvania. He started his financial career in 1958 after serving two years in the U.S. Army. In 1967 he created Windcrest Partners. He and his wife, Mary, have two grown children and live in Greenwich, Connecticut.

Gellert serves on the boards of numerous companies, including Devon Energy Corp., Humana Inc., Seacor Smit Inc., Six Flags, and Smith Barney World Funds. Among his many affiliations with other organizations, he is chairman of the Caramoor Center for Music and the Arts in Katonah, New York, vice chairman of the board of the New School for Social Research in New York City, a trustee of Human Rights Watch, a member of the Council on Foreign Relations, and a fellow of the American Academy of Arts and Sciences. •

TRUSTEE News

The board of trustees met at the administration building in Washington, D.C., on Thursday and Friday, May 1 and 2. Besides the full board, the Finance, Development, Employee Affairs, and Nominating Committees also met. Tom Urban, chairman of the board for the past 11 years, stepped down as chairman but will remain an active board member. Michael Gellert, a Carnegie trustee since December 1995, was elected to succeed him.

In addition to electing a new chairman, the board approved new committee assignments and the appointment of Viktor Struzhkin as Staff Member at the Geophysical Laboratory and David Ehrhardt as Staff Member at Plant Biology. Both scientists are longtime Carnegie researchers.

At a small reception Thursday evening, Urban was honored for his service with a gift of framed botanical prints from the institution's first scientific monograph. Later that night, board members and their guests attended the Carnegie Evening lecture, delivered by Andrew Fire of the Department of Embryology.

After the conclusion of board business on Friday, May 2, the trustees heard talks from two scientists with very different interests. Plant Biology Staff Member Wolf Frommer addressed the audience first, speaking about his innovative work visualizing small molecules as they traffic essential nutrients around the complex network inside plants. He showed the results of a new technique, based on fluorescent nanosensors, that he developed for this work. The technology allows him to image the concentration of sugars and other metabolites in living cells to reveal sugar transport and sensing. The work has the potential to boost harvests and improve the quality of some foods.

Larry Nittler, Terrestrial Magnetism Staff Member, "studies small things to get the big picture." By analyzing microscopic dust particles collected by spy planes from the upper atmosphere, and by examining meteorite samples, he is able to piece together some essential clues about how galaxies, stars, and the solar system formed. He "weighs atoms" to determine the ratio of different atomic species, or isotopes, which helps him toward his goal of untangling the history of organic matter in its progress from the interstellar medium through solar system formation. •

(Photo courtesy Ann Little.)

In appreciation of his years of service as chairman of the Carnegie board, the institution gave Tom Urban (left) a set of botanical prints. They appeared in Carnegie's first scientific monograph, *The Waterlilies,* written by Henry Conrad and published in 1905. Senior trustee Sidney Weinberg (right) listens as Urban describes the prints.

IMACS Goes to Chile!

The Inamori Magellan Areal Camera and Spectrograph (IMACS) was shipped from Long Beach, California, July 12. Instrument installation in Chile is scheduled for August 8 through August 20.

(Image courtesy Bruce Bigelow.)

The IMACS main component is loaded into the container. Principal Investigator Alan Dressler (foreground, right) looks on.

(Image courtesy Bruce Bigelow.)

Dozens of individuals and many organizations have collaborated on the IMACS project. Pictured here are some members of the loading crew. From left to right are Robert Storts, Greg Ortiz, Vince Kowal, Steve Wilson, Jerson Castillo, Rob Pitts, and Scott Rubel.

IMACS arrived and was unloaded in Chile July 28-July 30. The mainframe is en route to the Baade dome.

Researchers work at the Jasper Ridge Biological Preserve.

Environmental Changes Affect Plant Diversity

(Image courtesy Chris Field.)

In a high-performance machine, each part is essential to the overall function of the whole. In ecology, species diversity is necessary to the smooth operation of the ecosystem. Until recently, little attention was paid to the potential ecological effects on plant diversity from combined global environmental changes including increased atmospheric CO_2, warming, elevated nitrogen pollution, and increased precipitation. Scientists from Carnegie's Department of Global Ecology and Stanford University published a study on this subject in the June 16-20, 2003, *Proceedings of the National Academy of Sciences Online Early Edition*. "We were surprised at how quickly some environmental changes can alter the complexion of an ecosystem," said Erika Zavaleta, the study's lead author and a new member of the faculty at the University of California, Santa Cruz. The finding is significant for understanding what can happen to ecosystems when confronted with the interrelated climactic and atmospheric changes that are observed today and that presage larger changes in the future.

The Carnegie and Stanford scientists conducted their three-year study in the Jasper Ridge Biological Preserve—a typical California grassland where the 43 plant species are a mixture of grasses and wildflowers. "We simulated a series of possible future environments for California, with four global change factors: elevated CO_2, warming, nitrogen pollution, and added precipitation, alone and in combinations. Different combinations with altered levels of two, three, and four of these variables are likely to reflect future conditions in different parts of the globe," said Chris Field, director of the Department of Global Ecology and coordinator of the Jasper Ridge study.

"At the end of three years, we found that treatments with three of the four experimental treatments changed total plant diversity. Elevated CO_2 reduced diversity, as did adding nitrogen. More water increased plant diversity, and warming alone had no effect," Zavaleta explained. The four treatment combinations that represent likely possible futures all resulted in decreased wildflower diversity; but total diversity was not affected because there was an increase in the grasses. The largest loss of wildflower diversity came with elevated CO_2 plus warming and nitrogen pollution, and with all four of the factors combined. "Given the importance of the wildflower species for wildlife, nutrient cycling, and natural beauty, the losses under realistic global changes are a cause for concern," said Zavaleta.

The study was reported in the June 21 *Los Angeles Times,* Home Edition, the June 17 *Sacramento Business Journal,* and the June 17 *Silicon Valley/San Jose Business Journal,* among other news outlets.

The Jasper Ridge Global Change Experiment was supported by the National Science Foundation, the David and Lucile Packard Foundation, the Morgan Family Foundation, the Jasper Ridge Biological Preserve, and the Carnegie Institution.

Treadmilling: A Different Sort of Exercise

Animal cells, plant cells, and fungal cells all feature busy guide-wire-like structures called microtubules that perform a myriad of functions. They help move chromosomes into daughter cells, direct the motion of other organelles within the cell, and create a framework for cell shape and movement. In animal cells, these semirigid, hollow polymers, or long-chain molecules, group into arrays that radiate from the cell's center to its surface by a centralized organelle. In plant cells, however, most microtubules are arranged quite differently. Their ends are not gathered in the center of the cell. Instead, the polymers create an organized shell over the inside surface, or cortex, of the cell. "For years, scientists have been trying to figure out how these cortical arrays are created and become organized," said researcher David Ehrhardt of the Department of Plant Biology in Palo Alto. "Now, by tagging them with the green fluorescent protein (GFP), we have been able to watch this process in action in living plant cells." The work, conducted by scientists at Carnegie and Stanford University, determined where many microtubules originate and how some of them move around to become organized. The results were published in the April 24, 2003, online *Science,* and an article on the work was on the front page of the *Stanford Report.*

The researchers imaged individual microtubules in *Arabidopsis,* a member of the mustard family. "We found that most of the new microtubules are probably born at multiple sites directly at the cortex and are not formed elsewhere and transferred there," said Ehrhardt. "They didn't slide around to get where they were going. As we watched individual polymers, it became clear they migrated around by growing at their leading ends and slowly shortening their lagging ends." This movement, called treadmilling, is caused entirely by polymerization activity—the addition and deletion of molecules in the chain. This activity led individual microtubules to move into bundles. The scientists believe this operation is significant to the arrangement of highly ordered arrays and directs the organization of polymers that comprise the cell's wall. To watch the action go to **http://deepgreen.stanford.edu/.**

CASE Goes to Lebanon

by Mentor-Teacher, Tom Nassif

For four years I have been a mentor-teacher for the Carnegie Academy for Science Education (CASE) in Washington, D.C. Last August, through an O'Neill-Carew Fellowship, I traveled to Lebanon to document the archaeological and paleontological history of the area. My experiences examining ancient ruins and prehistoric fossils have enriched my teaching with new curricular ideas.

My research focused on three archaeological marvels outside Beirut: Byblos, Baalbeck, and Tyre. Discovered in Byblos is a story of prehistoric life beautifully captured in stone. Fossils of sharks, octopi, schools of fish, and various other species provide a snapshot of life during the Cretaceous period 100 million years ago. My excavations at the site with renowned paleontologist Pierre Abi Saad allowed me to imagine the vast sea that once covered this entire land.

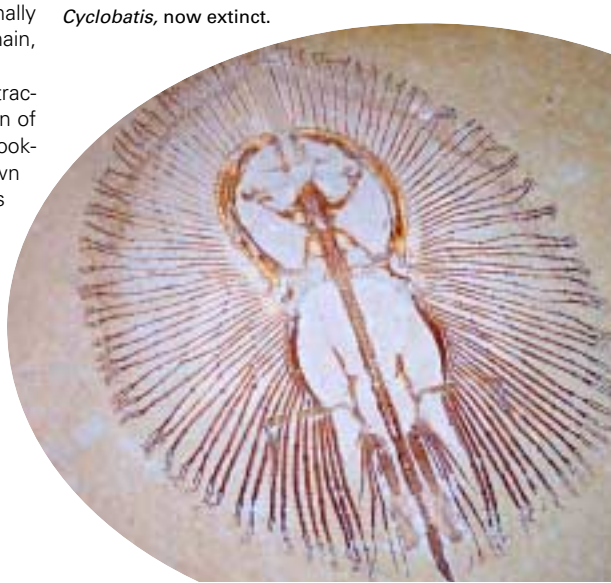
Byblos, one of the oldest continuously inhabited cities in the world, is the backdrop for 22 human civilizations spanning seven thousand years. Initially covered by 12 meters of sediment, the site took 50 years to unearth. As early as 3000 B.C. the Phoenicians had established a flourishing maritime culture along the Mediterranean. Enormous stone ship anchors and statuettes made of foreign materials attest to a lucrative trading relationship between Byblos and Egypt. By 64 B.C. the Romans had colonized Byblos, building theaters and monuments. During the First Crusade (A.D. 1095-1099), many Roman structures were dismantled and rebuilt as a fortress known today as the Crusaders Castle.

Baalbeck contains some of the world's most impressive Roman ruins. Although it was the Greeks who originally had the idea of building it, it was the Romans who actually began construction of the "City of the Sun," in 64 B.C. The 54-column Temple of Jupiter was finally completed in A.D. 65. Today six columns remain, at 22 meters high the tallest in the world.

The chariot races were a popular attraction in ancient Rome, and Tyre is the location of one of the largest hippodromes ever built. Looking at it one can easily imagine horse-drawn chariots rounding treacherously sharp curves at each end of the 480-meter-long track. Tyre was also a flourishing marketplace then; its past splendor is seen today in a mosaic-paved road adorned with towering marble columns.

My immersion in the paleontology and archaeology of Lebanon provided me with a unique insight into past life. Through these experiences I have been able to show my students how fossils reveal the natural history of life on Earth, and how archaeological remains reveal the impact of human culture on the physical world. In keeping with the philosophy of the CASE program, the curricula I use incorporate inquiry-based activities. My students now have a more vivid picture of the natural world and how human cultures have interacted with it over the course of history.

(Top left) This view of Byblos shows (front to back) the Roman theater (A.D. 200), the royal necropolis (2000 B.C.), and the Crusaders Castle (A.D. 1100). Below is a 100-million-year-old fossil of a *Cyclobatis,* now extinct.



(Top) Seated atop heavy equipment, Carnegie president Richard Meserve breaks ground by scooping a bucket of dirt where the new building will stand. (Center) Chris Field, director of Global Ecology, addresses the groundbreaking gathering. (Bottom) President Meserve (left) and chairman of the board Michael Gellert pose with the earthmover.

Hands-on Initiation for **Global Ecology Building**

As part of the Global Ecology groundbreaking ceremonies on May 22, Carnegie president Richard Meserve took to an earthmover and scooped a bucket of dirt to officially begin the construction of the department's new building on the Stanford campus in Palo Alto, California. The gathering was well attended by Carnegie trustees, faculty, students, and friends. In addition to his stint with the heavy equipment, Meserve also addressed the crowd. Chris Field, director of Global Ecology, Michael Gellert, chairman of the Carnegie board, and Pamela Matson, dean of Stanford's College of Earth Sciences, also spoke to the audience about the new department, what it means to Carnegie, and how it is strengthening the decades-long relationship between Stanford and the institution. A reception followed the ceremony.

The new research building will reflect the department's mission through an innovative, energy-efficient "green" design and will set a high standard for energy efficiency, low-impact materials, and a healthy environment. The 11,000-square-foot facility was designed by the San Francisco firm of Esherick Homsey Dodge and Davis (EHDD). (Images courtesy Mary Smith.)

Fundamental High-Pressure Research Boosted with Grant to Carnegie/DOE Alliance Center

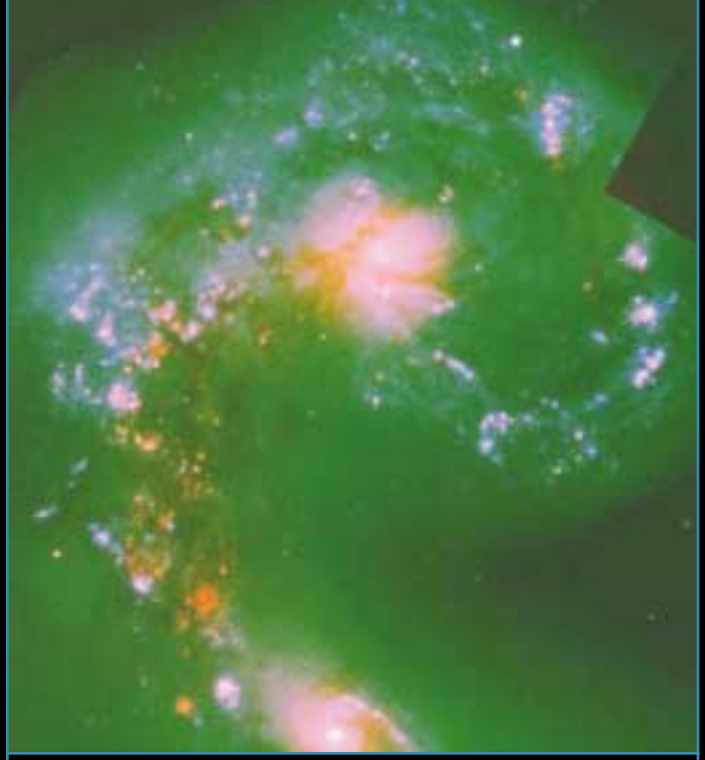
The National Nuclear Security Administration (NNSA) awarded a $5.9 million, 2.75-year grant to Carnegie's Geophysical Laboratory under the Stewardship Science Academic Alliances program. The grant will fund research into the behavior of materials under extreme pressure and temperature conditions at the Carnegie/Department of Energy Alliance Center (CDAC).

NNSA selected the alliance center because the team is a leader in developing new techniques and capabilities in high-pressure and high-temperature materials research. As principal investigator for the grant, Russell Hemley of the Geophysical Lab explains: "There is a critical need to perform experiments that improve our understanding of the broad range of materials that have been used in the pursuit of national security. Our unique techniques are ideal for addressing these fundamental scientific questions. We can now subject all kinds of substances to extreme pressures and varying temperatures under strictly controlled laboratory conditions and measure changes at the atomic level. At present, we are able to reach pressures in excess of those found at the center of the Earth (3 million atmospheres) and temperatures exceeding 10,000°F (6000 Kelvin)."

The grant will allow the scientists from the center's partner organizations to further develop their techniques and test the behavior of materials under a range of situations. They will also use experimental findings to refine so-called first-principles models, which use information on the fundamental properties of a material to predict what happens to them in different circumstances.

Much of the research at CDAC will take place at the Advanced Photon Source (APS) at Argonne National Laboratory near Chicago, Illinois, where the High Pressure Collaborative Access Team (HPCAT)—the state-of-the-art, high-pressure synchrotron X-ray facility managed by Carnegie, is located. The center will also serve as a training ground for students, postdoctoral fellows, and other scientists from around the country.

The Carnegie/DOE Alliance Center is based at the Carnegie Institution and includes partners from Princeton University, the University of Chicago, the University of California at Berkeley, the University of Illinois at Urbana-Champaign, the University of Alabama at Birmingham, and the California Institute of Technology.



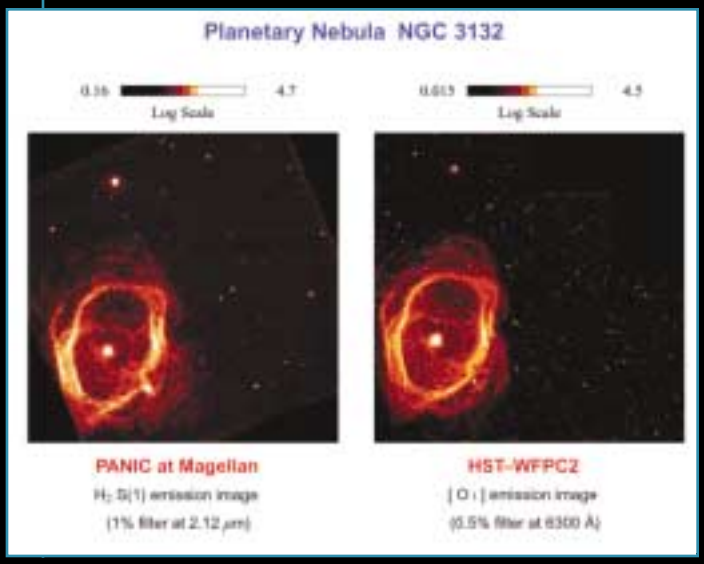
Among the first objects PANIC imaged is the famous pair of interacting galaxies called the Antennae. This color image of the Antennae is a composite of Hubble Space Telescope (HST) and PANIC data. The Antennae consist of many young, massive star clusters and a great deal of dust. Young stars are very blue and formed in this galactic collision, which also resulted in a lot of dust blocking more blue light (shorter wavelengths) than red light (longer wavelengths). For this reason, regions behind a lot of dust are much easier to see at longer, red wavelengths. In this picture the shorter-wavelength HST data were used for the blue and green color channels, while the PANIC data (longer, near-infrared data) were used for the red color channel. The blue star clusters, thus, really appear blue, while the very dusty regions, which are much easier to see in the near-infrared, really appear red. Note that toward the bottom of the image there is a large, red star cluster, barely visible in the HST data, that is quite obvious in the PANIC frame, indicating that it is buried under a great deal of dust.

PANIC's Great!

Recent near-infrared images from the new camera PANIC (Persson's Auxiliary Nasmyth Infrared Camera)on the 6.5-meter Clay telescope at Las Campanas Observatory, Chile, confirm that the camera and telescope hold a promising future for understanding the nature of dark energy, exploring the formation and evolution of distant galaxies, and identifying protoplanetary material around young stars.

PANIC is the first near-infrared camera built for the Magellan Project, a consortium with more than 300 astronomers from five institutions: the Carnegie Observatories, Harvard University, the University of Arizona, the Massachusetts Institute of Technology, and the University of Michigan. Observatories astronomer Eric Persson was a principal designer of the instrument. The camera was built at Carnegie over the last two years and began operations in Chile in April with stunning results. •

This image pair of NGC 3132 shows the PANIC image of molecular hydrogen and an HST image that is sensitive to emission from oxygen. These pictures indicate PANIC's ability to produce superb results.



(Image courtesy PBS.)

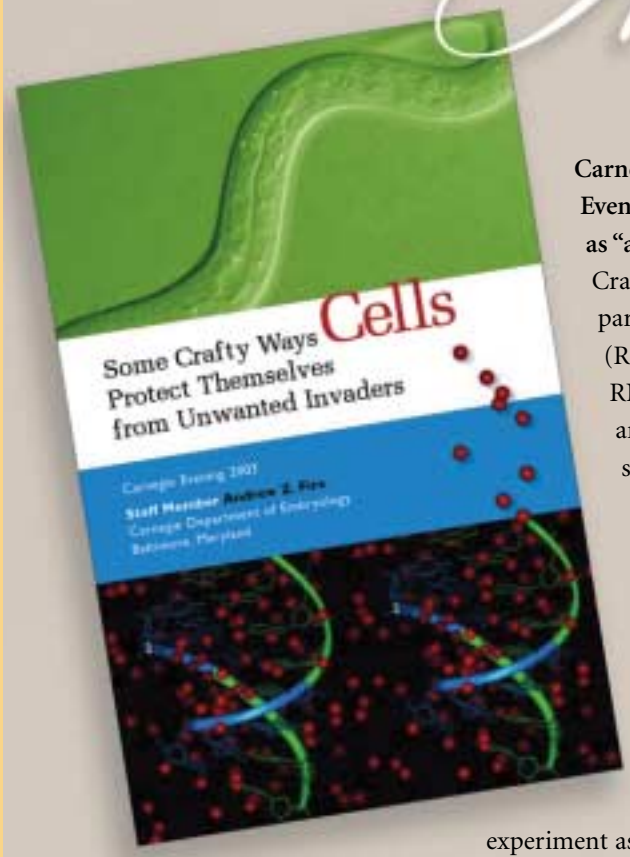
Alan Boss appeared on the July 11 PBS *Lehrer NewsHour* to comment on the discovery of the oldest planet ever found.

Extrasolar Planets Grab the News

Members of the Anglo-Australian Planet Search Team, the team that includes the Department of Terrestrial Magnetism's (DTM) **Paul Butler** and **Chris McCarthy**, recently discovered a solar system similar to our own. Researchers found a planet that is twice the size of Jupiter around Sun-like star HD 70642. The planet's orbit is similar to Jupiter's orbit, suggesting that smaller Earth-like worlds could be nearby. The story had wide coverage, including stories in the July 3 *New York Times* and *Melbourne Herald Sun*, among many other news outlets.

Alan Boss, also of DTM, was quoted all over the world on July 11—from the *Washington Post* to the *Straits Times* in Singapore—about the discovery of a 13-billion-year-old planet, the oldest planet ever found. Boss, not involved in the observations, commented on what the discovery means to the theories of planet formation. He was also featured on the PBS *Lehrer NewsHour.* •

SLEUTHING GENE SILENCING WITH *Andrew Fire*



Carnegie president Richard Meserve introduced this year's Carnegie Evening speaker, Dr. Andrew Fire from the Department of Embryology, as "a grand master" in the field of molecular biology. Fire's talk, "Some Crafty Ways Cells Protect Themselves from Unwanted Invaders," was in part a detective story about his team's work on RNA interference (RNAi)—the phenomenon whereby two complementary strands of RNA can silence a targeted gene. He also discussed the implications and ramifications of RNA-based gene silencing that have emerged since the double-stranded effector molecule was identified.

Fire's work on RNA interference grew from his interest in understanding the steps involved in early cellular development. His talk began with some simple images that illustrated the complex facts of early development—in just 12 hours, a fertilized egg of the tiny soil-dwelling worm *Caenorhabditis elegans* progresses from 1 cell to 550 cells, arranged neatly into body structures. "How does it get so complex so fast?" he asked. "And how do they know how to make that pattern?"

Fire and technician Susan White-Harrison designed an experiment as part of their effort to understand this complexity. Their objective was to increase gene expression—that is, to turn on a specific gene—to see if they could plot the steps in cellular development from the beginning. They injected *C. elegans* with a piece of DNA called a promoter which initiates the synthesis of messenger RNA (mRNA), or "sense" RNA—the single-stranded molecule that conveys the information from a DNA template to turn on a specific gene. Instead of the hypothesized result of turning that gene on, however, the opposite happened: the gene was inactivated.

These observations sat on the shelf for some time, bolstered along the way by observations by other animal and plant biologists of similarly paradoxical results that small amounts of a sense RNA apparently could shut genes off. Then the puzzle deepened when Sam Driver, working as a graduate student in Craig Mello's lab at the University of Massachusetts, discovered that just a single injection of RNA into the body cavity of a worm was capable of inactivating genes through the entire animal. It seemed that something very potent and stable was responsible for turning genes off.

A little later, technician SiQun Xu carried out a series of experiments with Fire in which the sense RNA was carefully purified before injection. Oddly, the purified sense RNA lost its capacity to turn off genes. The key experiment was to mix the sense RNA with a small amount of RNA from the other strand ("antisense"). Amazingly, Xu generated the silencing effect only if the two purified strands were mixed. In further experiments, the Fire and Mello groups found that the process was exquisitely dependent not on sense or antisense RNA alone but on the mixture of the two, with the two strands forming a paired molecule called double-stranded RNA. So what about the early experiments in

which researchers thought that sense RNAs were capable of turning genes off? It now appears that these responses may have been due to unintended contamination that had formed as a consequence of the "sloppiness" of the natural machinery used by cells and by researchers to make sense RNA in the lab.

Additional researchers working in different institutions tried similar experiments with their favorite model organisms and confirmed that many different plants and animals had the same type of silencing response to double-stranded RNA. This made it apparent that there was natural purpose for this phenomenon. As Fire explained, double-stranded RNAs are not an integral part of a cell's life. Instead, a double-stranded RNA is almost always indicative of an RNA virus caught in the act of replicating. Since many viruses are independent RNAs that survive by arranging their own replication and disseminating themselves from cell to cell, RNAi forms a natural defense mechanism that recognizes such molecules and reacts to their presence.

As it became clear how effectively double-stranded RNA interfered with gene expression, there was an explosion of activity in the research community. RNAi has become a powerful tool to understand developmental processes, and it is now commonly used to investigate gene function. Using RNAi, scientists routinely "knock out" targeted genes to observe the disruptions to normal processes. Their results help them determine what the gene was supposed to have done.

Beyond these research applications, investigators postulated that if a gene could be turned off, then this same process could be used to turn off the genes driving abnormal cell growth in a particular cancer, or shut down genetic diseases. There is considerable hope by scientists in this field that targeted drugs or other therapeutic techniques could be devised to combat these health problems.

As Fire concluded his remarks, he outlined his current research interest: to understand what the RNAi mechanism is doing for the cell. He ended his talk by giving credit where it is due—to his many, many colleagues who made all this work possible.

Carnegie Evening 2003

Before the Carnegie Evening lecture, delivered this year by Andrew Fire of the Department of Embryology, a small reception was held at the St. Regis Hotel for trustees and their guests. After Fire's talk the audience and speaker gathered for refreshments in the rotunda and reception area at the administration building.

(Top) Director of Global Ecology Chris Field (left) chats with trustee Hatim Tyabji.

(Center) Vera Rubin of the Department of Terrestrial Magnetism (DTM) talks with fellow astronomers Alycia Weinberger and Sara Seager, both of DTM, and director of the Observatories Wendy Freedman (left to right).

(Bottom) Trustee and chairman of the finance committee David Swensen talks to Marty Meserve, wife of Carnegie president Richard Meserve.

(Images courtesy Ann Little.)

CASE Interns:
What They Do and Where They Go

The Carnegie Academy for Science Education (CASE) is a training ground for Washington, D.C., elementary school teachers to learn the art of teaching science, mathematics, and technology. Each summer selected teachers attend the CASE summer institute. During the school year, the program is reinforced as the CASE staff works with teachers in the D.C. public schools. During the summer institute, CASE hires student interns to help keep the program running smoothly. We asked a few of them about their experience and what it meant to them. Their reflections follow.

Jennifer Lee,
CASE Intern, **Summer 1997**

I first became acquainted with CASE and First Light after an externship during the winter break of my junior year at Swarthmore College. Inés Cifuentes, CASE director and a Swarthmore alumna, opened her work and her home to me.

During that week, I visited the classrooms of some CASE teachers in Washington. I really enjoyed observing students interact with science through the careful instruction of their teachers. The following summer, I returned as an intern and worked with the CASE staff during their summer program. At that time, I was interested in educational policy and its implications in teacher professional development. However, the mentor-teachers and CASE staff did such an excellent job introducing content and pedagogy in elementary science teaching that I became hooked.

My time with CASE that summer made me seriously consider becoming a classroom teacher. I really enjoyed working with the teachers; they were professional, collaborative, and lifelong learners. I already had some concerns about my future plans in educational policy without having extensive teaching experience. So, I applied to the Teach for America program and taught elementary school in New Orleans for two years after graduating from Swarthmore in 1998. This year, I completed my master's in elementary education at Teachers College, Columbia University, and plan to teach in New York City in the fall.

Naamal De Silva,
CASE Intern, **Summer 1999**

I truly enjoyed my internship with CASE. Having attended D.C. public schools, I was aware of both the strengths and the weaknesses of its teachers and curricula. Many teachers lacked up-to-date training, and CASE provided a great way for them to learn new skills, connect with colleagues, and gain a renewed enthusiasm for their work. As an intern I was able to work with a great group of people, and learned a lot about hands-on education. The semester before working at CASE, I took an introductory course in education, and my internship allowed me to see some of what I had learned being put into practice. The internship reinforced my interest in education. After graduating from Swarthmore College, I went on to a master's program in environmental management at Yale, where I took a course in environmental education during my first semester. I graduated at the end of May, and will be returning to D.C. I remain interested in education, especially as it relates to conservation, and I hope to find a career that in some way incorporates writing, biology, conservation, and education.

Amy Seitz,
CASE Intern, **Summer 1999**

My summer at CASE was a wonderful introduction to novel ways that science can be taught in the classroom. As an intern I assisted the teachers who participated in the program with a variety of tasks. I helped them with problems they encountered in the computer lab and with their take-home assignments. I also helped the CASE staff organize field trips to Chester Creek for a marine biology lesson and to Discovery Creek to learn about forest ecology. In 2001 I finished my B.A. at the University of Maryland, Baltimore County, and I am currently conducting research at the National Institutes of Health as a postbaccalaureate fellow. Next year I plan to attend graduate school for public health and tropical medicine. I enjoy visiting the people in the CASE program when I attend Carnegie lectures. My experience at CASE made it apparent to me how instrumental it was for developing my own interest in biology. I also realized how important interactive science is for learning at all stages of education.

(Images courtesy Scott Rubel.)

Out and About at the Observatories

The spring launch of the Carnegie Observatories centennial public lecture series was a huge success. Held in Friends' Hall, a 400-seat auditorium at the Huntington Library in San Marino, California, Carnegie astronomers talked about the expanding universe, black holes, cosmic collisions, and the search for extraterrestrial planets. This was the first free public lecture series offered by the Observatories, and the response was overwhelming. Each sellout lecture was generously underwritten by the Whittier Family Foundations and the *Los Angeles Times*. Prelecture sessions and dinners were held for children and their parents to learn about the basics of astronomy with Dan Kelson and Paul Martini. Children from the Pasadena Unified School District and the Downey Unified School District attended. The education/outreach activity continued at Longfellow Elementary School with a star party and a Saturday science day featuring Carnegie astronomers teaching children about telescopes and planets. The lecture series and educational sessions will be repeated next year beginning in March.

The Friends of the Carnegie Observatories recently held a dinner in honor of director Wendy Freedman. Guests enjoyed cocktails and a brief presentation by Freedman before dinner in the Hale Library. Pasadena Mayor Bill Bogaard, Danielle and Dallas Raines, Andrea and John Van de Kamp, Jim Watterson, Alice Coulombe, Molly Munger and Steve English, Cathy and Steve Ascher, Kathy and Bob Ray Offenhauser, Nancy Baxter, Samuel Hale, Angie and Tom Thornbury, and Herrad and Marlow Marrs attended.

The Observatories will be hosting its second annual open house on Sunday, September 21 (2 p.m. to 5 p.m.), offering music, light refreshments, and an opportunity to visit with Carnegie astronomers. On Sunday, October 18, the department will partner with the California Art Club and the Mount Wilson Institute to host the exhibition *Artists Celebrate the Cosmos: The 100th Anniversary of the Mount Wilson Observatory.* For more information, call 626-304-0241. ◗

❶ Wendy Freedman converses with members of the audience after her Huntington Library lecture on the expanding universe on March 13.
❷ The crowd swarmed around John Mulchaey (facing camera) after his Huntington lecture on how asteroids and comets have affected the planets and life on Earth.
❸ Postdoctoral fellow Dan Kelson interacts with parents, children, and teachers at his talk.
❹ Guests Jim Watterson and Molly Munger head into the Hale Library for the Friends of the Carnegie Observatories dinner held in honor of director Wendy Freedman.

NASA Renews Support for Astrobiology Group

On June 24 NASA announced that it would grant new or renewed membership in the NASA Astrobiology Institute (NAI) to 12 institutional teams. Carnegie's astrobiology group, made up of scientists at the Department of Terrestrial Magnetism (DTM) and the Geophysical Lab, was among those awarded renewed support. Astrobiology is the interdisciplinary study of the evolution of life on Earth and its potential for existing elsewhere. The Carnegie team has been a lead astrobiology institution for five years, with DTM's director, Sean Solomon, as the principal investigator. The new $6.3 million, five-year award will further the researchers' investigations into the different pathways for forming life. Some team members study the physical and chemical evolution of disks surrounding nearby stars, other planetary systems in the Galaxy, and solar system environments. Other researchers focus on early organic compounds in extraterrestrial materials, the evolution from the chemical world to the biological world on Earth, and the emergence of life in extreme environments on Earth. Additional investigations include defining fingerprints, or biosignatures, indicative of life, and developing methods for spacecraft instrumentation to detect life elsewhere in the solar system. The award also supports educational and public outreach efforts. ◗

IN Brief

Charles T. Prewitt, former director of the Geophysical Laboratory, retired on June 30. He will continue as a Visiting Investigator to GL for two years beginning July 1. After receiving his Ph.D. from MIT, Prewitt spent 7 years working for the DuPont Company and then 17 years in the Dept. of Earth and Space Sciences at SUNY-Stony Brook. After leaving Stony Brook, he served as director of GL for 12 years beginning in 1986. At the end of his tenure he continued as a Senior Staff Member. His work was varied—high-pressure research, applications of synchrotron radiation to geological problems, and the role of hydrogen in planetary evolution. He also oversaw the establishment of the Center for High Pressure Research (1991-2002), a joint effort between GL, SUNY-Stony Brook, Princeton U., and later UC-Davis. The center was part of NSF's Science and Technology Center Program and is being followed at GL and elsewhere by several other high-pressure initiatives funded by NSF and DOE. Over the past two decades Prewitt has promoted research on physical and chemical properties of minerals and related materials and used this knowledge to solve problems in the Earth sciences. The field, generally called mineral physics, has grown substantially and is a significant component of many institutions and scientific conferences in the USA and abroad.

Prewitt recently moved with his wife, Gretchen, to Tucson, where they bought a house in The Academy Village, a retirement community for academics. He was appointed an adjunct professor in the Dept. of Geosciences at U. Arizona, where he will continue an active research program in collaboration with former GL postdoc Robert Downs. In addition, he and his wife hope to spend time exploring the natural wonders of the American West.

❶ Joe Gall, Sue Gerbi of Brown, and Ji-Long Liu a postdoc in the Gall lab pose at the symposium.

Trustees

Steven McKnight was interviewed on National Public Radio on July 4 about his work on a gene that is involved with napping. The research was published in the online edition of *Science.*

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Freeman Hrabowski was elected to the American Philosophical Society in Apr.

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NPR interviewed **Maxine Singer** on Apr. 23 about the 50th anniversary of the discovery of the structure of DNA.

Administration

Carnegie president **Richard Meserve** was elected to the National Academy of Engineering. He will also serve on a Roundtable on Scientific Communication and National Security established by the National Academies and the Center for Strategic and International Studies.

—

CASE math mentor **Dayo Akinsheye** received the Presidential Award for Teaching Mathematics in Mar.

Embryology

Allan Spradling and former Embryology Staff Member **Gerry Rubin** received the 2003 George Beadle Award of the Genetics Society of America, presented on Mar. 5 at the annual National *Drosophila* Research meeting in Chicago.

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❶ A symposium entitled "Symposium on Nuclear Dynamics" was held at Mudd Hall at Johns Hopkins U. June 13-15 to honor longtime Staff Member **Joseph Gall** on his 75th birthday. Participants came from all over the U.S. and abroad.

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Olivia Doyle received her Ph.D. from Johns Hopkins U. in May and will begin her postdoctoral studies in Joseph Gall's lab.

—

Dongli Duan and his wife, Yukan, had a baby boy on Mar. 28, Anthony (Tony) Botao.

—

Anne Lynn and Drew Langloh welcomed their new son, John Robert (Jack) Langloh, on May 12.

—

Two members of Allan Spradling's lab have left for teaching positions. **Melissa Pepling** is an assistant professor of biology at Syracuse U., and **Daniela Drummond-Barbosa** is an assistant professor in the Dept. of Cell and Developmental Biology, Vanderbilt U.

—

Sophia Lizarraga of Yixian Zheng's lab received her Ph.D. from Johns Hopkins U. in May. She will conduct her postdoctoral studies in Chris Walsh's laboratory at Harvard Medical School.

Observatories

❷ **Wendy Freedman** was elected to the National Academy of Sciences. She was mentioned in the May 6 *New York Times* in an article about women in the academy. Among other honors, Freedman presented the first lecture of the Centennial Lecture Series at the Huntington Library and Botanical Gardens. Freedman was an invited speaker at New York U. and participated in the External Advisory Board Meeting for the Center of Cosmological Physics (CfCP) on Apr. 24 at U. Chicago. On May 15 she gave a talk at the Adler Planetarium in Chicago, and on May 31 she gave the commencement address at the Illinois Mathematics and Science Academy (IMSA).

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Bruce C. Bigelow was a reviewer at the critical design review for the Prime Focus Imaging Spectrograph (PFIS) held for the South African Large Telescope in Madison, WI.

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Postdoctoral fellow **Jon Fulbright** gave talks at JPL and Penn State.

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Carnegie Fellow **Mike Gladders** gave colloquia at U. Washington and U. Toronto in Feb. and spoke at UC-Davis in May. He also presented an invited talk to the Friends of Beckman Auditorium at the Observatories.

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Hubble Fellow **Mario Hamuy** spoke at the 2003 Annual Hubble Symposium in Baltimore, Mar. 6-7, and at "Supernovae (10 years of SN 1993J)," Valencia, Spain, Apr. 22-26.

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Barry Madore was the senior author on a white paper entitled "The Celestial Navigator System: the integration and

❷ Wendy Freedman (far right) at the Santa Barbara Street celebration for her NAS induction. Others from left to right are Stephen Helsdon, Kathleen Koviak, Paul Collison, Ken Clardy, Samuel Boissier, and Barry Madore.

(Image courtesy Robert Storts.)

❸ Members of the Frommer lab from left to right are Sakiko Okumoto, Wolf Frommer, Marcus Fehr, and Melanie Hilpert.

interoperability of NASA astrophysics data centers and services," presented at NASA headquarters in Washington, DC, in Apr. The paper outlines a plan to unite all of NASA's major archives, mission centers, and thematic centers through a centralized database of objects and through the adoption of standard query-response protocols between centers. Madore also presented a joint paper with **Wendy Freedman** at the Satellites and Tidal Streams meeting held in the Canary Islands.

—

Patrick J. P. McCarthy gave a colloquium at UC-Berkeley and a talk at the US Gemini Advanced Instrumentation Workshop. He also participated in the Hubble Space Telescope Observing Time Allocation Committee, the US Gemini Telescope Time Allocation Committee, and the Wide-field Camera 3 Oversight Committee for NASA in the spring.

—

Michael Rauch gave a colloquium at the Space Telescope Institute in Baltimore in Mar. He also served on one of the panels of the Hubble Space Telescope time assignment committee.

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Steve Shectman participated in a review of the Pan-STARRS project at U. Hawaii in Feb. In Mar. he visited MIT, where he worked with Scott Burles on plans for a new echellette spectrograph for Magellan.

—

Paul Martini and **Jeremy Darling** joined forces to teach a full course entitled "Galaxies and Cosmology" at U. Southern California.

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Visitor **Samuel Boissier** presented a paper at the fourth Carnegie Observatories Centennial Symposium: Origin and Evolution of the Elements.

Plant Biology

In Feb. **Shauna Somerville** visited the Risø National Laboratory in Roskilde, Denmark, to present a talk and participate in a Risø Fellows meeting. In Apr. she gave a talk at Rutgers U., New Brunswick, NJ, and in May she attended a conference in Riken, Japan.

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On Mar. 26-28 **Kathy Barton** was an invited speaker at the UK Genetics Society Meeting in Warwick. She was also an invited speaker at U. Chicago's one-day symposium on stem cells and plasticity on Apr. 4.

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On Jan. 15-18 **Zhi-Yong Wang** gave a talk at the 22nd Symposium in Plant Biology, UC-Riverside, and on May 14 he gave a seminar at the Dept. of Molecular, Cell, and Developmental Biology, UCLA. Wang also gave a talk at the 21st Annual Missouri Symposium, "Plant Protein Phosphorylation," at U. Missouri, Columbia, on May 28-31.

—

On Jan. 18 **Chris Somerville** presented a talk at a symposium on plant cell biology in Riverside, CA, and on Feb. 4 he presented a seminar at U. Arizona. On Mar. 8 he presented the same talk at a symposium on model organisms at York U. in Toronto. On May 17 he presented a talk for the general public on the subject "The future of plant genetic engineering" at the invitation of the Leibniz Collegium at U. Potsdam, Germany.

—

Chris and **Elliot Meyerowitz** (Caltech) organized a workshop on plant systems biology held at UC-Riverside on Jan. 18. The meeting, which was sponsored by the US Dept. of Energy, explored the possible implications of enhanced funding for research on systems biology of plants.

—

Winslow Briggs was an invited special lecturer for two talks at U. Florida-Gainesville and in Feb. presented the seminar "Phototropins: A New Family of Plant Photoreceptors" at U. Seville, Spain. Also in Feb., Briggs was the invited speaker at the Juan March Symposium on Plasticity in Plant Morphogenesis. His topic was phototropins. He presented this same seminar at U. Nebraska-Lincoln in Mar.

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Nick Kaplinsky joined Kathy Barton's lab in Feb. He arrived from UC-Berkeley after a short spell of hiking through the Chilean Andes.

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Neelima Sinha, a visiting researcher in Barton's lab on sabbatical from UC-Davis, gave a keynote address at this year's Maize Conference.

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In Mar. **Behzad Mahini** became the newest curator at the TAIR group. Mahini was formerly employed by TMRI/Sygenta in San Diego.

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In Mar. **Gabriel Lander**, of the TAIR group, departed for the East Coast. Also leaving in Mar. was **Zhaoduo Zhang**, a postdoc in Arthur Grossman's lab. Zhang has returned to Canada.

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In Apr. the Wang lab welcomed a new lab assistant, **Nathan Gendron.**

—

❸ In May the department welcomed two of Wolf Frommer's postdocs and his lab technician from U. Tübingen, **Melanie Hilpert**, who is organizing the new lab space with the assistance of the two postdocs, **Marcus Fehr** and **Sakiko Okumoto.**

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In Feb. Shauna Somerville's lab bade farewell to **Lorne Rose**, who has taken a position in Memphis, TN.

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Katrina Ramonell, a postdoc in Shauna's lab, has accepted an assistant professorship at U. Alabama and will leave Carnegie in Aug.

—

David Finkelstein, a former postdoc in Shauna's lab, and wife, Martha, welcomed their son, James Issac, on Feb. 9.

—

Lalitha Subramanian, a former software analyst in Shauna's lab, and husband, Anant, had a baby boy, Gautham, on May 2.

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After a seven-month stay as a postdoc in Arthur Grossman's lab, **Dafna Elrad** left in May to pursue other opportunities.

—

John Christie, a former postdoc from Winslow Brigg's lab, will receive the ASP New Investigator Award for 2003 from the American Society for Photobiology. Christie will receive his award and present a special lecture at the 31st Annual Meeting of the American Society for Photobiology to be held in Baltimore July 5-9. He is at present a Royal Society Research Fellow at U. Glasgow.

—

The department started a new program for undergraduate interns under the direction of **Leonore Reiser.** In addition to working on their research projects, summer interns will meet weekly to talk about their work. They will also present their work to the entire department at the end of the summer. Among the interns are **Christopher Tang**, an undergraduate from Rice U. Tang is working as a lab assistant in Arthur Grossman's lab. **Monica Jain**, from San Jose State U., is also working in the **Grossman lab**, as a bioinformatics intern. **Thomas Yan**, also an undergraduate from San Jose State, is a bioinformatics intern with the TAIR group. **Samir Kapadia**, a Stanford undergraduate, joined Devaki Bhaya's lab for the summer as a lab assistant.

Global Ecology

Duncan Menge, in the Field lab, received the Firestone Medal for the best undergraduate honors thesis in the Goldman Honors Program at Stanford U. He will begin a Ph.D. program in ecology and evolution at Princeton U. in the fall.

—

Amber Kerr, in the Field lab, accepted a position as an MAP Sustainable Energy Fellow. She is pursuing this fellowship at the Rocky Mountain Institute.

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Also in the Field lab, **Elsa Cleland** and John O. Niles were married on June 14.

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Jeff Dukes, Field Lab postdoctoral fellow, joined the faculty at U. Mass-Boston. Dukes will stay at Carnegie for the rest of 2003.

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Erika Zavaleta (former Ph.D. student, Field lab) began a position on the faculty of UC-Santa Cruz.

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Linda Longoria joined the department as assistant to the director.

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Julia Silvis left the Field lab to begin an

One of the world's great field petrologists, GL's T. Neil Irvine, retired June 30. His specialty is layered igneous intrusions. Among those he studied in detail were the Duke Island ultramafic complex in southeastern Alaska, the Muskox Intrusion of the Canadian Northwest Territories, the Stillwater Complex in Montana, the Bushveld Complex in South Africa, and especially the Skaergaard Intrusion in East Greenland.

Most of these layered intrusions are economically important because they contain major deposits of chromium, nickel, copper, titanium, vanadium, platinum, palladium, gold, or iron. But it was the theoretical importance of the layered assemblages of crystals that was Irvine's chief interest. He produced detailed geological mapping of the intrusions, examined their tectonics, and systematized the terminology used to describe them. He also conducted detailed microscopic and analytical work on the rocks and minerals. These data led to experimental investigation of the melting, crystallization, and immiscibility in the magmas. On that basis Irvine developed theoretical and computer modeling of the heat-transfer processes. Ultimately he generated scale-model laboratory experiments that illustrated the convective flow, crystal transport, and sedimentation of the crystals forming in the magma. His new concepts were always illustrated with detailed drawings. He led field excursions and encouraged discussions of the specific observations that led to his views.

Irvine's genius was in his appreciation of the geological importance of the relationships between components of outcrops. His work at the Skaergaard brought new light to the rhythmic modally graded layers. Similarly, he showed how a remarkable phenomenon called double-diffusive convection resulted in upgrading ore metals many times over their original parent magma concentrations. ●

internship with the Union of Concerned Scientists.

—

David Kroodsma, in the Field lab, finished his thesis and began a bike ride across North America.

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Ben Shaby left the Field lab to start a Ph.D. program in statistics at Cornell U.

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Postdoctoral fellow **Florent Mouillot** left the Field lab for a position with the French agency for international development.

Geophysical Laboratory

Wes Huntress was appointed to a National Research Council committee to advise Congress on NSF's processes for prioritizing, approving, and managing large research facilities in its major research equipment line. He also moderated a workshop involving the Association of Space Explorers (an association of astronauts), the American Astronautical Society, and the Planetary Society to offer advice on the future of the space shuttle and a next-generation space transportation system to low Earth orbit that could support exploration beyond Earth orbit.

—

The Siemens Foundation recognized **Viktor Struzhkin** as an outstanding mentor in the 2002-2003 Siemens Westinghouse Competition in Math, Science, and Technology. His student, **Wei Gan**, won second place and a $50,000 scholarship to a university of his choice. Struzhkin was appointed Staff Member as of July 1.

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Robert Hazen was keynote speaker at the 3rd International Conference on Biochemical Chirality at Modena, Italy; invited speaker at the American Chemical Society meeting in New Orleans; and delivered lectures on aspects of astrobiology at Johns Hopkins U., Georgia State U., Georgia Southern U., and Tennessee Tech., and at universities in Kiel, Greifswald, Freiberg, Bochum, Cologne, and Münster in Germany as part of the Mineralogical Society of America's Distinguished Lecture Series.

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Postdoctoral fellow **Stefanie Japel** has accepted a postdoc position at the Max Planck Institute for Chemistry in Mainz, Germany, and will leave the lab in Aug.

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George Cody was quoted in the Apr. 26 *Science News* in a feature about hydrothermal vents.

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Ho-kwang (David) Mao presented two invited talks at the SMEC (Study of Matter at Extreme Conditions) 2003 Conference in Miami, Mar. 24-27. He also gave an invited journal-club talk at Stanford U. on Apr. 28.

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Bjørn Mysen gave an eight-lecture short course, "Structure of Silicate Melts: From SiO_2 to Basalt," at ETH in Zurich, Switzerland, Feb. 27-28.

—

Hatten S. Yoder, Jr.,

director emeritus of the GL, died on August 2. An upcoming issue of *Spectra* will feature a tribute to his life and work. ★

Anurag Sharma has accepted a faculty position at Rensselaer Polytechnic Institute. He gave a NASA Astrobiology Director's seminar via webcast on Apr. 28. It can be accessed on the Web at http://nai.arc.nasa.gov/seminars/index/.

—

Aravind R. Asthagiri (Chemical Engineering, Carnegie Mellon U.) was appointed a postdoctoral fellow beginning July 1. His proposal involves the study of the absorption of chiral amino acids and sugars on chiral calcite surfaces using Density Functional Theory (DFT).

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Muhetear Aihaiti (Dept. of Applied Physics and Chemistry, U. Electro-Communications, Tokyo) was appointed a postdoctoral research associate. He is working on high-pressure Brillouin scattering studies of phase transitions in general and ambient pressure high-temperature Brillouin scattering of ferroelectrics/ferroelastics.

—

Andrey Bekker (Dept. of Earth and Planetary Sciences, Harvard U.) will begin his postdoctoral fellowship on Jan. 1, 2004. His interest is the evolution of the atmosphere and the surface environment of the Earth. He has been involved in research projects on many continents, including Australia, Africa, India, North and South America, and Eurasia.

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Beginning Oct. 3 **Li-Hung Lin** (Dept. of Geosciences, Princeton U.) will be a postdoctoral fellow with the astrobiology group. His research on the role of hydrogen generation in supporting deep subsurface microbial communities and on bacterial mineral interactions is an important link between Carnegie's research on prebiotic synthesis and on the identification of microbial processes in hydrothermal systems.

—

Rosa Maria and **Jaime Torres** are the proud parents of Keila Emily Torres, who arrived on May 1.

—

On June 5 **Albert Colman** and his wife, **Julie Park**, were presented with a baby boy. Mother, baby, and father are all doing well.

Terrestrial Magnetism

Vera Rubin has been awarded the 2003 Catherine Wolfe Bruce Medal of the Astronomical Society of the Pacific. She also spent a week in Mar. with the 40 finalists of the Intel Science Talent Search. In Apr. Rubin returned to Cornell, where she received her M.A., as the Thomas Gold Lecturer. In June she spoke at the European Southern Observatory/University Católica/University of Chile Joint Astronomy Seminar series in Santiago.

—

Alan Boss was elected a fellow of the

❹ Conel Alexander, Robert Walker, and Larry Nittler at the Walker symposium, Washington U.

❺ Mary Coder in her office at DTM.

In Apr. DTM and GL hosted a party honoring Maxine and Dan Singer for all their contributions to the two departments over the years. From left to right are Dan Singer, Maxine Singer, Sean Solomon, a catering assistant, and Pam Solomon.

American Academy of Arts and Sciences in May and will be inducted in Oct.

—

Rick Carlson was elected a fellow of both the American Geophysical Union and the Geochemical Society. Among other activities he co-organized a workshop, "Integrated Solid Earth Sciences Cyberinfrastructure," at U. Kansas in Mar., which defined a work plan for developing database, sample archiving, and information technology infrastructure for geochemistry, geology, and geochronology in the US. In May he attended the geoinformatics workshop at the San Diego Supercomputing Center to help coordinate cyberinfrastructure activities across the atmospheric, ocean, and Earth sciences funded by NSF. Also in May, he attended the Geochemical Earth Reference Model (GERM) meeting, in part to deal with cyberinfrastructure issues and to present a talk on the geochemical structure of the mantle.

—

David James was appointed to a three-year term as chairman of the Program for Array Seismic Studies of the Continental Lithosphere (PASSCAL) Standing Committee of Incorporated Research Institutions for Seismology (IRIS). He was also selected as an IRIS/Seismological Society of America Distinguished Lecturer for 2003-2004.

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In Mar. **Alan Boss** spoke about giant planet formation to the National Research Council's Committee on the Origin and Evolution of Life, in Washington, DC. In Apr. he gave a colloquium on planet formation at UCLA, and also spoke at the Toward Other Earths: Darwin/Terrestrial Planet Finder Workshop in Heidelberg, Germany.

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In Mar. **Alycia Weinberger** presented a lecture as part of the Young Engineers and Scientists Seminars, sponsored by the Historical Electronics Museum. She also gave invited talks in May at the American Astronomical Society meeting and in July at the Gordon Conference on origins of solar systems.

—

Sara Seager was featured on a PBS television documentary, "Big Ideas," about the Institute for Advanced Study in Princeton, NJ. This spring Seager gave talks at UCLA, the National Radio Astronomy Observatory, and NASA's Ames Research Center and Goddard Space Flight Center. Seager and Jonathan Lunine (U. Arizona) convened a workshop on the James Webb Space Telescope and astrobiology at P Street in May. The goal was to identify science that is astrobiologically relevant to the James Webb Space Telescope (JWST), a NASA infrared space telescope that will take the place of the Hubble Space Telescope at the end of this decade, and any instrument modifications needed. Seager and Mike Wevrick welcomed Maxwell Solstice Wevrick Seager into their family on the summer solstice, June 21.

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Paul Butler gave a talk in May at the Huntington Library in Pasadena as part of the Carnegie Observatories Centennial Lecture Series.

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❹ The Lunar and Planetary Science Conference, held in Houston in Mar., included DTM presenters **Conel Alexander, Alan Boss, Steven Desch, Steven Hauck, Larry Nittler,** and **Sean Solomon.** In Mar. **Alexander** and **Nittler** gave invited talks at a symposium at Washington U. in honor of Prof. Robert M. Walker. **Nittler** gave an invited talk at a workshop on hyperspectral data analysis at the National Institute of Standards and Technology in Apr.

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The Joint Assembly of the EGS (European Geophysical Society), AGU (American Geophysical Union), and EUG (European Union of Geosciences) was held in Nice, France, in Apr. DTM presenters included **Steven Hauck, David James, Alan Linde, Selwyn Sacks, Paul Silver**, and **Sean Solomon.**

Tarzan Kwadiba arrived in June to work with **David James** analyzing data from the Southern Africa Seismic Experiment.

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Matt Fouch, a former DTM postdoctoral fellow, returned to DTM in late June for a one-month stay.

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Former DTM postdoctoral fellow **Karl Kehm,** now an assistant professor at Washington College in MD, and undergraduate physics student **Leger West** visited DTM for eight weeks during the summer. They investigated the isotopic variability of Fe and Ni in terrestrial settings and meteoritic material.

—

Myung Gyoon Lee, a DTM Visiting Investigator from Seoul National U., returned to South Korea after 13 months at DTM. He studied the star formation history of Local Group galaxies, star clusters in the interacting galaxy M51, globular clusters in spiral galaxies and giant elliptical galaxies, formation of galaxies in galaxy clusters, and variable stars in galactic globular clusters. **Hoseong Hwang,** a graduate student at Seoul National U., visited Lee at DTM in May. He analyzed the spectroscopic data of globular clusters in giant elliptical galaxies to study the kinematics of the globular cluster system.

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Among the postdoctoral fellows who left DTM this summer was **Steven Desch,** who has joined the Dept. of Physics and Astronomy at Arizona State U. as an assistant professor. **Steven A. Hauck, II** left for a position as an assistant professor at Case Western Reserve U. in Ohio. **Sujoy Mukhopadhyay** took an assistant professorship at Harvard U.; and **Petrus LeRoux** accepted a position as a research geologist at the Danish Lithosphere Centre in Copenhagen.

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❺ **Mary McDermott Coder,** a senior administrator at DTM, retired on June 30. She started at DTM in 1978 and worked closely with former director George Wetherill and acting director Louis Brown, as well as with current director Sean Solomon, on projects ranging from composing "In Brief" for the newsletter to planning social events.

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DTM postdoctoral fellow **Mark Schmitz** married Karen Viskupic at CIW's P Street building in Apr.

DTM/GL

V. Rama Murthy, a DTM/GL Visiting Investigator from U. Minnesota, was on campus in May.

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John Boatright has joined DTM and GL as project manager to oversee the renovation of the Experiment Building. He will be working closely with Roy Dingus and the BBR staff, as well as with the staff committee overseeing the renovation planning.

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Summer interns are working with many DTM and GL scientists this summer. They are **Charlene Adzima,** College of Wooster; **Martha Buckley,** MIT; **Katherine Chen,** Stanford U.; **Elana Chung,** Montgomery Blair HS; **Jared Crossley,** New Mexico Institute of Mining and Technology; **Ivan Eremets,** Moscow Engineering Institute; **Lizz Felnagle,** Caltech; **Mary Francis Fitzsimmons,** St. John's HS; **Allie Gale,** U. Maryland; **Kevin Wei Gan,** Princeton U.; **Patrick Griffin,** George Mason U.; **Karen Horning,** Florida Institute of Technology; **Garret Huntress,** U. Maryland; **Simon Kung,** Winston Churchill HS; **Asad Mahmood,** Alice Deal Junior HS; **Matthew Peck,** U. Maryland, Baltimore County; **Katie Phillips,** Vassar College; **Molly Potter,** Embry-Riddle Aeronautical U.; **Claire Runge,** College of William and Mary; **Maia Schweizer,** Princeton U.; **Jessica Shang,** Montgomery Blair HS; **Devon Shook,** Carnegie Mellon U.; **Ken Tossell,** Sandy Springs Friends School; **Jill Van Tongeren,** U. Michigan; and **Andrea Young,** Columbia U.

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The Third NASA Astrobiology Institute General Meeting, held in Feb. in Tempe, AZ, included papers by DTM and GL members **Conel Alexander, Nabil Boctor, Alan Boss, James Cho, George Cody, Marilyn Fogel, Nader Haghighipour, Erik Hauri, Robert Hazen, Russell Hemley, Wes Huntress, Bruce Jakosky, Jake Maule, Larry Nittler, Shuhei Ono, Nicholas Platts, Douglas Rumble, Gotthard Sághi-Szabó, James Scott, Sara Seager, Anurag Sharma, Andrew Steele, Viktor Struzhkin, Jan Toporski, Pei-Ling Wang,** and **Hatten Yoder.**

Caryl and Edna Haskins Leave $15 Million to Carnegie

(Portrait by Sydney Dickinson.)

Carnegie has received an extraordinarily generous bequest of $15 million from the estates of former Carnegie president Caryl P. Haskins and his wife, Edna. Their gift is the culmination of the many years of devoted service and support they gave to the institution. Over the decades, when the couple lived within walking distance of the Washington administration building, they rarely missed a lecture or social event.

Haskins, president from 1956 to 1971 and trustee emeritus, died on October 8, 2001, at age 93. Mrs. Haskins died in 2000. In 1958, Haskins wrote eloquently in the *Year Book* about the role of a scientific research organization like Carnegie: "To it must fall the essential function of symbolizing...the way of scientific innovation with all that it means for our nation and our culture—undismayed and undeterred by pressure or by hazard."

Haskins went on to express his concern that the costs of scientific research might exceed the reach of any group other than the federal government. The risk, he reasoned, was then and still is that researchers would lose their independence—the rare and special freedom that Carnegie scientists are given to follow their research wherever it takes them.

Caryl and Edna Haskins did more than lead and advise. By giving generously during their lifetimes, and especially by making a planned gift to benefit the institution, the Haskinses have provided an enduring demonstration of what individuals can do to keep their goals alive. The Haskins bequest will go a very long way toward assuring that current and future Carnegie scientists will be able to conduct innovative scientific research "undeterred by pressure" created by unanticipated increases in the cost of research.

Most of the Haskins bequest has been directed to the $75 million *Carnegie Campaign for Science,* which will enhance the capabilities of all six research departments. As of July 2003, the campaign has raised $45 million for new buildings, scientific instruments, and endowed postdoctoral fellowships.

(Top right) This portrait of Carnegie Institution president Caryl Haskins hangs in the institution's boardroom.

Small Place with a BIG Impact

Science Watch, a publication that tracks the performance of institutions conducting basic research worldwide, rated Carnegie eighth in citation impact for the geosciences. This ranking was above that for MIT and Caltech, among others. "Citation impact" is a measure of how frequently an institution's publications are cited in the literature. Each paper by a Carnegie author was cited around 14 times in the literature for the period 1991 through 2001.

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