SPECTRA

Spring 2001

THE NEWSLETTER OF THE CARNEGIE INSTITUTION

Extending the Frontiers of Science

Three hundred and twenty guests were on hand for the Magellan Project dedication ceremony at Carnegie's remote Las Campanas Observatory in Chile. (Image courtesy Arnold Pryor.)

INSIDE:

Flawed Diamond May Be Scientists' Best Friend 3
Little Humans with Wings? 4
Paul Butler Awarded Draper Medal 4
CASE Part of Program to Reform Science and Math in D.C. Schools 5
Butler, Boss, and Planets 6
Nitrogen, Carbon Dioxide, and Plants 7
Dedicating Magellan 8
The Little Plant with a Big Future 16
First Science with the Baade Telescope 16

CARNEGIE CREATIVITY

Tom Urban

Science is a rigorous, systematic, and sometimes tedious endeavor. Most people experience it only through lower-level course work that emphasizes procedure, memorization, and rote experimentation; creativity doesn't seem to be part of the process. The exceptional scientist, however, is by definition highly creative. And it is this quality that lies at the core of Carnegie. In the 60th anniversary issue of the Year Book, President Caryl Haskins reflected on our foundation: "the philosophy that all [of the institution's] resources, all its deepest purposes are centered in the creative individual, whatever be his field."

The creative process involves making something new–solving a problem, developing a new tool or method, or designing an object. The inventive individual understands his or her subject thoroughly and when confronted with a particularly vexing challenge, often has a moment of true insight that leads to a unique product. Today, as our centennial approaches, countless creative individuals continue to make our institution what it was formed to be–an organization that finds novel solutions to both old and new problems.

To study some phenomena, Carnegie scientists have had to invent new tools or dramatically improve old ones. DTM and the Geophysical Lab have a long history of this in the earth sciences; Selwyn Sacks provides just one example. More than 30 years ago he, with colleague Dale Evertson, developed the Sacks-Evertson borehole strainmeter, an extremely sensitive device that measures the deformation of the Earth near active faults and volcanoes. Today strainmeters keep watch from California to Iceland and Japan. They are helping scientists around the world understand volcanoes and earthquakes better, and the information they provide is improving early-warning systems.

Steve Shectman at the Observatories has designed a countless array of new devices over the years to help researchers study important problems in astronomy. His unique approach to Magellan's telescope control system and some of the new instrumentation to accompany the twin reflectors are the latest in a long line of his extraordinary contributions.

Carnegie scientists continually refine their methods and come up with new ones. For example, as more genomes are mapped, the thrust in genetics is changing from identifying the genes to understanding what they actually do. Andy Fire at Embryology was instrumental in developing the method of RNA interference to accomplish just that. It is helping researchers screen large numbers of genes in the worm *C. elegans*. This will ultimately aid our understanding of how our own genes function.

Sometimes the question is the creative spark. Until recently, most scientists interested in studying the effects of car-

CARNEGIE INSTITUTION
OF WASHINGTON

1530 P Street, N.W.
Washington, D.C. 20005-1910
(202) 387-6400
Web site: www.CarnegieInstitution.org

Maxine F. Singer, President
Augustus Oemler, Jr., Director, The Observatories
Wesley T. Huntress, Jr., Director, Geophysical Laboratory
Sean C. Solomon, Director, Department of Terrestrial Magnetism
Christopher Somerville, Director, Department of Plant Biology
Allan C. Spradling, Director, Department of Embryology
John J. Lively, Director, Administration and Finance
Susanne Garvey, Director, External Affairs
Tina McDowell, Editor
Ellen Carpenter, Assitant Editor and Designer

TRUSTEE NEWS

Steve Shectman, Magellan Project Scientist (center), describes the Magellan telescope operations to trustees and their guests.

The December trustees' meeting was held at Las Campanas, Chile, on December 8 and 9 to coincide with the Magellan dedication activities. After the committee meetings on the eighth, Steve Shectman, Magellan Project Scientist, and Leonard Searle, director emeritus of the Observatories, gave a talk to board members and their guests about astronomy and Magellan. Later that night the group stargazed with the new Walter Baade telescope.

On December 9 the trustees elected a new member to the board, Dr. Stephen Fodor. Dr. Fodor is currently the chairman and chief executive officer of Affymetrix, Inc., of Santa Clara, California. In 1993 he cofounded the company, which produces high-density oligonucleotide arrays and supporting equipment for gene analysis. He has received numerous awards, among them the Jacob Heskel Gabbay Award in Biotechnology and Medicine and the AAAS Newcomb-Cleveland Award. He is a member of the American Chemical Society, the Biophysical Society, and the AAAS.

Dr. Stephen Fodor

bon dioxide emissions focused on the cycle of the carbon itself. Recently, Chris Field at Plant Biology and colleagues published results of a study that examined how nitrogen use by plants and soil microbes is affected by increases in CO_2. Looking at the issue from this new perspective has led to surprising findings and a whole new avenue of inquiry.

Although Carnegie science spans an enormous spectrum–from the molecular mechanisms of our genes to the large-scale structure of the universe–our scientists share a common trait: the ability to approach a problem with a fresh eye and the appetite to find an answer. These qualities inspire new ideas, and they have kept us at the forefront of our disciplines. As we go forward they will continue to do so.

Tom Urban, Chairman

William R. Hewlett, trustee emeritus, dies

William R. Hewlett, Carnegie trustee emeritus and cofounder of the company Hewlett-Packard, died January 12, 2001, at the age of 87. A trustee since 1971, Hewlett served as chairman of the board from 1980 until 1986 and became a trustee emeritus in 1990.

Hewlett graduated with a B.A. from Stanford University in 1934 and obtained his master's degree in electrical engineering from MIT in 1936. While president of Hewlett-Packard he developed the "HP Way," the company's belief in promoting individual creativity, a relaxed management hierarchy, and a trust in employees. In 1985 Hewlett received the National Medal of Science. He served on the boards of the Stanford Medical Center, the Institute of Electrical and Electronics Engineers, and the Kaiser Foundation Hospital among others.

Neva Abelson, trustee wife, dies

Neva Abelson, wife of former Carnegie president and current trustee Philip Abelson, died on September 26, 2000, at the age of 89. She graduated with a bachelor's degree in chemistry from the State College of Washington (now Washington State University). In 1942 she received an M.D. from the Johns Hopkins University medical school. Among her many contributions, she worked with Dr. Louis Diamond on the Rh-antibody test.

Flawed Diamond May Be Scientists' Best Friend

A unique combination of diamond with coesite–a dense variety of quartz–is providing Dave Mao and Russell Hemley of the Geophysical Lab, along with scientists from the Russian Academy of Sciences, with a new means for determining the pressure at which rock or mineral forms deep within the Earth. The intriguing combination of minerals retains the high pressures that surrounded the rock long ago, giving the researchers a sample of "fossilized pressure." The investigators reported their research in the October 17, 2000, issue of the *Proceedings of the National Academy of Sciences.*

Diamond and coesite are formed under high pressure, which is the condition typically found at great depths. Normally, the pressure that existed when the materials were formed would have been released long ago as the specimens reached the Earth's surface. A particular diamond-coesite sample from Venezuela, however, is an exception to this rule: it still contains the pressure that was present at an earlier epoch. The combination of the two substances is excellent for preserving and determining fossilized pressure because the diamond provides an extremely strong, nonyielding container that prevents the highly compressed, chemically simple coesite from expanding and releasing the pressure. The maximum pressure is therefore preserved, and the scientists can analyze the sample without the chemical variability associated with other inclusions such as garnet or olivine.

In their analysis, the scientists used two techniques–micro-Raman and micro-x-ray diffraction. They focused lasers and x-rays to beams, which were less than a tenth of the diameter of a human hair, and probed the tiny, 60-micrometer inclusion of the coesite lodged within the 2-millimeter diamond crystal. The results showed that the pressure at the site of the inclusion was 3.62 gigapascals–enough force to squeeze charcoal into diamond. According to Dave Mao, "The preserved pressure depends upon the difference between the compressibility and expansivity of the host diamond to the inclusion. From the fossilized pressure, we can retrace the exact pressure and temperature at which the diamond-containing rock was formed and the journey that it went through to reach the Earth's surface. This enlightens our understanding of Earth's interior at depths exceeding 120-150 kilometers."

Little Humans with Wings?

One of the most astounding findings over the last decade is how similar we are genetically to other organisms–even the common fruit fly. One area where this similarity is paying off is in stem cell research. Stem cells, the undifferentiated cells with the capacity to renew themselves and form other specialized cells, are the focus of a lot of attention because of their therapeutic potential in treating a variety of human disorders.

Scientists believe that the behavior of stem cells is controlled by nearby supporting tissue cells that create a special "niche" in which signals are transmitted instructing the stem cells how to act. Finding these niches within a tissue has been difficult, however, because they are rare and seem to lack a distinctive structure. This has sharply limited attempts to understand how they work. Now, Ting Xie, formerly a Department of Embryology postdoc, and Allan Spradling, the department's director, have identified a germ line stem cell niche in the ovaries of the fruit fly *Drosophila*. Their research was reported in the October 13, 2000, issue of *Science*.

Germ line stem cells in *Drosophila* maintain egg production. They are surrounded by three differentiated groups of cells in the adult ovary called stromal cells. The scientists first demonstrated that the stromal cells create a stem cell niche capable of reprogramming nearby cells into becoming stem cells. To do this, the researchers genetically marked normal stem cells and made them unusually prone to loss using a special mutation. They observed that within 24 hours after stem cell loss, a new cell always moved into the location of the departed cell and took over its function. The new stem cell was always a recent daughter of another nearby stem cell that would have developed into an egg if it had not taken up residence within the niche. The researchers showed that normal ovaries retain functional stem cells longer than predicted based on the normal lifetime of individual stem cells. This finding suggests that stem cell replacement within niches helps aging fruit flies extend their ovarian function. The work also provides a rationale for why ovarian stem cells are found in pairs, and suggests that stem cell partnerships may be found in other tissues.

To determine how the niche functions, the scientists looked at the three different cell groups that are close to the stem cells. They found that one type of cell, cap cells, physically interact with germ line stem cells throughout the animals' lifetime. Cap cell contact may hold the stem cells within the niche, while all three nearby cell groups send intercellular signals that control when and how often stem cells divide and keep them from differentiating prematurely.

The Xie and Spradling study has implications for stem cell niches in other organisms. Scientists increasingly believe that the fundamental mechanisms within multicellular organisms, such as stem cells, evolved early and are shared among diverse animals. It suggests that a greater knowledge of *Drosophila* niches, their component cells, and their stromal cell-stem cell signals may help reveal how to propagate large numbers of healthy and functional human stem cells for medical applications. "Biologists have always believed in an underlying unity of all living things," says Spradling, "but recently they are looking at fruit flies as little humans that happen to have wings."

Planet Hunter Paul Butler Awarded Draper Medal

On January 9, 2001, the National Academy of Sciences announced that DTM's Paul Butler and his longtime collaborator Geoffrey Marcy of UC-Berkeley would receive the prestigious Henry Draper Medal on April 30, 2001. The announcement came on the heels of the team's latest and strangest discovery–the two largest objects thus far found orbiting a distant star. The find baffles astronomers and defies the very definition of the term planet (see page 6).

The NAS awards the Draper Medal every four years to the person or persons who have made a significant contribution to astronomical physics. It was established through the Draper Fund and was first awarded in 1886. Butler and Marcy will receive the medal "for their pioneering investigations of planets orbiting other stars via high-precision radial velocities." They will join the ranks of other eminent astronomers including George Ellery Hale, organizer of Carnegie's Mount Wilson Observatory; Arthur Eddington; Harlow Shapley; Carnegie astronomer Horace Babcock; and the team of Penzias and Wilson.

Butler and Marcy's team is engaged in a multiyear research project to look for planets around 1,100 stars that are within 300 light-years of Earth. Since 1995, they have discovered two-thirds of the 55 known extrasolar planets. Their discoveries include the only planet thus far found to transit a host star, two sub-Saturn mass planets, and in addition to the two giant objects just found, a pair of smaller objects that orbit their star in complete synchrony, similar to the way several

CASE Part of Innovative Pilot Program To Reform Science and Mathematics Education In D.C. Schools

The National Science Foundation (NSF) recently awarded a $3.9-million grant to fund a three-year pilot program designed to increase D.C. public school student achievement in mathematics, science, and technology at all grade levels. The grant was given to DC ACTS, a coalition of three Washington, D.C., organizations: the Carnegie Institution of Washington, the American Association for the Advancement of Science (AAAS), and the D.C. public schools. Two high schools, 4 middle schools, and 15 elementary schools in a range of socioeconomic neighborhoods are participating in the program. The Carnegie Academy for Science Education (CASE) is implementing the effort at the elementary schools, and the AAAS will be responsible for program goals at the middle and high schools. According to Inés Cifuentes, who heads CASE, "We are talking about school reform. Even though the focus is on math, science, and technology, we've got to look at everything."

DC ACTS emphasizes a unique hands-on, "whole-school" approach to reforming science and mathematics education. Carnegie's CASE staff pioneered many of the techniques that are being used. During the three-year period, staff members from the coalition will work with the schools' principals and teachers in five main areas: revamping school curriculum infrastructure; implementing standards-based instruction; providing intense professional education and development for teachers; coordinating with parents and the communities on achievement goals; and establishing forums for instructors from each of the schools to share what they have learned with colleagues.

One goal the program hopes to achieve is to increase student performance on the SAT-9 mathematics tests at the advanced level for all grades by 15% by the end of the pilot period. The program also hopes to decrease the number of students scoring below the basic level by 15% in the elementary schools and by 30% in the middle and high schools. The staff is also aiming to increase the number of advanced placement courses in mathematics and science and increase the number of students passing them.

Since the school year began, the CASE staff have been spending a lot of time in the eight elementary schools they are focusing on this year. Says Cifuentes, "We are seeing a definite change in attitude. Teachers are coming to our courses. They are becoming excited about teaching science and mathematics after they experience how we do it, and they are getting materials and equipment–a new experience for them."

Partnerships with other organizations, including the Challenger Center, AOL, Texas Instruments, Howard University, and Daimler Chrysler, provide additional support and resources for DC ACTS. The Howard Hughes Medical Institute provided a $450,000 grant to the Carnegie Institution to acquire materials for the elementary schools and help with professional development for teachers who serve as mentors there. AAAS obtained a $750,000 grant from Intel for training, laptop computers, and other equipment for teachers. In addition, D.C. public schools will provide each participating school with funds to support the implementation of the program.

moons orbit Jupiter.

Butler's work focuses on improving the precision for measuring stellar Doppler velocities–a technique that detects the telltale stellar wobbles that indicate an orbiting planet. He designed and built the iodine absorption cell system at the Lick Observatory of the University of California, Santa Cruz, which resulted in the discovery of six of the first eight extrasolar planets. This instrument is now the de facto standard for precision Doppler studies.

Marcy and Butler together conceived this novel technique for detecting the stellar wobble and deducing from it the mass and orbit of its companion planet. After some eight years of hard work, they announced their first planet discoveries in 1995, shortly after a Swiss team reported detection of an extrasolar planet. Since then Marcy, Butler, and their colleagues have continued observations at the Lick telescope, and have extended their planet search to the more sensitive Keck telescopes in Hawaii. To view stars in the Southern Hemisphere, the team uses the Anglo-Australian Observatory and will use Carnegie's Magellan telescopes in Chile as they become operational.

By 2010 the team hopes to have completed a "planetary census" of nearby stars. They will be able to tell what percentage of stars have planets, how many planetary systems are like our own solar system, and how many types of planetary systems exist. Their work is supported by NASA, the National Science Foundation, and Sun Microsystems. More information about the team's work can be found at *www.exoplanets.org.*

Butler Finds the Planets...

The latest and most baffling finds so far made by extrasolar planet detectives Paul Butler (DTM) and Geoffrey Marcy (U. California, Berkeley) were covered by the media coast-to-coast on January 10, 2001. "I can't wait until the theorists explain these things to us," Butler told the *New York Times*.

The latest discoveries, announced at the American Astronomical Society meetings in San Diego, California, astonished scientists. Both finds were multiple-object systems. In one of them, two enormous bodies were found orbiting a Sun-like star HD 168443, 123 light-years away. The more massive object, weighing in at 17 times the mass of Jupiter, is challenging the very definition of the term *planet*. Although it orbits a star as a planet would, it weighs more than 13 Jupiter masses, which is thought to be the upper limit for a planet because at this point heavy hydrogen starts to burn the core. Thus far, it is unclear if the body is a planet, a failed star, or something altogether different. The second object in the system is a whopper too. But at over 7 Jupiter masses it is well within the bounds of being called a planet.

The other system is no less unusual. The researchers found a pair of planets locked in synchronous orbits about 15 light-years from Earth. They orbit Gliese 876, a dim red dwarf star. Although several moons of Jupiter orbit in a similar fashion, this is the first discovery of planets orbiting a star this way.

...While Boss Theorizes

While DTM's Paul Butler and colleagues are turning up new and increasingly stranger extrasolar planets at a quick clip, Alan Boss, also at DTM, and other theorists are assessing their planetary-formation models to learn if they can accommodate the startling new finds.

Until about five years ago, theories on how solar systems and planets form were based on the only solar system we knew—our own. The generally accepted formation model for planets like Jupiter has been core accretion. In this model, gas and debris swirled around the Sun and formed a solid core about 10 times the mass of Earth, upon which gas later accreted. Making planets this way takes a long time. Another theory, which was first suggested in the 1950s but was largely ignored until recently championed by Boss, is the disk-instability theory. In this theory, gas giant planets form more quickly—in thousands of years instead of millions—because of gravitational instabilities in the disk. Although Boss believes that both of these models are possible, the disk-instability mechanism has an advantage in explaining the enormous object 17 times the mass of Jupiter; such a huge mass may exceed the upper limit of what core accretion can produce. Disk instability, on the other hand, preferentially forms massive protoplanets, and should be able to explain the formation of the new behemoth.

Boss has been interviewed and quoted extensively about the surprising finds made by Butler and colleagues. Much of the attention has focused on the question of what to call the more massive companions. In particular, the discovery of the system with objects at least as massive as 7.5 and 17 Jupiter masses seems to blur the line between the most massive planets and the least massive brown dwarf stars, previously thought to fall somewhere in the range of 10 to 30 Jupiter masses. Boss told *U.S. News and World Report*, "We thought we had our labels straight, but Mother Nature seems to have other ideas." He expressed similar sentiments to other publications such as *Newsweek*, *USA Today*, and the *Washington Post*. Boss wrote an invited "News and Views" article for the January 25 issue of *Nature*, with a title summarizing the murky situation regarding nomenclature: "Extrasolar Planets: Giant Giants or Dwarf Dwarfs?"

. . . More News . . . More News . . . More News . . .

On November 23, 2000, the *Washington Post* ran an article about NASA suspending the robotic mission to Pluto, the only planet in our system that has not yet been explored. **Wes Huntress**, director of the Geophysical Laboratory, was interviewed about the agency's recent rash of mission cancellations. He told the *Post* that in his view the "faster, better, cheaper" method of exploration works, as proven by the *Pathfinder* mission, the Near Earth Asteroid Rendezvous, and other projects. He believes that NASA "found the limits to this approach" with the failed Mars probes, but cautioned that the agency may have "overreacted." "The fear of failure now prevails instead of a spirit of bold adventure," he said. "The middle ground has not yet been found."

It appears that volcanoes around the world are erupting more frequently than in the past. **Alan Linde** of DTM was cited in the December 16, 2000, *San Francisco Chronicle* in an article about the status of early-warning systems in this volatile environment. As an example of the worldwide situation, Linde said that the Hekla volcano in Iceland "used to erupt once every 100 years or so and is now regularly erupting every 10 years." Its last eruption, in February 2000, was so sudden, he said, that a warning was issued just 20 minutes before the event took place.

The model plant *Arabidopsis thaliana* has now joined the fruit fly *Drosophila*, the worm *C. elegans*, and yeast in having its genome fully sequenced. **Chris Somerville**, director of the Department of Plant Biology, has been a driving force in the sequencing project. When the completion of the work was announced, the *New York Times* quoted him as saying, "There are thousands of applications coming down the pipeline...our goal is to understand plants like little machines." Indeed, Somerville is now in the thick of a sequel to the sequencing project–a 10-year effort to discover how the mapped genes function.

Nitrogen Use by Plants and Microbes Affected by Increased Carbon Dioxide

For some time scientists have known that terrestrial ecosystems, particularly forests, can potentially offset some human-induced carbon dioxide (CO_2) emissions by storing carbon in wood and organic matter in the soil. Over the short term, increases in CO_2 can enhance the rate of carbon storage by stimulating photosynthesis. However, it has not been clear what impacts higher levels of CO_2 may have on nitrogen use by plants or microbes. Chris Field of Carnegie's Department of Plant Biology, with senior author Shuijin Hu of North Carolina State University, and others investigated this issue and published their results in the January 11, 2001, issue of *Nature*.

All living organisms need nitrogen. It is made available to plants through decomposition, the process by which soil microbes break down organic material into a usable form. This cycle also releases CO_2. To analyze the effects of increased CO_2 levels on nitrogen use in this process, the researchers conducted a six-year experiment in a grassland environment at Stanford's Jasper Ridge Biological Preserve. They exposed two sets of open-top chambers with grassland plant species continuously to the gas. One set of chambers was exposed to normal levels of CO_2 (360 parts per million), and the other set was subjected to double that amount (the level expected about 100 years in the future).

The investigators analyzed samples at various points in the growing cycle. The results showed that the higher concentration of carbon dioxide stymied the decomposition process, which decreased the discharge of carbon dioxide to the atmosphere. One cause of this effect appears to be malnutrition of the soil microorganisms. Limited availability of nitrogen under elevated CO_2 slowed microbial metabolism, probably through shifting the composition of the decomposer community toward more fungi (relatively inefficient decomposers) and fewer bacteria (efficient decomposers).

This study shows that future levels of CO_2 can change the way plants and microbes interact, producing positive and negative effects on the ecosystem. It also indicates that, like forests, grasslands may be terrestrial "carbon sinks," offsetting some, but certainly not all, of the carbon dioxide released through fossil-fuel combustion and deforestation. Now, Field and his colleagues are extending these experiments to include the study of other aspects of global change, including not only carbon dioxide levels but also warming, increased precipitation, and nitrogen pollution.

DEDICATING

Some of the guests walk up the final ascent to the Walter Baade and Landon Clay telescopes, where the dedication ceremony will take place. (Image courtesy Arnold Pryor.)

Music from a Chilean brass band greets guests arriving on the telescope summit. (Image courtesy Hernán Contreras.)

Guests take in the breathtaking view before the ceremony begins. (Image courtesy Arnold Pryor.)

On December 9, 2000, 320 people gathered on top of the world in the middle of the Earth's driest desert to dedicate two of the largest optical telescopes ever made. It was an extraordinary event for all who attended and one they will talk about for years.

At about three o'clock that afternoon 13 buses picked up guests and members of the media from hotels in the Chilean coastal resort city of La Serena for the 100-mile trek over the desert and into the Andes to the observatory where the Walter Baade and Landon Clay 6.5-meter reflecting telescopes are housed. The attendees, many of whom came from thousands of miles away, were members and friends of the Magellan Consortium institutions, as well as contractors, government officials, and local workers who were involved with the project.

The first buses began arriving at Las Campanas around 5:30 and parked at the bottom of the final ascent. Some of the guests rode shuttle buses and others walked to cover the last leg of the journey to the telescopes–the centerpieces of the ceremony.

As the guests arrived, they were greeted with music from a brass band. At about 6:00 p.m. they headed up red-carpeted steps to the bridge between the first telescope and the auxiliary building where they seated themselves for the dedication. The speakers took their positions under the Baade reflector. Small earphones, providing translations in either English or Spanish, enabled all to follow the ceremony.

A red-carpeted stairway leads to the bridge between the Baade telescope and the auxiliary building, where the audience will sit. (Image courtesy Arnold Pryor.)

Chilean schoolchildren sing their national anthem to begin the ceremony. (Image courtesy Arnold Pryor.)

Other youngsters perform a traditional dance with a modern twist in costuming. (Image courtesy Hernán Contreras.)

The dedication began with the Chilean national anthem, sung by local schoolchildren of Domekyo. A second group of schoolchildren performed a traditional dance. Tom Urban, chairman of Carnegie's board of trustees, then welcomed the guests and introduced the Archbishop of La Serena, Monsignor Manuel Donoso, who gave the blessing.

Next, Eric Goles, president of CONICYT–the Chilean equivalent of the National Science Foundation–spoke on the importance of astronomy in general and the importance of the new instruments to Chile. Mr. Urban returned to dedicate the Walter Baade telescope and the Horace Babcock Lodge. He prefaced his dedication with short biographical sketches of Baade and Babcock, explaining their importance to astronomy. Then, on behalf of Harvard University, Professor Henry Rosovsky presided over the dedication of the second telescope–the Landon Clay–and introduced members of the Clay family. Next to speak was Provost Robert Brown of MIT, who introduced the donors of the Cecil and Ida Green and Neil and Jane Pappalardo Science Support Facility. Finally, Michael Whalen of the John Stauffer Charitable Trust ended the ceremony with the dedication of the John Stauffer Library.

After the dedication, the guests mingled around the telescopes, feasting on hors-d'oeuvres of king crab in pink olive sauce, squid, and artichokes, and drinking pisco sours. Pisco is the local liquor, made from distilled

continued on page 10

Tom Urban, chairman of Carnegie's board of trustees, welcomes the guests and speakers. (Image courtesy Arnold Pryor.)

The archbishop of La Serena, Chile, Monsignor Manuel Donoso, blesses the facilities. (Image courtesy Arnold Pryor.)

Eric Goles, president of CONICYT—the Chilean counterpart of the National Science Foundation—speaks to the crowd about the importance of the telescopes to the people of Chile. (Image courtesy Hernán Contreras.)

grapes. A little later some of the guests started moving toward an enormous tent that extended beyond the Clay telescope enclosure. Eight people had worked for six days to erect the structure on site. It had come from Santiago and was outfitted with large windows that overlooked the panorama of the mountains below.

By about eight o'clock the guests were ready to settle down to the business of dinner, catered by an army of 50. Inside the tent, 20-foot grape arbors adorned a buffet that included roast beef, turkey, suckling pig, salmon soufflé, Chilean sea bass, hearts of palm, avocado, asparagus, goat cheese, salmon tartar, baby artichoke hearts, yellow peas, and much, much more. The fleet of waiters served wines, more pisco, and tropical juices.

Maxine Singer, president of Carnegie, addressed the crowd as they ate. She was followed by Augustus Oemler, director of the Observatories. Other speakers included Lee Bollinger, president of the University of Michigan, and Peter Strittmatter, head of the University of Arizona's Department of Astronomy. Strittmatter paid tribute to the many years of hard work the members of Arizona's Mirror Lab have devoted to fabricating the practically perfect telescope mirrors.

With great animation, and pointed humor, Steve Shectman, Magellan Project Scientist, reminisced about all the people, their dedication to the project, and the challenges and innovations that he has witnessed since Magellan began in 1986. He thanked

the three Carnegie project managers: Matt Johns, Peter de Jonge, and the late Al Hiltner. He also emphasized the unique relationship that was established between the scientists and the telescope engineers at L & F Industries, singling out for recognition Marlow Marrs, Dave and Don Chivens, and Steve Gunnels, all of L & F. Carnegie's Frank Perez, who supervised the installation of both telescopes, was also acknowledged. Shectman concluded by expressing his "profound gratitude" to all the many others involved.

Matt Johns took the podium next, commending the many Chileans who worked long and hard on Magellan. Johns was followed by Miguel Roth, the director of Las Campanas, who spoke to the crowd in Spanish about the relationship between Carnegie and Chile.

As coffee cups were refilled, Shectman returned to tell the audience what to expect for the grand finale–a look through the Walter Baade telescope. Although he had fashioned an eyepiece at the focus of the 6.5-meter reflector for the audience to use, he made it very clear that astronomers "NEVER use eyepieces!" He explained how the telescopes operated and told the viewers what they would be seeing: the planet Saturn with attendant moons, and a globular cluster of old stars that formed in our galaxy 10 to 15 billion years ago. He put the experience into perspective when he said, "I think there are really very few people in the world who have ever had a chance to

continued on page 12

Guests Deborah Warren, Judy Miner, and Carnegie trustee John Crawford investigate the dinner tent. One of the buffets can be seen on the right (top). Guests fill their plates from a vast array of choices (middle). As guests begin to eat, the large windows provide a spectacular view of the Sun setting over the Andes (bottom). (Images courtesy John Lively.)

Steve Shectman, Magellan Project Scientist since 1986, thanks the many individuals who have worked on the project over the years. (Image courtesy Hernán Contreras.)

The climax of the evening is a look through the Walter Baade telescope. An eyepiece, which is never used for scientific observations, was installed for the audience to view the heavens. (Image courtesy Hernán Contreras.)

actually look through a telescope of this size." With that in mind, the guests lined up to look at the heavens from *the* premier viewing spot on the planet.

Around 10:30, the guests started boarding the buses for the long drive back to La Serena. The last bus arrived in the coastal town at 4:00 a.m. As they gathered in the hotel lobbies for departure that Sunday morning, the words "amazing," "spectacular," "astounding," "extraordinary," and "unbelievable" were heard over and over again.

THE MASTER OF LOGISITCS

How do 320 people get to a remote spot high in the Andes to dedicate two of the world's largest telescopes? With lots of planning beginning months in advance. Miguel Roth, director of Las Campanas, was the mastermind of the occasion. He, with help from a Chilean event planner, Paola Roig, shopped for hotels, caterers, buses, guides, music, decorations, contingency medical staff, and more. In the final weeks before the event, the two were in daily contact with two Chilean airlines to keep track of incoming flights and arriving guests. With help from the Observatories' Karen Gross and Carnegie's Sharon Bassin, they juggled the logistics of constantly changing guest plans. And as if the main event of the dedication were not enough, Roth and his team organized bus tours of the nearby Elqui Valley, walking tours of La Serena, and special dinners at the El Molle restaurant and the Las Tacas Resort Hotel before the dedication. The reward for such hard work and attention to detail: everyone had a magnificent time.

In Brief. . .

TRUSTEES

Charles H. Townes has received the National Academy of Engineering's 2000 Founders Award. The award recognizes Townes's lifelong contributions to engineering; one of his most important contributions was the development of the maser-laser principle. In Dec., Townes was interviewed in one of the Smithsonian Insitution's Millennial Reflections seminars.

TERRESTRIAL MAGNETISM

Sean Solomon visited U. Hawaii in Sept., where he delivered the Arthur L. Day lectures. He also gave seminars at Harvard in Sept., and at UC-Berkeley and at the Lawrence Livermore National Laboratory in Oct. He presented invited talks at a workshop on the Tharsis region of Mars in Oct. and at the Geological Society of America annual meeting in Nov. He also visited Taiwan during Oct.–Nov. as a member of the external panel to the Institute of Earth Sciences, Academia Sinica.

Kaisa Mueller, an intern at DTM during the summer of 1999, is the lead author of an article published in the Nov. issue of the *PASP (Publications of the Astronomical Society of the Pacific)*. The article, "Young Stars Associated with the Reflection Nebula NGC 2626," was coauthored with **John Graham**, her DTM advisor. Ms. Mueller completed her senior year at U. Missouri–Columbia last spring and is now a graduate student at U. Texas.

Vera Rubin spoke in Sept. at the Challenger Center's Annual Flight Director Conference, and also delivered talks to two science classes at a local junior high school. She attended the celebration at Harvard in honor of the Cecilia Payne-Gaposchkin Centenary. In Nov., Rubin spoke at the Far Future Universe Conference and at the meeting of the Pontifical Academy, both in Vatican City. She also visited the astronomy departments of the Universities of Bologna and Padua and delivered talks at both institutions.

Seismic field technician **Peter Burkett**, accompanied by Visiting Investigator **Douglas Toomey**, technician **Pat Ryan** (U. Oregon), and DTM postdoctoral associate **Emilie Hooft**, visited the Galápagos Islands for a month in Oct.–Nov. to service nine Carnegie broadband portable stations of the IGUANA Seismic Project. The project, of which Toomey is principal investigator, is a joint venture between U. Oregon and DTM in collaboration with the Escuela Politécnica Nacional, Ecuador, to determine the mantle structure of the Galápagos hotspot.

Rick Carlson presented a paper at the Seventh International Conference on Plasma Mass Spectrometry in Durham, UK, in Sept., and worked with former DTM postdoctoral fellow Graham Pearson, now a professor at U. Durham, and his student, Gordon Irvine, a former DTM predoctoral fellow. Carlson also attended a workshop in Houston in Sept. for the Geoinformatics Program–an attempt to utilize the NSF Information Technology Program to establish a general database effort in the earth sciences.

Alan Boss became chair of the International Astronomical Union's Working Group on Extrasolar Planets in Sept. Boss reviewed the implications for habitable planets of recent extrasolar planet discoveries at the "Astrobiology: Life in the Universe" symposium of the Dept. of Molecular, Cellular, and Developmental Biology at U. Colorado, Boulder, in Sept. Also in Sept., Boss spoke about extrasolar planets at the Smithsonian Institution's Museum of Natural History. In Oct., he described his models of gas giant protoplanet formation at the American Astronomical Society's Division for Planetary Sciences Meeting in Pasadena, CA. Boss has also been appointed a collaborator on NASA's Kepler mission to search for Earth-like (and other) extrasolar planets. Finally, Alan Boss, for "fundamental discoveries about the origins of protostars and giant gaseous protoplanets through increasingly sophisticated numerical simulations and for educating the public about these ideas," has been named a Fellow of the American Association for the Advancement of Science (AAAS).

Carnegie Fellow **Derek Schutt** arrived in mid-Nov. after completing his Ph.D. in seismology at U. Oregon. At DTM, he plans further work on the North American mantle structure, notably tomographic imaging of seismic attenuation structure as an adjunct to velocity structure.

Mark Richards, professor of geology and geophysics at UC-Berkeley, began a long-term visit in Oct. as a DTM Visiting Investigator. Richards is one of the world's leaders in linking mantle dynamics to geological and geophysical observations.

Hugh van Horn, director of the Division of Astronomical Sciences, National Science Foundation, has been appointed a Visiting Investigator for this academic year.

Professor **Steven Vogt**, an astronomer on sabbatical from Lick Observatory, visited DTM this fall. He worked with Paul Butler on their latest extrasolar planet finds, as well as on the manufacture of more iodine cells for planet searches on new telescopes.

Miami U. predoctoral student **Darin Snyder** spent six weeks working on the measurement of Pb-Sr-Nd isotopes on whole-rock trachytes and on the measurement of Pb-Sr on sanidine separates from a relatively young (4.5 ka) explosive volcanic deposit located on the island of São Miguel, Azores. Former DTM postdoctoral fellow Elisabeth Widom is his advisor at Miami U.

Other recent short-term visitors at DTM include Visiting Investigators **Timothy Filley** (Purdue U.), **Stephen Richardson** (U. Capetown), and **Martha Savage** (Victoria U., New Zealand).

Associate **Kenneth Chick** joined Dynamics Technology, Inc., in Torrance, CA, in Nov. as a research scientist working on a project to develop synthetic aperture sonar. At DTM, he developed a computer code to model the long-term evolution of the solar nebula accretion disk, based on an implicit time-differenced algorithm.

Chiara Petrone returned to U. Florence as a researcher in the Dept. of Earth Sciences, after spending the past year at DTM as an Italian National Research Council Fellow.

Former postdoctoral fellow

Erik Hauri (left) was presented with the F. G. Houtermans Medal of the European Association of Geochemistry (EAG) by former DTM Staff Member and EAG president Albrecht Hofmann (right) at the Eighth V. M. Goldschmidt Conference in Oxford, UK, in Sept. The medal is given in recognition of "outstanding contributions to geochemistry by a young scientist of outstanding ability." Postdoctoral fellow Laurie Benton and Visiting Investigator Julie Morris also participated in the meeting.

Carolina Lithgow-Bertelloni has been awarded a Packard Fellowship and will receive $625,000 over five years to support her scientific research. An assistant professor in the Dept. of Geological Sciences at U. Michigan, she was selected by the David and Lucile Packard Foundation in Oct. as one of 24 of the most promising science and engineering researchers at 22 universities across the U.S. Now a DTM Visiting Investigator, she was an NSF Earth Sciences Research Fellow at DTM from 1995 to 1997.

In Sept., **Louis Brown** visited the site of DTM's first headquarters (1904-1914) at the Ontario Apartments in northwest Washington, D.C., in conjunction with his work on a centennial history of the department.

DTM/GL

James Van Orman (Ph.D., MIT) arrived in early Sept. as an NSF Earth Sciences Research Fellow jointly appointed by DTM/GL. While here, he is investigating diffusion of cations and oxygen in $MgSiO_3$ perovskite and MgO periclase under high pressure.

In Brief. . .

William Minarik has been appointed a research scientist and summer education coordinator at DTM/GL. A former DTM/GL postdoctoral research associate and Visiting Investigator, he is a lecturer and undergraduate studies director in the Dept. of Geology at U. Maryland.

Visiting Investigator **Harry Green** has returned to his position as professor of geology and geophysics at UC-Riverside, after spending an eight-month sabbatical at DTM/GL. At Broad Branch Road, Dr. Green worked on topics ranging from the mechanics of deep-focus earthquakes to laboratory and field studies of rock deformation and phase transitions in minerals, and served as an advisor to DTM summer research interns.

Timothy Filley has been appointed Visiting Investigator at DTM and GL. He was formerly a Carnegie Fellow and a NASA Astrobiology Institute Fellow at GL.

In Nov., **Shaun Hardy** hosted visiting librarian Theodhora Zoto from the Institute of Geological Research, Tirana, Albania. Zoto spent several days at Broad Branch Road studying library technology and services under the auspices of a Geoscience Information Society International Fellowship.

Shaun Hardy was featured in the *Montgomery Gazette Community News* on May 24 for serving as a reader for the past seven years for Thomas McKeithan, who is blind. McKeithan graduated this past spring from American U. Hardy, a volunteer for the Columbia Lighthouse for the Blind, plans to continue to read for McKeithan through graduate school.

GL's Dave Mao and trustee Jaylee Mead are pictured at the GL Visiting Committee's meeting.

GEOPHYSICAL LABORATORY

Wes Huntress has been elected vice-president of the Planetary Society. In Dec., Wes received a Presidential Design Award in recognition of his work on NASA's Mars *Pathfinder* program.

Charles Prewitt and **Russell Hemley** attended the 39th Annual Eastern Analytical Symposium from Oct. 29 to Nov. 3 in Atlantic City, where they spoke at the session "The 40th Anniversary of the Lever-Arm Diamond Anvil Cell (DAC). An Honorarium in Honor of the Co-Inventors of the DAC, Alvin Van Valkenburg, Charlie Weir, and Their Associates." The session was organized by John R. Ferraro and Eric Van Valkenburg, and featured presentations by several authors on how the DAC has been used over the 40-year period. Alvin Van Valkenburg spent most of his scientific career at the National Bureau of Standards, where the diamond cell was invented, but became program director for geochemistry at NSF from 1964 to 1971 and spent substantial time at the Geophysical Laboratory working with Dave Mao and Peter Bell in the 1970s and early 1980s.

Former research scientist **Constance Bertka** has accepted a position as project director for the Dialogue on Science, Ethics, and Religion at the American Association for the Advancement of Science. Bertka has been appointed a Visiting Investigator at GL.

Former research scientist **Hexiong Yang** has accepted an appointment at the Jet Propulsion Laboratory in Pasadena, CA. He will be working on the interaction between minerals and microorganisms with Ken Nealson and former postdoc Pan Conrad. He will return to GL periodically to work with Charlie Prewitt and others in the crystallography program.

At the Carnegie HPCAT facility in Chicago, **Richard Benn** has been appointed technical coordinator and **Michelle Ficner** has been appointed office manager.

Henry Fricke, a former NSF Fellow, has accepted a faculty position at Colorado College, Colorado Springs.

Eugene Heifets (Ph.D., U. Latvia) has been appointed a postdoctoral associate and will be working with Ronald Cohen on ferroelectric solid solutions.

Diane O'Brien (Ph.D., Princeton U.) has been appointed a Visiting Investigator and will be working in Marilyn Fogel's laboratory. Dr. O'Brien currently has a postdoctoral fellowship at the Center for Conservation Biology at Stanford U.

Debora Passos de Araujo (U. Brasilia) has been appointed a Visiting Investigator and will be working in Yingwei Fei's lab.

W. Van Westereren (Ph.D., U. Bristol, UK) has been appointed a postdoctoral fellow. He will be doing research on problems that lie at the crossroads of mineral-melt trace element partitioning and mineral physics. His proposed research will be conducted in collaboration with Yingwei Fei, Bob Hazen, Charlie Prewitt, and others at GL.

David Mao participated in the Euro School 2000, "New Materials and Their Dynamics," in Warnemünde, Germany, Aug. 28-Sept. 8, 2000, as a lecturer. He gave a colloquium talk, "High Pressure–A New Dimension in Studies of Earth and Planetary Interiors," at the Dept. of Geological Sciences at U. Colorado, Boulder, in Sept. Mao presented the Materials Research Lecture, "High Pressure–A New Dimension in Physical Sciences," on Oct. 4 at Caltech.

Robert Hazen was a keynote speaker at the Modena, Italy, Workshop on Life, where he lectured on the topic "Emergence and the Origin of Life." He also presented a seminar, "Minerals and the Origin of Life," at Virginia Tech.

Hatten Yoder lectured on "Mineral Resources: Unlimited Supplies and Substitutes?" at George Mason University's Learning in Retirement Institute on Oct. 17.

It was announced at the Goldschmidt Conference, held in Oxford, UK, that in recognition of his outstanding contributions to geochemistry, **Douglas Rumble** has been appointed Geochemistry Fellow of the Geochemical Society and the European Association for Geochemistry.

In Iceland, DTM's Alan Linde (left) and collaborator Kristjan Agustsson visit surface fissures formed by the June 17, 2000, earthquake. From Sept. 27 to Oct. 18, Linde worked with Iceland Meteorological Office collaborators Ragnar Stefansson and Agustsson on strainmeter data recorded this year during the eruption of Hekla in Feb., and during two magnitude-6.3 earthquakes in June.

The collaboration of the Geophysical Lab, Stanford U., the Tokyo Institute of Technology, and Waseda U. to study the diamond-bearing eclogites of Kokchetav, Kazakhstan, is flourishing. **Hideki Masago**, a graduate student of S. Maruyama's at the Tokyo Institute of Technology, worked in Doug Rumble's laser fluorination lab from Sept. 21 to Oct. 29. He analyzed oxygen isotope ratios in silicate mineral samples from diamond-eclogite facies rocks collected in the Barchi-kol, Daulet, Kumbdy-kol, and Kulet districts of Kokchetav. During Oct., Carnegie trustee and Stanford professor **W. Gary Ernst**, a member of the Kokchetav team, analyzed oxygen isotopes in diamond-eclogite rocks from Kumbdy-kol, Kokchetav.

The Visiting Committee to the Geophysical Laboratory heard staff presentations and toured GL laboratories on Oct. 19 and 20. Members of the committee who attended were trustees **W. Gary Ernst**, chairman (Stanford U.), **Philip H. Abelson** (AAAS), **John Diebold** (The Diebold Institute for Public Policy), **William T. Golden** (New York); **David Greenewalt** (Washington, DC), and **Jaylee Mead** (Wash-

ington, DC); and scientists Thomas J. Ahrens (CalTech), Michael Drake (U. Arizona), Andy Knoll (Harvard), Ken Nealson (JPL), and Bruce Watson (RPI).

In Aug., **Russell Hemley** gave a plenary talk at the 17th International Conference on Raman Spectroscopy in Beijing, and gave an invited talk at the Cryocrystal 2000 Conference in Szklarska Poreba, Poland. He also gave lectures at U. Delaware, NIST, and Los Alamos.

Postdoctoral fellows **Jie Li** and **Holger Hellwig** were married on Aug. 22, 2000.

EMBRYOLOGY

Donald Brown gave the Alan Wilson Memorial lectures Oct. 25 and 26 at UC-Berkeley.

Michel Bellini has taken an assistant professor position in the Dept. of Cell and Structural Biology at U. Illinois, Urbana-Champaign.

In Sept., **Marnie Halpern** was a participant in a workshop at the Sanger Center concerning their upcoming project to sequence the zebrafish genome.

New members of the Halpern lab are postdoctoral fellows **Rachel Brewster** and **Christian Broesamle**. Both will be studying aspects of zebrafish neural development. Christian has been awarded a Swiss National Science Foundation Fellowship.

Valarie Miller-Bertoglio received her Ph.D. from Johns Hopkins U. and has taken a postdoctoral position in the laboratory of Mark Van Doren at Johns Hopkins's Dept. of Biology.

Jennifer Prowell, a high school senior at Baltimore Polytechnic Institute, is undertaking a yearlong internship in the Halpern laboratory.

Paul Megee has taken a position as assistant professor in the Dept. of Biochemistry and Molecular Genetics at the U. Colorado Health Sciences Center in Denver.

Chiyoko Kobayashi (U. Okayama) is a Visiting Investigator in the Sánchez Alvarado laboratory. She is learning methodologies to introduce double-stranded RNA into the Japanese planarian *Dugesia japonica*.

Audrey Huang (UC-Berkeley) is a joint postdoc in the Spradling and Koshland labs and will study chromosome structure and dynamics in *Drosophila melanogaster*.

Hongjuan Gao joined the Gall laboratory in Sept. as a postdoc. She comes from the Institute of Zoology at the Chinese Academy of Sciences in Beijing. She will be studying aspects of oogenesis in the toad *Xenopus*.

OBSERVATORIES

Wendy Freedman gave a brief invited talk at the induction ceremony for new fellows at the Oct. meeting of the American Academy of Arts and Sciences in Cambridge, Mass. Also in Oct., she gave an invited review at Harvard on "Cepheids: Past and Present" at the centenary meeting in honor of Cecilia Payne-Gaposchkin and in Nov. gave a colloquium to the UCLA physics department on measurement of the Hubble constant.

Alan Dressler was invited to speak to students and then to an alumni group of his high school, Walnut Hills, in Cincinnati, Ohio, on Oct. 24. The school has recently dedicated a new science and arts center; Dressler will contribute a telescope to the facility. He also spoke at the Manchester, UK, IAU meeting. He and Todd Boroson hosted a meeting in Phoenix, AZ, Oct. 27-29, "First Workshop on the Ground-based OIR System." Attendees included **Pat McCarthy**, **Gus Oemler**, and **Michael Rauch**.

Michael Rauch gave invited talks at the workshop "Dark Matter and Gravitational Lensing" in San Pedro, Chile, at the Victoria Computational Cosmology Conference in Victoria, BC, and at the First Workshop on the OIR Ground-Based System in Phoenix.

Hubble Fellow **Scott Trager** presented his work on star-formation histories of elliptical galaxies in invited seminars at U. British Columbia, Vancouver, and at the Dominion Astrophysical Observatory (Victoria). He presented his work with **Alan Dressler** and trustee **Sandra Faber** on the stellar content of distant cluster galaxies at the Hubble Fellowship Symposium at the Space Telescope Science Institute.

PLANT BIOLOGY

The Dept. of Plant Biology hosted the annual advisory meeting for The *Arabidopsis* Information Resource (TAIR) on Sept. 25. The meeting was attended by leading scientists in the *Arabidopsis* and plant research community, bioinformatics experts, and members of the NSF.

From June 18 to 24 **Shauna Somerville** attended the meeting of the International Society for Plant Molecular Biology in Quebec to present her plenary talk about the use of the microarrays to study plant-pathogen interactions. From July 30 to Aug. 2 Shauna attended a Novartis-sponsored workshop in Cardona, Spain, on plant-pathogen interactions, where she gave a presentation about powdery mildew-resistant mutants of *Arabidopsis*.

On Aug. 24, **Chris Somerville** presented a talk, "Application of Genomics to Cell Wall Biochemistry," at the Gordon Conference on Cell Walls at Meriden, NH. On Sept. 7 he gave the keynote address, "Recent Progress in Plant Genetic Engineering," at the International Congress on Biotechnology in Berlin, Germany. In Oct., Chris spoke on "The *Arabidopsis* Information Resource: Developing the Structure and Tools to Integrate, Display, and Analyze Comprehensive *Arabidopsis* Data" at the GARnet meeting in York, UK. He later spoke on the same subject at U. Oxford and at U. Arizona.

Winslow Briggs presented the keynote address, "Phototropins: A New Class of Plant Photoreceptors," at the Gordon Conference on Plant Molecular Biology held in New Hampshire, July 16-21. He also spoke at a retirement symposium honoring Prof. Harry Smith at U. Leicester, UK, on Sept. 8-9.

Akihiko Onodera, from Prof. Akira Nagatani's laboratory in Kyoto, visited the laboratory for two weeks in July to learn phosphorylation techniques he could apply to a newly discovered photoreceptor in the green alga *Chlamydomonas*.

John Sedbrook, a postdoctoral research associate, and his wife, Jen, welcomed Blake, born on July 17. **John Vogel** and his wife, Tanja, welcomed their new son, Forrest, on Oct. 10. **Ling Zhang**, a lab assistant in the Grossman lab, and her husband, Sufang, welcomed their twin daughters, Malinda and Miranda, on Sept. 21. **Rebecca Shaw**, a postdoctoral research associate in the Field lab, and her husband, Mike Delapa, welcomed their new son, Charles Dominic, on Sept. 25.

photo by John S. Connolly

Winslow Briggs (left) received the Finsen Medal, which has been awarded every four years since 1937 by the Association Internationale de Photobiologie for outstanding research in photobiology, at the International Photobiology Congress in San Francisco on July 1-6. Emmanuel Liscum (right), a former postdoctoral fellow in the Briggs laboratory, was awarded the Young Investigator Award of the American Society of Photobiology at the same time. Briggs presented the Finsen Award Lecture, "Phototropins: A New Class of Plant Photoreceptors," after which he immediately introduced Liscum, who gave his award lecture on the topic of signal transduction in phototropism.

CENTENNIAL UPDATE

A centennial provides an opportunity to look ahead–as well as back–in time. The Carnegie Institution plans to do both during its celebrations in 2002.

An exhibition highlighting the history and achievements of the institution will open on December 1, 2001, at the administration building in Washington, D.C. The exhibition, which will run through May 31, 2002, will be open to the public. There will be many related events, including lectures and symposia. James Trefil, the distinguished science writer, is writing an illustrated book about the history of the institution, for which Timothy Ferris will write an introduction.

Meanwhile, plans are being made for a number of symposia on cutting-edge topics of research now under way at the Carnegie Institution. In addition to an "all-Carnegie symposium," the departments are invited to host their own symposia on topics of their choice. Please speak to your departmental centennial representatives if you have any ideas for the content and format of these events.

THE LITTLE PLANT WITH A BIG FUTURE

The December 14, 2000, issue of *Nature* announced on its cover that the entire genome of the mustard plant *Arabidopsis thaliana*–almost 26,000 genes–has been completely sequenced. Thanks to the National Science Foundation, extraordinary international cooperation, and technical advances, scientists finished the 10-year effort to map the DNA of all five chromosomes. The milestone achievement is expected to accelerate research in agriculture, energy, and medicine.

The story of *Arabidopsis* is intimately tied to the story of Shauna and Chris Somerville of Carnegie's Department of Plant Biology. In the late 1970s, most plant biologists considered the tiny plant little more than a weed. Because of their economic importance crop plants such as tobacco were preferred laboratory subjects. But the Somervilles saw *Arabidopsis*' potential: it is compact and easy to grow in the laboratory, and it has a short life cycle–just six weeks. Their vision was to use the plant as *the* research model for the 250,000 other plant species, including agriculturally important ones. In the 1980s, the discovery that the *Arabidopsis* genome was small, with little repetitive DNA, helped to assure its selection as an ideal model. Now, 20 years later, the genome is mapped. The Somerville vision came true.

The *Nature* issue contains numerous articles by dozens of authors on the sequence and analysis of *Arabidopsis*' genetic makeup. Chris Somerville contributed the section about the metabolic genome, which includes genes involved in processes such as photosynthesis, respiration, mineral acquisition, and the synthesis of organic compounds.

Now that the scientists know what the genome is, they are embarking on a new initiative to discover what each gene does in a project known as the NSF 2010 Project. In their article "Plant Biology in 2010," which appeared in the December 15 issue of *Science*, Chris Somerville and his colleague Jeff Dangl speculated that the new effort could help develop a "virtual plant." Such a cyberorganism could simulate many aspects of plant growth and development and ultimately lead toward new agricultural crops that can grow under extreme environmental conditions.

FIRST SCIENCE WITH THE WALTER BAADE TELESCOPE!

Science operations started at Magellan February 14, 2001, on the Walter Baade 6.5-meter telescope. The honor of being first on the new telescope went to Dennis Zaritsky from the University of Arizona; Carnegie Observatories' Steve Shectman assisted him. Dennis is using a spectrograph borrowed from the existing suite of instruments at Las Campanas Observatory for his observations.

Over the next two months two more instruments are expected to become available: MAGIC, a new CCD imager from the Massachusetts Institute of Technology, and LDSS-2, multiobject spectrograph. During this time observers from all five partner institutions and Chile will have an opportunity to try out the telescope.

Two additional major instruments under development for Magellan are due to be completed next year. The first, called MIKE, is an Echelle spectrograph that will provide high-dispersion measurements of single objects over the full visible spectrum. MIKE is the work of Carnegie's Steve Shectman and Rebecca Bernstein. Mario Mateo at the University of Michigan is building a fiber-optic bundle that will allow MIKE to simultaneously measure the spectra of a large number of objects over a more restricted spectral range.

IMACS will be the second premier instrument on the Baade telescope. It is designed for multiobject imaging and spectroscopy over the telescope's full 30-arc-minute field of view. This large instrument is being built at Carnegie Observatories under the direction of Alan Dressler and instrument scientist Bruce Bigelow. Fabrication and assembly are well under way.

The early performance of the Baade telescope is living up to the project staff's expectations. The ability of the telescope to accurately acquire and track objects in the sky and the high quality of the image it delivers are already state-of-the-art.

Matt Johns, Magellan Project Manager
February 16, 2001