Universe

Jet Propulsion Laboratory

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Inside

162 million stars now online

By Jane Platt

Photos: IPAC / University of Massachusetts

Upper right: the Monoceros molecular star-forming region. Above: the Sombrero Galaxy, Messier 104.

Your home computer can become a portal to a wonderland of stars, thanks to a massive release of images from an infrared sky survey sponsored by NASA and the National Science Foundation.

"Any computer with a Web browser can be transformed into a desktop observatory," said Dr. Michael Skrutskie of the University of Massachusetts, principal investigator of the sky survey, which has scanned the nighttime sky and produced an online image potpourri of half a million galaxies and 162 million stars. The images can be seen at *http://www.ipac.caltech.edu/2mass/gallery/second.*

"The general public can see a menagerie of objects in infrared wavelengths that they couldn't see in any other way," said Project Scientist Dr. Roc Cutri of the Infrared Processing Analysis Center at Caltech, which is operated by JPL. The 1.9 million images would fill 6,000 CD-ROMs, equivalent to 4,000 gigabytes or four terabytes of computer hard disk space.

The images were gathered by the Two-Micron All Sky Survey (2MASS), the most thorough census of stars ever made. The survey detects infrared wavelengths that are beyond the red light in the rainbow of visible colors. Infrared light penetrates the gas and dust in our galaxy and is particularly effective for detecting the heat of very cool objects not visible with optical telescopes.

In order to cover the entire sky, the 2MASS survey uses two highly automated, 1.3-meter diameter (51-inch) telescopes, one at Mount Hopkins, Ariz., the other at the NSF Cerro Tololo Inter-American Observatory, Chile.

Operations for 2MASS began in 1997. Its catalogs will contain more than 300 million objects by the time observations are concluded next year. Final processing of the data and release to the public will be complete by 2003.

Already, 2MASS data have uncovered numerous stars with characteristics so unique that astronomers had to revise a century-old classification system of known types of stars.

Astronomers armed with 2MASS data also discovered the coolest brown dwarfs, or failed stars, known to date. They also detected previously unknown star clusters within, and galaxies beyond, our own Milky Way, and have mapped new star-birth regions. In the distant reaches of the universe, 2MASS discovered a new population of dust-obscured active galaxies, quasars and super-massive black holes.

The current release is based on a volume of data several hundred times larger than that contained in the human genome, Skrutskie said. "Astronomers will become cosmic geneticists, searching out patterns in these sky maps to decode the structure and origin of the Milky Way and the surrounding nearby universe."

The 2MASS project is a collaborative effort between the University of Massachusetts, Amherst, and the Infrared Processing and Analysis Center (IPAC).

The University of Massachusetts was responsible for the development and construction of the 2MASS telescopes and cameras and currently manages the collection of survey data.

Part of NASA's Origins Program, 2MASS is funded by NASA's Office of Space Science and the National Science Foundation.

2MASS results will benefit future Origins missions, including the Space Infrared Telescope Facility and the Next Generation Space Telescope, and will also help scientists plan observations for the Hubble Space Telescope and the Stratospheric Observatory for Infrared Astronomy.

Hurricane Carlotta spins in stereo

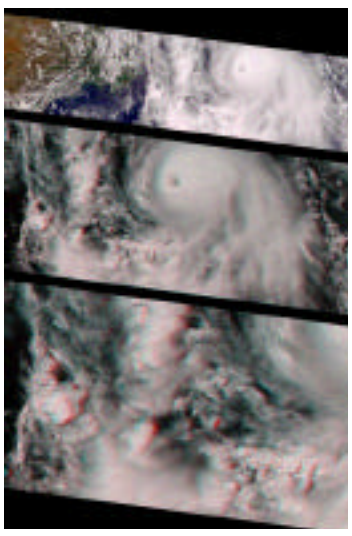
By Rosemary Sullivant

Views of Hurricane Carlotta in the eastern Pacific Ocean, as imaged by MISR's vertical camera.

With winds reaching 250 kilometers per hour (155 mph), this year's Hurricane Carlotta became the second strongest eastern Pacific June hurricane on record. New images from the Multi-Angle Imaging SpectroRadiometer (MISR)—built and managed by JPL—show the hurricane on June 21, the day of its peak intensity. The images are best viewed in color, with 3-D glasses (red filter over the left eye), at *http://www.jpl. nasa. gov/pictures/misr* .

MISR is one of several Earth-observing instruments aboard NASA's Terra satellite, which was launched in December 1999. This set of images has been oriented so that the spacecraft's flight path is from left to right; north is at the left.

The top image is a view from MISR's vertical (nadir) camera,



showing Carlotta's location in the eastern Pacific Ocean, about 500 kilometers (310 miles) south of Puerto Vallarta, Mexico.

The middle image is a stereoscopic anaglyph created using MISR's nadir camera plus one of its aftward-viewing cameras, and shows a closer view of the area around the hurricane.

Near the center of the storm, the eye is about 25 kilometers (16 miles) in diameter and partially obscured by a thin cloud. About 50 kilometers (31 miles) to the left of the eye, the sharp drop-off from high-level to low-level cloud gives a sense of the vertical extent of the hidden eye wall. The low-level cloud is spiraling counterclockwise into the center of the cyclone. It then rises in the vicinity of the eye wall and emerges with a clockwise rotation at high altitude. Maximum surface winds are found near the eye wall.

The bottom stereo image is a zoomed-in view of convective clouds in the hurricane's spiral arms. The arms are breeding grounds for severe thunderstorms, with associated heavy rain and flooding, frequent lightning, and tornadoes. Thunderstorms rise in dramatic fashion to about the same altitude as the high cloud near the hurricane's center, and are made up of individual cells that are typically less than 20 kilometers (12 miles) in diameter. This image shows a number of these cells, some fairly isolated, and others connected together. Their three-dimensional structure is clearly apparent in this stereo view.

More information about MISR is available online at *http://www-misr.jpl.nasa.gov* .

MISR scientific data products are available through the Atmospheric Sciences Data Center at NASA's Langley Research Center: *http://eosweb.larc.nasa.gov*

The Terra mission is managed by NASA's Goddard Space Flight Center, Greenbelt, Md.

News Briefs

Finding: ocean causes Earth's wobble

The century-old mystery of Earth's "Chandler wobble" has been solved by a JPL scientist. The Chandler wobble, named for its 1891 discoverer, SETH CARLO CHANDLER JR., an American businessman turned astronomer, is one of several wobbling motions exhibited by Earth as it rotates on its axis, much as a top wobbles as it spins.

Scientists have been particularly intrigued by the Chandler wobble, since its cause has remained a mystery even though it has been under observation for more than a century. Its period is about 433 days, or just 1.2 years, meaning that it takes that amount of time to complete one wobble, which amounts to about 6 meters (20 feet) at the North Pole. It has been calculated that the Chandler wobble would be reduced to zero in just 68 years, unless some force were constantly acting to reinvigorate it.

Writing in the Aug. 1 issue of Geophysical Research Letters, JPL geophysicist RICHARD GROSS reports that the principal cause of the wobble is fluctuating pressure on the bottom of the ocean, caused by temperature and salinity changes and wind-driven changes in the circulation of the oceans. He determined this by applying numerical models of the oceans, which have only recently become available through the work of other researchers, to data on the Chandler wobble obtained during the years 1985–95. Gross calculated that two-thirds of the wobble is caused by ocean-bottom pressure changes and the remaining one-third by fluctuations in atmospheric pressure. He says that the effect of atmospheric winds and ocean currents on the wobble was minor.

Comet LINEAR visible, with help

With the aid of binoculars, amateur astronomers should be able to see Comet C/1999 S4 LINEAR in the northwest night sky through July 26.

The comet, which has been visible since July 19, will be at its brightest when it makes its closest approach to Earth on Sunday, July 23, at about 55 million kilometers (34 million miles), according to JPL astronomer DR. DON YEOMANS.

He said to look for the fireball at the outer rim of the Big Dipper, where it will be traveling eastward from the tip of the "ladle" toward the "handle."

Just three days after its closest approach to Earth, the comet will make its closest approach to the sun and be 114 million kilometers (71 million miles) from Earth.

The comet was named after the computer simulation program that found it, the Lincoln Near Earth Asteroid Research (LINEAR) project, funded by the U.S. Air Force.

Lab teams complete tough Mojave race

Two teams comprising members of the JPL Running, Bicycle and Amateur Radio clubs participated in the 2000 Mojave 250+ Mile Death Race in June.

A 285-mile team event that features a combined race for runners, road and mountain cyclists in the eastern Mojave Desert in California and Nevada, the race is run relay-style in 21 legs over surfaces ranging from paved roads to desert trails. Each 12-person team completed running and cycling legs of between 6 and 42 miles, with most members competing in two legs.

This is the third consecutive year JPL has entered the race and the first time it fielded two teams. The "Mars Attacks" team finished the race in 24 hours, 31 minutes, placing first in the corporate division and sixth overall out of 18 teams. JPL's co-ed "Mars Needs Women" team finished in 27 hours, 58 minutes and placed second in the mixed division and 14th overall.

For results, photos and other information, go online to *http://www.jplerc.org/running/death.html.*

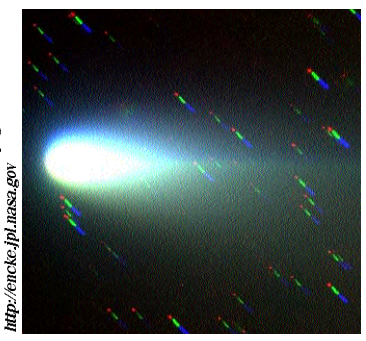
Dryden hosting alumni meeting

NASA's Dryden Flight Research Center is hosting an alumni reunion Sept. 14-17 for those who worked at the facility between 1946 and 1958.

The event marks the 54th anniversary of the High Speed Flight Station Muroc Unit, which today is known as Dryden. Founded as a support unit for the X-1 rocket plane supersonic research flights, Dryden has evolved from a small desert outpost into the nation's premiere flight research facility.

The reunion committee seeks names, addresses or telephone numbers for anyone who was employed by the National Advisory Committee for Aeronautics at Edwards between Sept. 15, 1946 and Oct. 1, 1958.

Information can be mailed to NACA Reunion IX, P.O. Box 1589, Lancaster, 93539-1589. Call BETTY LOVE at (661) 265-8049 or PAT KENNER at (805) 995-3430.



Comet Observation home page: http://encke.jpl.nasa.gov

Comet LINEAR as imaged by the Korea Astronomy Observatory June 28.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. Call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon on Wednesdays. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the third Thursday of the month at noon in Building 167-111. Call Greg Hickey at ext. 4-0776.

Senior Caregivers Support Group—Meets the meet the first Tuesday of each month in Building 167-111. For information, call the Employee Assistance Program at ext. 4-3680.

Friday, July 21

Von Kármán Lecture Series—Robert Manning, who is leading a systems engineering study for the Mars 2003 geological mission, will present a lecture titled "Mars Engineering: Building a Vehicle to Land on Mars" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Monday, July 24

Caltech Ballroom Dance Club—The first of four successive Monday sessions of salsa will be presented from 7:30 to 9 p.m. in the campus' Dabney Hall. The course costs $24 and is taught by a professional dance instructor. Refreshments and practice time are provided until 9:30 p.m. See *www.its.caltech.edu/~ ballroom* or call Don at 626/791-3103.

Tuesday, July 25

Insurance Plans—Medical and dental plan representatives will be on Lab for one-on-one meetings with employees to answer questions about JPL's various spending account plans. To be held from 9 a.m. to 1 p.m. in the Building 167 cafeteria, east side.

JPL Firewall Requirements Workshop 2—The JPLNet group, in coordination with JPL Network and Computer Security, will deploy an institutional firewall this calendar year. This workshop will discuss various options for a JPL firewall, including requirements by NASA and JPL users. To be held from noon to 1:30 p.m. in von Kármán Auditorium.

Wednesday, July 26

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Call Mary Sue O'Brien at ext. 4-5090.

Thursday, July 27

JPL Golf Club—Meeting at noon in Building 306-302.

Monday, July 31

JPL 2000 Lecture Series—Dr. Diane Evans, Dr. Loren Lemmerman and Alfred Zieger will present "Earth Science and Future Missions/ Technologies" at 11 a.m. in von Kármán Auditorium.

Tuesday, August 1

JPL Gamers Club—Meeting at noon in Building 301-169.

JPL Genealogy Club—Meeting at noon in Building 301-227.

Thursday, August 3

Data Acquisition Fair—Company representatives will demonstrate hardware- and software-based technical capabilities of their data acquisition and analysis products from 10 a.m. to 3 p.m. in von Kármán Auditorium. Sponsored by the Measurement Technology Center in Section 351. For more information, call Phillip Yates at ext. 3-3705.

JPL Gun Club—Meeting at noon in Building 183-328.

Rescuers of JPL engineer receive special NASA award

By Jane Platt and Mark Whalen

Tom Wynne / JPL Photo

JPL engineer Dr. Len Efron, center, meets with Kazuhito Hachiya, left, and Keiko Asano after the pair received a special NASA Group Achievement Award for their efforts in rescuing him from Japan's Mt. Fuji last fall.

JPL engineer Dr. Len Efron is alive and well today thanks to the heroic efforts displayed by two Japanese mountain climbers who rescued him from almost certain death. Last week, the pair received special recognition from NASA for putting their own lives on the line to help a stranger.

Efron, who works in the Navigation and Mission Design Section 312, was in Japan last November preparing for NASA/JPL meetings with two Japanese national space agencies (NASDA and ISAS). During some down time, Efron hiked to the 3,775-meter (12,400-foot) icy summit of Mt. Fuji.

The ascent took more than six hours to complete, and he rested while eating lunch and enjoying the view of the summit crater. It was noon when a man and a woman passed Efron on their way to the crater edge.

Efron began his descent a minute later. Moving a bit too quickly, he took a misstep in a steep icy chute and his crampons—steel spikes attached to the soles of his boots—came loose.

He was sliding feet-first on his stomach for the next 20 to 30 seconds, "waiting for the inevitable terminal impact," he recalled. Suddenly, the slide was interrupted by a violent collision with an object he didn't see. The impact left him on a 45-degree slope with a fractured pelvis and broken hands.

Efron had fallen 100 meters (more than 300 feet). Immobilized, he cried for help.

About 10 minutes went by, he said, before help arrived. It was the last pair of hikers that had passed him on their way to the summit.

"From above and behind I heard a woman's voice call, "Are you all right?," Efron said. "Then I heard the sweetest words ever spoken: 'It's all right! I have a cellular phone.'"

Keiko Asano and Kazuhito Hachiya not only responded to Efron's cries—they stopped his bleeding, prevented him from falling farther, and called police. Although a blizzard was approaching rapidly, they refused to leave him, endangering their lives and using their own bodies to keep Efron from freezing to death.

During the next seven hours, when teams of rescuers would arrive to transport Efron down the mountain, Asano and Hachiya selflessly protected Efron. They carved a seat for him in the ice, planted their ice axes to provide foot rests, attended to his head wounds and shared their warm lemonade.

"On several occasions I told Keiko and Kazuhito that as much as I would regret my own dying, I would have more remorse if three died instead of one," Efron said. "Each time, Keiko merely responded, "Everything is all right."

Indeed it was. The trio and rescue teams spent the night in a mountainside shelter cabin, and later that day Efron made it to a hospital at the base of the mountain.

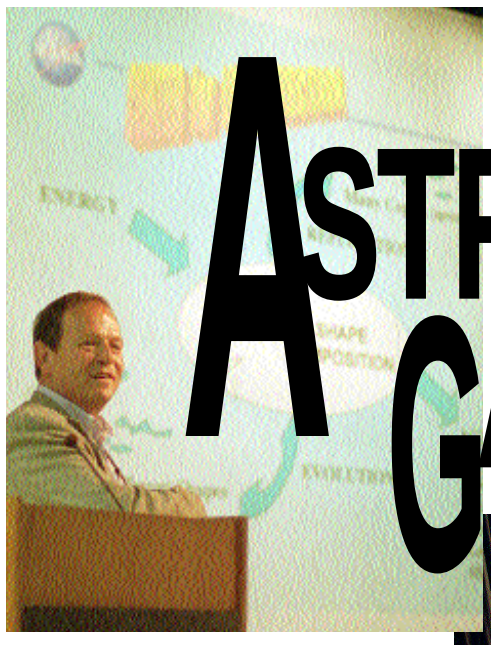
Now fully recovered and back at work, Efron welcomed Asano and Hachiya to California a couple of days before their July 7 visit to JPL. The pair received a special NASA Group Achievement Award and were cited for "heroic, selfless actions, despite an impending winter storm."

A certificate has also been presented to Rich Miller, manager of TMOD Plans and Commitments, who led the working group meeting Efron attended in Japan and who mobilized and coordinated international resources.

Others to be honored in Japan are Gilbert Kirkham, the NASA representative at the U.S. Embassy in Tokyo, who coordinated the rescue efforts, arranged transportation, and interfaced with medical and rescue teams; the Fuji-Yoshida police station and Mikasa Climbing Club, both of which sent volunteer rescue climbers; and the Keio Plaza Hotel for coordination, support and sensitivity during and following the rescue.

"I want to thank the Lab as an institution; they really came through on my behalf," Efron said. "Not until after my return did I learn how many unseen on-Lab individuals were involved in assisting my safe return."

ASTROBIOLOGY GAINS ATTENTION



Bob Brown / JPL Photos

PIA01033

Gullies proposed to have been formed by seeping ground water emanate from a specific layer near the tops of trough walls in Mars' Gorgonum Chaos region, as imaged by Mars Global Surveyor's camera.

"If [Global Surveyor's discovery] is real, it could potentially change the entire Mars strategy."

— Dr. Ken Nealson
Lead scientist,
Astrobiology Research Element

By Mark Whalen

IF ANYONE IS TO EVER FIND AND analyze life outside of the Earth, it will likely be Dr. Ken Nealson and his group in JPL's Center of Excellence for Life Detection. So it was with excitement and anticipation that astrobiologist Nealson heard last month's announcement of the discovery of the possible evidence of water on Mars as imaged by Mars Global Surveyor's camera.

Nealson shared his views on the implications of the Mars discovery in a July 7 lecture, part of the Director's Topical Seminar Series. The standing-room crowd in von Kármán Auditorium was abuzz with a fervor perhaps not seen since Pathfinder's landing on the red planet three years ago.

Nealson heads a staff of about 20 people, including six staff scientists. Organizationally, JPL's Astrobiology Group (Research Element 3251) is part of NASA's overall Astrobiology Institute, and also works on one of JPL's Grand Challenge initiatives, "the in-situ detection of life."

"Life detection cuts across many factors that are integral to the JPL community and NASA—missions, planetary protection, extreme environments and the origin and detection of life," Nealson told the audience.

Nealson provided a cautionary note: "As some of you know, I'm not a big fan of life on Mars until we actually prove it's true." But he also pointed out that if NASA's Mars strategy is " 'follow the water,' we can now do it. If [Global Surveyor's discovery] is real, it could potentially change the entire Mars strategy. And it should, because we would have a place to go, a place to look where the organic carbon might be, and if we're lucky, where life might still be preserved."

The step-by-step approach to detecting life will include the following components:

- Physical and chemical measurements of shapes, structures and metabolic activities in the environment
- The use of multiple measurements: Except for obvious life, no single indicator will be sufficient
- A strong contribution of statistics and data mining
- The use of remote and in-situ measurements for life detection and in selection of samples for return to Earth

"We want to first define life," Nealson said, noting that researchers need to develop non-Earth-centric biosignatures for life detection methods "that do not require Earthly molecules like DNA or RNA, but which would never miss Earthly life when encountered." Test methods would need to be developed for Earthly environments, the best of which, he said, would be "extreme environments"—frozen sites, freshly formed lava, and hot or cold deserts. On Earth, areas with small amounts of liquid water support little active life; i.e., the signals are subtle.

"We know from studying extreme environments on Earth that when things get tough, the smart organisms move into the rocks and the dumb ones die. So when you go to these extreme environments, like Antarctica, you don't find any dumb living things. You find smart living things."

But to find life in the rocks will require new approaches. For example, Nealson's group built an ultraviolet imaging detection system that allows them to study surfaces of exposed rocks for the presence of carbon-based molecules and organisms. "This allows you to reduce the search space, then go to a spot that's interesting," he said. "If it's made up of something organic, it'll jump out at you."

Once likely structures are found, they must be further analyzed for their physical and chemical properties in order to verify the presence of past or current life.

"Some of you may know of my arguments with my colleagues at Johnson Space Center about the nanobacteria on the Martian meteorite," Nealson said, referring to an ancient rock found in Antarctica in 1996 that purportedly contained fossils of past Martian life. "The entire supposition for the presence of living forms in the meteorite is based on structural analysis: things that look like they *could* be bacteria."

Nealson contended that unless researchers look at the chemistry of these structures—things such as the abundances of elements of carbon, hydrogen, nitrogen, oxygen and others; the presence of macromolecules; and non-predicted abundances of molecules—"at the spots that are interesting and at the proper size scales, it is not convincing to make an argument for life."

It will be the development of techniques to make such measurements—at the micrometer level—that will allow scientists to see whether or not there is biological activity and tell the difference between life and non-life.

Statistical approaches—such as calcium-to-iron ratios—may also be used to determine life vs. non-life from samples. Finally, scientists will also look for activities such as movement and the weathering of rocks.

Most biologists agree that anyplace with liquid water, organic chemistry and energy is a potential setting for life to arise and prosper. But what about places where liquid water is only occasionally available? What about places where freezing and thawing occur regularly?

Many such environments exist, where the daily temperature fluctuations are such that all life is frozen at night and thawed the next day. To this end, Nealson said it's important to realize that bacteria have the advantage of being so small—"ice crystals are bigger than they are"—that freezing and thawing wouldn't kill them.

The time of analysis can also be very important. "In Antarctic rocks, for example, there may be only one week out of the year when it gets warm enough that there's liquid water, where the temperature gets above zero. If you happen to be there, you can see a lot of biological activity. So time becomes an important factor when making measurements," he said.

As a final point, Nealson noted that bacteria have highly evolved repair systems, designed for fixing accumulated damage. "If you can make the argument that once every 500,000 to 1 million years you could wake up the system and it could fix itself, then you could argue that there could still be some life there. I didn't care for that argument at all before the recent report, but if indeed there have been episodes of recent liquid water on Mars, it energizes that kind of thinking."

Nealson pointed to the findings of 250-million-year-old salt deposits, which can be dissolved to find viable bacteria. "The amount of time that life can survive keeps moving back. So people are asking questions today they wouldn't have even thought of 20 years ago, because we didn't think it was possible."

Indeed, astrobiology has gained lots of attention of NASA Headquarters. In attendance at the talk was Dr. Kathie Olson, who joined NASA last year as the agency's chief scientist. JPL Director Dr. Edward Stone noted that Olson is a strong advocate of research at NASA and has a great interest in the detection of life.

"I am the first biologist to be chosen chief scientist at NASA, and this is (Administrator Daniel) Goldin's way of making a statement that he believes that biology is going to be important to our future in terms of the search for life," she said.

Ten years ago, Olson noted, NASA allocated 31 percent of its budget for research and development. Next year, it will be 41 percent, and five years from now, 51 percent. "And at JPL, where you combine the engineering, the science, the technology and the missions, you are primed for the future."

New space stamps unveiled

The Postal Service's first pentagonal stamps were issued to commemorate solar system exploration.

JPL participated in a ceremony earlier this month held by the U.S. Postal Service to dedicate a new series of stamps commemorating space.

The Postal Service's dedication of its Space Achievement and Exploration issue took place at the World Stamp Expo, held in Anaheim. Five stamp panes, each showing a different aspect of the exploration and study of space, provided several firsts for the Postal Service: the first hologram stamps, the first circular stamp and the first pentagonal stamps.

JPL Deputy Director Larry Dumas represented the Laboratory for the first-day issue ceremony for the five pentagonal $1 stamps, together named "Exploring the Solar System." These stamps showed different views of the sun based on NASA images.

Other NASA themes that were part of the new stamp issue included "Landing on the Moon," "Probing the Vastness of Space" and "Escaping the Gravity of Earth." In addition, "Stampin' The Future," four stamps based on designs by American children in a national stamp design contest, were also released.

JPL provided exhibits at the expo, as did Johnson Space Center and the International Space Station.

For pictures of the new stamps and more information, go online to ***http://www.worldstampexpo.com.***

View this and previous issues of Universe online

http://universe.jpl.nasa.gov

Universe

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Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission.

Ads must be submitted on ad cards, available at the ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

Ads are due at 2 p.m. on the Monday after publication for the following issue.

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.

Letters

My thanks to my many friends at JPL for their kind support at the passing of my father. Their wishes and the peace lily plant from the ERC were much appreciated.

Gary Kunstmann

My family and I would like to express our appreciation to our many friends at JPL for their comforting expressions of sympathy on the recent passing of my wife's father, Joseph Forcier. I would also like to thank those involved with sending the nice plant from the ERC; it was a very kind sentiment.

Don Potter and family

Thank you to my dear friends and coworkers, and especially to Al Williams and Steve Silverman, for my wonderful retirement send-off. I will never forget my 29 years at JPL and will miss all of you.

Jeanne Stevens

Rod and I want to thank all our friends and co-workers for their condolences, concern and cards upon the passing of my father. The support of our JPL family means a lot and we are very appreciative. The Section 388 plant arrangement and the ERC plants add a special touch to our home.

Carol and Rod Stanley

Passings

CARLO FEA Jr., **77, a retired senior environmental test specialist in Section 357, died of congestive heart failure June 24 at his home in Los Angeles.**

Fea worked at the Lab from 1962 to 1991. He is survived by son Gregory and daughters Donna and Janet.

Services were private.

WILLIAM VAN DE WETERING, **77, a retired maintenance electrician in Section 662, died of cardiac arrest July 5 at his home in Monrovia.**

Van de Wetering joined JPL in 1967 and retired in 1989. He is survived by his wife, Nanda, two sons and four grandchildren.

Services were private.

Classifieds

For Sale

AIR CONDITIONER, Amana, 9600 BTU, win., energy saver modes, 1 yr. old, hardly used, like new; $250. 626/792-7753 after 6pm.

APPLIANCES: Westinghouse refrigerator, frost-free, white, top freezer, 19 cu. ft., $120/obo; GE washer, extra lg. cap., $30/obo. 626/301-1538.

BICYCLE RACK, Thule, holds 2 bikes, fits most cars & trucks w/raingutters, $150. 626/797-5804.

BICYCLES, 10 spd., recent refurb., 27" & 24" wheels, 5 min. from JPL, $25 ea. 952-8803, Don.

BINOCULARS, Explorer 750, Orion, BAK 4 prism, field 6.8, 365 ft., 1,000 yd., $100 negotiable. 323/665-2684.

COFFEE TABLE, glass top, square, marble base, $40/obo. 626/791-9049, Suzi or Paul.

COMPUTER, Mac 7100-66 with L2 cache, 66 MHz 601 PowerPC, 32 MB RAM, 1 GB HD, 33.3 KHz modem, 13" monitor, software, $400. 773-9571.

CLAY POTS, lg. round, 2'dia., $50 ea./obo, 3' dia., $60 ea./obo. 626/398-3480.

DRESS, evening, Alan Schwartz designer, brand new, stunning, black w/spaghetti straps, sz. 2-4, tag, $235, sell $130. 241-8208, after 9 p.m., Irena.

FILE CABINET, 5 drawer, vertical, lock, gray/green, incl. 150 hang-file folders, gd. cond., $100. 909/593-4046, vivdavies@star-quest.net.

GARAGE SALE, Sat. & Sun., July 22 & 23, 4808 Matley Rd., La Canada, directional signs at Foothill Blvd. & Ocean View. 248-4790.

GOLF CLUBS, Ping Black Eye, 2 thru PW, gd. cond., $250. 541-9493.

LAWN EDGER, McLean, gas, like new, $100. 909/593-4991.

LAWN EDGER, pwr., McLane 3 HP, 8" dia. blade, exc. cond., 10 yrs. old but less than 2 hrs. use, 5 min. from JPL, $35; MOWER; pwr., King-O-Lawn, 3 HP, 21" reel, clutch-type drive, old but reliable, $25. 952-8803, Don.

MATTRESS, full sz., never used, Sealy Posturpedic, cushion firm, pd. $400, sacrifice $200. 323/665-3439.

MICROWAVE, Sharp Carousel II/convective oven, 800W, turntable & tons of special functions, $65/obo; LAWNMOWER, Poulan, "weedeater", 4 HP, Quattro Briggs & Stratton motor, mulch capable, 1 yr. old, $75/obo. 362-7542.

MONITOR, Sony Triniton, 15", $99; BATTERIES: for Nokia cell 5100 or 6100 series, $20; new Nokia, vibrating, $59; for Sony Camcorder, $10;, new Sony Mavica, $30; COVER PLATE, new, Disney's Goofy for Nokia 5100 series phone, $15; MOUSE, new, Logitech, Web scrolling, $15; AUTO SWITCH, new, 4:1, Belkin, $35; DVD MOVIES, new, orig., $22-$30, sell $15. 366-6134.

ORGAN, Yamaha 415 elect. console, 13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifice $3,000; DIET TAPES, Jenny Craig, set of 14, $50; POWER CONTROL CTR, computer, 5 pwr. + 1 master switch, 5 surge-protected outlets + 2 modem/ fax/phone jacks, new, $20; ADAPTERS, Lawn Genie sprinkler valve, model 756LG 3/4, new, $10 ea.; CD CASES, 50, jewel, $10. 790-3899.

OVEN, convection, by Décor, self-clean, white, wall mount, $250/obo. 626/584-9632.

ROUTER, Makita 1.5 HP, D-handle, 1/2" collet, $90; SPRAY FINISHER, Wagner, fine coat, low overspray finisher, for water-based finishing only, both in exc. cond., new $180, sacrifice $90. 626/303-0988, eves.

SKI BOOTS, Salomon, men's size 11, worn only 5 times, in original box, $35. 236 4869, eves.

SOFA & CHAIR, matching, gray/multi-colored pattern, $100/obo. 626/301-2481.

STEREO SYSTEM, Cerwin Vega D-9 speakers, Numark graphic equalizer, full display, Onkyo receiver, bad pwr. switch but working remote, $250/obo. 626/798-8369.

TABLE, oak, library w/drawer, c. 1900, George III taste, 29.5"Hx26"Wx47"L, $400/obo. 626/345-0681.

TABLE TOP, laboratory, 2.5'x5', all steel, strong frame & black coated surface, $20. 323/255-3226.

TELEVISION, Panasonic, 25' diagonal, wood cab. remote, 8 yrs. old., $150/obo. 626/398-3480.

WASHER/DRYER, Whirlpool, lg. cap., exc. cond., 2 yrs old, $180 ea. 241-8208, after 9 p.m., Irena.

Vehicles / Accessories

'93 ACURA Integra RS, black, 5-spd. manual, a/c, full pwr., stereo/CD/cass., alarm, rear spoiler, orig. owner, 103K mi., exc. cond., $8,200/obo. 790-1419.

'95 BUICK Skylark custom sedan, 4 dr., auto, air, cass., air bags & more, exc. cond., 110K mi., $5,400. 661/252-8470.

'92 BUICK Le Sabre, fully equipped, exc. cond., white ext., blue leather seats, $5,400. 892-9824.

'83 CHEVROLET El Camino, blue, V8, 100K mi., $3,500/obo. 626/284-2025.

'93 CHRYSLER Le Baron conv., blue/white top, auto, a/c, clean, new tires, trans., 130K mi., gd. cond., $4,500/obo. 352-5666.

'84 DODGE D-50 pickup truck, VG cond, auto, 2.6L, bedliner, shell, new batt. & carb., very clean, well maint., all service records, 138K mi, orig. owner, $2,800. 626/332-2682, Steve.

'96 FORD Escort LX, exc. cond., 5 spd., 2 dr., 57K mi., a/c, am/fm/cass., $6,900/obo. 909/323-3640.

'95 FORD Mustang, 3.8L V6, 5 spd manual, 53K mi, silver, a/c, power everything, cc, stereo/CD/cass., dual air bags, no scratches/dents, $7,400/obo. 249-0038.

'95 FORD Taurus GL wagon, exc. cond., 48,400 mi., new Michelin tires, V6 3.0L, auto, cc, a/c, am/fm/cass., pwr. seat/ steering/locks/windows, silver paint, gray int., cloth seats, orig. owner, $7,900. 626/351-1219.

'90 FORD Ranger Supercab, 4.0L V6, 4X2, auto, a/c, pwr./win./locks, cc, am/fm cass., camper shell, 67K mi., $5,000. 248-2480.

'72 FORD Bronco, tan, V8, 75K mi., dual limited slip differential, $6,000/obo. 626/284-2025.

'96 GEO Prizm, 4 dr., green, 1.6L, only 38K mi., exc. mech. cond., new tires at 33K mi., 28 city/38 hwy. MPG, gray int., 5-spd. manual, a/c, Alpine stereo w/Polk speakers, $8,000/obo. 626/398-0483, Pat Huber.

'95 HONDA Civic EX sedan, 5 spd, a/c, cc, am/fm/CD, s/r, pwr./win./locks, black w/dark gray int., recent tires, dealer maintained, 81K mi., exc. cond., $9,100/obo. 626/462-9110.

'91 HYUNDAI Excel, low mi., less than 63K, new tires/brakes/muffler, looks gd., runs better, $1,950. 679-1471.

'93 PACE ARROW motor home, 30', exc. cond., only 23K mi., basement model, levelers, safetyplus steering, TV, micrwv., a/c, much more, $39K/obo. 249-0939.

'84 MILLER Tiltbed equip. trailer, completely refurbished, new deck/tires/brakes/elec., Pinto hitch, 21,000 gross vehicle weight, $3,995/obo. 626/798-6249.

'77 PLYMOUTH Voyager 15-passenger van, gd. cond., $2,500/obo. 626/571-2052.

'96 SAAB 9000 Aero, high-output turbo eng., 225 HP, 252 lb. ft. of torque, 5-spd., 20.5K mi., silver/black leather, loaded, one owner, very clean, exc. cond., $3,270 below Kelley Blue Book at $22,500. 626/794-2965, leave msg.

'98 SATURN, wagon SW-2, white, mint/ spotless cond., extended bumper-bumper warranty 6 yr/75,000 mi., all papers incl. proof of oil changes, dual airbags, auto, keyless entry, cc, CD, tinted wins., 19K mi., $12,800/obo. 661/294-0712, Brad.

'95 SUBARU Legacy, 4-dr. sedan, 56K, single owner, exc. cond., dark green, AWD, ABDS, auto, pwr. sunroof/locks/windows, a/c, am/fm/cass., c/c, alloy wheels, $10,500. 626/355-5662.

'89 TOYOTA Camry, exc. cond. auto, a/c, pwr./win./locks, 96K mi., $4,999. 626/579-7403.

'97 VOLKWAGEN Jetta GT sedan, red, exc. cond., auto, 42K mi., tinted wins., am/fm stereo/cass., alloy wheels, rear spoiler, dual airbags, pwr. steer., new tires, $14,500/obo. 626/359-5200.

Wanted

GERMAN SPEAKERS/parents to form play group for toddlers to foster native language development. 249-9093, Petra.

MAGAZINES, bridal/wedding, for pics. only, any cond., 626/345-0681, Susanne.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.

VOLLEYBALL PLAYERS, coed, all levels of play, Tues. nights, 8-10, Eagle Rock H.S., $3/nt. 956-1744, Barbara.

Free

KITTEN, charcoal gray, born April 17, to a good home. 626/448-5957.

TABLE TENNIS TABLE and paddles, good condition, needs net. 249-1749.

For Rent

ALTADENA, lg. furn. rm., cable, also share 3 bd., 3 ba. quiet hilltop house, pool, patios, view (incl. JPL), c/a/h., all amen., kitch., d/w, laundry, priv. off-st. pkg. spot, 11 minJPL, smoking OK (owner smokes), $500, incl. all util. + dep. 626/795-1050, Harry, after 7 p.m.

ALTADENA condo lease, mins. from JPL, 2 bd., 1 3/4 ba., nice closets w/organizers, f/p, c/a, comm. pool, storage rm., 2-car gar., carport, tile counter & marble flr. in kitch., lg. patio, landscaped, planters/oriental garden/ waterfall/spa, end unit w/wins. on 3 sides, rent by owner, $1,200. 626/398-1988, Beverly Drane.

SOUTH PASADENA, fully furn. 1 1/4-bd. apt., nice area at 1718 Huntington Dr., betw. Marengo & Milan Sts, laundry facilities on premises, util. pd. except elec., no smoke/pets, $1,000 + $1,000 sec. dep. 626/792-9053, Marilyn.

Real Estate

LA CANADA-FLINTRIDGE, view home, 4 bd., 2.5 ba., c/a, 2,778 sq. ft., 2-car gar., lg. driveway, 15-ft. swim spa, LC schools, very quiet street/neighbrhd., 53,954 sq. ft. on 2 lots w/oak forest & creek, 2.5 mi./ JPL; see www.realtor.com, "La Canada", "Ca", MLS ID=G202353, $849,500. 952-9654.

PASADENA, beaut. spacious Spanish style 1922 vintage home loc. in desirable "Bungalow Heaven" area, 3 bd., 1 ba., 1,600 sq. ft., lg. lot & much more, $349,000. 679-1471.

PASADENA executive condo, next to Caltech, total remodel, 2 bd., 1 3/4 ba., 1,200 sq. ft., newly refinished hrdwd. flrs. in dining rm., newer appliances, carpet & paint, top floor unit in park-like setting, walk to Caltech & S. Lake Ave., nice pool & spa. 626/585-9048.

Vacation Rentals

BIG BEAR cabin, quiet area near village, 2 bd., slps. 8, compl. furn., f/p, TV/VCP, $75/nt. 760/246-7754.

BIG BEAR LAKEFRONT, lux. townhome, 2 decks, tennis, pool/spa, beaut. master bd., suite, sleeps 6. 949/786-6548.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails; 2 bd., sleeps up to 6, f/p, TV, VCR, phone, mcrwv., BBQ & more, JPL disc. from $65/nt. 909/210-9182.

CAMBRIA ocean front house, slps. up to 4, exc. view. 248-8853.

HAWAII, Kappa, Kauai, 1 bd., 1 ba., ocean front condo, sleeps 4, full kitch., patio, pool, spa, sauna, BBQ grills, tennis, Oct. 21-28, $90/nt. 323/296-6641.

HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house comfortably sleeps 6; 3 bd., 2 ba., rustic, relaxing & beautiful, swim/snorkel/fish, spectacular views, near restaurants/ golf/other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, mcrowv., d/w, pool, priv. lanai, slps. 4, 4/15-12/14, $100/nt./2, 12/15-4/14, $115/nt./2, $10/nt. add'l. person. 949/348-8047.

LAKE TAHOE, north shore, 2 bd., 2-1/2 ba. condo, slps. 6-7, private sandy beach, pool, great loc., all amens., hike/golf/fish, 2 mi. to casinos, JPL disc. summer wkly. Rate, $650. 626/355-3886, Rosemary or Ed.

LAKE TAHOE, west shore @ Homewood in Chamberlands, full amen., assoc pool, tennis, private beach & club, 3 bd. + loft, 2 ba., slps. 8, linens provided, full kitch. & laundry, TV/VCR, wood stove, 2-day min., $700/wk., $75 cleaning fee. 626/585-0321, Bob or Nicole.

MAMMOTH, Chamonix condo, 2 bd., 2 full ba., slps. 6, fully equip. elec. kitch. w/ mcrowv. & extras, f/p & wood, color TV, VCR, cable, FM stereo, pool & sun area, o/d Jacuzzis, sauna, game, rec. & laundry rms., play & BBQ areas, convenient to hiking, shops, summer events, daily/weekly rates. 249-8524.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equip. kitch. incl. mcrwv., d/w, cable TV, VCR, phone, balcony w/view to mtns., Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL disc. 626/798-9222 or 626/794-0455.

OCEANSIDE, on the sand, charming 1-bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., slps. 4. 949/786-6548.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on private rd., 18-hole golf course 6 mi. away, private secure pkg. 626/794-3906.

SOUTH LAKE TAHOE KEYS waterfront, 4 bd., 3 ba., 1 bd. & liv. rm. upstairs, hcp. access fair, slps. 12+, f/p's, decks, gourmet kitch., boats, TV's, VCR, stereo, assn. in & o/d pools, bch., tennis/ski/casinos/golf, 3-day min., $1,195/wk. [1 June-15 Sept; 22 Nov- 1 April], $595/wk. low seas., + $90 clean fee. 949/515-5812.