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## Opportunity prepares for launch

*Opportunity, the second Mars Exploration Rover, required repairs and will launch no earlier than July 5.*



The launch of "Opportunity," the second of JPL's twin Mars Exploration Rovers, has been postponed to no earlier than Saturday, July 5.

NASA decided on Monday, June 30 to take additional time to perform tests on the process used to bond the cork insulation to the surface of the Delta II launch vehicle. These tests were scheduled to be completed late Wednesday, July 2.

The launch times on July 5 are 7:51 p.m. and 8:34 p.m. PDT.

NASA engineers inspected the first stage of the Delta vehicle after a June 28 attempt to launch Opportunity, and found that a lower band of cork insulation that was removed and replaced had limited areas that debonded from the surface of the vehicle.

NASA announced Sunday, June 29 that sections of this band, approximately 10 percent of the

circumference, would be reinstalled.

Following its scheduled Jan. 25, 2004 landing in Meridiani Planum, Opportunity will join its twin, Spirit, in a quest to understand the role of water on Mars. Plans call for each rover to operate for at least three months.

Spirit, which was launched June 10, performed its first trajectory correction maneuver June 20.

Following commands from the Mars Exploration Rover flight team at JPL, Spirit first performed a calibration and check of its eight thrusters, then fired the thrusters to fine-tune its flight path toward Mars.

The main burn had two components. Thrusters that accelerate the rotating spacecraft along the direction of the rotation axis burned steadily for about 28 minutes. Then, thrusters that

accelerate the spacecraft in a direction perpendicular to the rotation axis fired in pulses timed to the spacecraft's rotation rate—with 264 pulses totaling about 22 minutes of burn time. The total maneuver increased Spirit's speed by 14.3 meters per second (32 mph).

At the end of the trajectory correction, Spirit performed an attitude turn that adjusted its orientation in space to maintain the optimal combination of facing its solar array toward the Sun and pointing its low-gain antenna toward Earth. All systems on the spacecraft are in good health.

Spirit's next trajectory correction maneuver is scheduled for Aug. 1 and its next attitude turn for July 22.

Spirit will arrive at Mars on Jan. 4, 2004, Universal Time (evening of Jan. 3, 2004, Eastern and Pacific times).

## Odyssey orbiter reveals Mars' icy character

By Guy Webster

*In winter months, Mars' icy soil is covered by a thick layer of carbon dioxide ("dry ice") frost, obscuring the water ice signature. As the layer dissipates in the spring and summer, the water ice becomes 'visible' to the neutron and gamma ray detectors onboard Odyssey. Left image mosaic shows the northern hemisphere of Mars as seen by the Viking orbiter. The second image shows the concentration of water ice (in blue) observed by Odyssey during the northern winter, when much of it is buried by carbon dioxide frost. Third image shows the water ice that is revealed during the Martian summer.*

JPL's Mars Odyssey spacecraft is revealing new details about the intriguing, dynamic character of the frozen layers now known to dominate the high northern latitudes of Mars. The implications have a bearing on science strategies for future missions in the search of habitats.

Odyssey's neutron and gamma ray sensors tracked seasonal changes as layers of "dry ice" (carbon-dioxide frost or snow) accumulated during northern Mars' winter and then dissipated in the spring, exposing a soil layer rich in water ice, the Martian counterpart to permafrost. Researchers used measurements of Martian neutrons, combined with height measurements from the laser altimeter on another JPL spacecraft, Mars Global Surveyor, to monitor the amount of dry ice during the northern winter and spring seasons.

"Once the carbon-dioxide layer disappears, we see even more water ice in northern latitudes than Odyssey found last year in southern latitudes," said Odyssey's Dr. Igor Mitrofanov of the Russian Space Research Institute, Moscow, lead author of a paper in the June 27 issue of the journal Science. "In some places, the water-ice content is more than 90 percent by volume." Mitrofanov and co-authors used the changing nature of the relief of these regions, measured more than two years ago by the Global Surveyor's laser altimeter science team, to explore the implications of the changes.

Odyssey's trio of instruments, the gamma ray spectrometer suite, can identify elements in the top meter (3 feet) or so of Mars' surface. Mars Global Surveyor's laser altimeter is precise enough to monitor meter-scale changes in the thickness of the seasonal frost, which can accumulate to depths greater than a meter. The new findings show a correlation in the springtime between Odyssey's detection of dissipating carbon dioxide in latitudes poleward of 65 degrees north and Global Surveyor's measurement of the thinning of the frost layer in prior years.

"Odyssey's high-energy neutron detector allows us to measure the thickness of carbon-dioxide at lower latitudes, where Global Surveyor's altimeter does not have enough sensitivity," Mitrofanov said. "On the

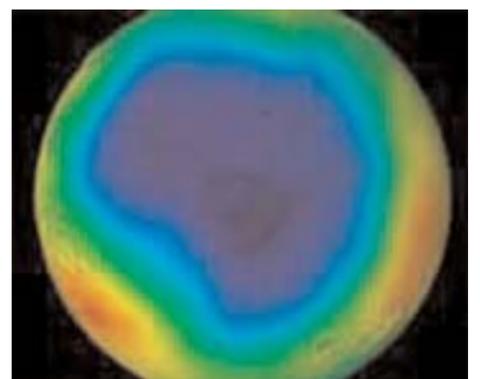
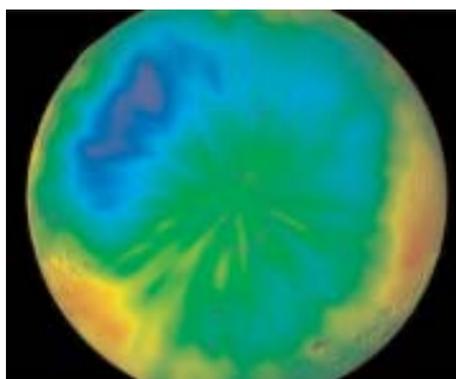
other hand, the neutron detector loses sensitivity to measure carbon-dioxide thickness greater than 1 meter (3 feet), where the altimeter obtained reliable data. Working together, we can examine the whole range of dry ice snow accumulations."

"The synergy between the measurements from our two 'eyes in the skies of Mars' has enabled these new findings about the nature of near-surface frozen materials, and suggests compelling places to visit in future missions in order to understand habitats on Mars," said Dr. Jim Garvin, NASA's lead scientist for Mars exploration.

Another report, to be published in the Journal of Geophysical Research-Planets, combines measurements from Odyssey and Global Surveyor to provide indications of how densely the winter layer of carbon-dioxide frost or snow is packed at northern latitudes greater than 85 degrees. The Odyssey data are used to estimate the mass of the deposit, which can then be compared with the thickness to obtain a density. The dry ice layer appears to have a fluffy texture, like freshly fallen snow, according to the report by Dr. William Feldman of Los Alamos National Laboratory, N.M., and 11 co-authors. The study also found once the dry ice disappears, the remaining surface near the pole is composed almost entirely of water ice.

"Mars is constantly changing," said Dr. Jeffrey Plaut, Mars Odyssey project scientist at JPL. "With Mars Odyssey, we plan to examine these dynamics through additional seasons, to watch how the winter accumulations of carbon dioxide on each pole interact with the atmosphere in the current climate regime."

Mitrofanov's co-authors include researchers at the Institute for Space Research, Russian Academy of Science, Moscow; Massachusetts Institute of Technology; NASA Headquarters, Washington, D.C.; Goddard Space Flight Center, Greenbelt, Md.; and TechSource, Santa Fe, N.M. Feldman's co-authors include researchers at New Mexico State University; Cornell University, Ithaca, N.Y.; and Observatoire Midi-Pyrenees, Toulouse, France.



# News Briefs

## Stardust trajectory modified

JPL's Stardust spacecraft on June 18 successfully completed the mission's third deep-space maneuver. This critical maneuver modified the spacecraft's trajectory, placing it on a path to encounter and collect dust samples from comet Wild 2 in January 2004.

Stardust fired its eight, 4.4-newton (1-pound) thrusters for 1,456 seconds, changing the comet sampler's speed by 34.4 meters per second (77 mph).

"It was a textbook maneuver," said JPL's ROBERT RYAN, Stardust's mission manager. "This was the last big burn we will have prior to our encounter with Wild 2, and it looks very accurate."

Stardust has traveled more than 2.9 billion kilometers (1.8 billion miles) since its February 1999 launch. In January 2004, Stardust will fly through the halo of dust that surrounds the nucleus of comet Wild 2. The spacecraft will return to Earth in January 2006 to make a soft landing at the U.S. Air Force Utah Test and Training Range. Its sample return capsule, holding microscopic particles of comet and

interstellar dust, will be taken to the planetary material curatorial facility at Johnson Space Center for examination.

## Women's Club offers kids' activities

The Caltech Women's Club is sponsoring two summertime activities for children from 10 a.m. to noon at Tournament Park in Pasadena.

Preschool Playgroup for ages 1-4 is held Tuesdays. The group offers crafts, song and story time, free play and exploratory learning, and also offers a supportive environment for parents and caregivers to observe and interact with their child in learning and at play. For more information, contact JULIA KENNEDY at (626) 792-7808 or julia@astro.caltech.edu.

Wednesdays in the Park offers conversation and camaraderie for grownups and playtime for infants through school-age children. This is a great way to meet people and share practical information about services and activities available for families. For more information, contact KATIE CLARK at (626) 403-7163 or ktclark@caltech.edu.

It only skippered the seas of space for a mere three months, but just as Gilligan's "three-hour tour" has continued on in syndication for decades, a salty satellite launched to study the oceans 25 years ago last month by JPL is living on through the many missions it has spawned.

Seasat's tale began in the 1970s when a group of engineers and scientists at JPL began work on an experimental satellite to study Earth and its seas, using technologies being developed to study other planets. The satellite's trip started from the not-so-tropic port of Vandenberg Air Force Base on June 26, 1978, aboard an Atlas-Agena rocket. The five "passengers" that set sail that day aboard Seasat included three prototype radar instruments and two radiometers.

Seasat's "weather" got rough 106 days later, when a malfunction unexpectedly ended the mission. Yet during its brief life Seasat collected more information about the oceans than had been acquired in the previous 100 years of shipboard research. It established satellite oceanography and proved the viability of imaging radar for studying our planet. Most importantly, it fathered many subsequent Earth remote sensing satellites and instruments at JPL and elsewhere that track changes in Earth's oceans, land and ice. Its advances were also subsequently applied to planetary exploration.

"Seasat served to vault Earth science to where it is today, advancing the study of such diverse disciplines as land- and sea-surface topography, ice sheet and land movement, and sea-surface winds," said JPL research scientist Dr. Frank Carsey. "It greatly advanced our understanding of the El Niño and La Niña climate phenomena. It's astonishing to think such a short mission could have such a tremendous impact."

"Seasat had a major impact on future mission planning at NASA and elsewhere," said Seasat sensor manager Tony Spear. "Its prototype radars and altimeter were precursors for many of today's more powerful Earth observation satellites."

Seasat's experimental instruments included a synthetic aperture radar, which provided the first-ever highly detailed radar images of ocean and land surfaces from space; a radar scatterometer, which measured near-surface wind speed and direction; a radar altimeter, which measured ocean surface and wave heights; and a scanning multichannel microwave radiometer measuring surface temperatures, wind speeds and sea ice cover.

In oceanography, Seasat gave us our first global view of ocean circulation, waves and winds, providing new insights into the links between the ocean and atmosphere that drive our climate. For the first time, the state of an entire ocean could be seen all at once. Seasat's altimeter mapped ocean topography, allowing scientists to determine ocean circulation and heat storage. The data also revealed new information about Earth's gravity field and the topography of the ocean floor. Since Seasat, advanced ocean altimeters on JPL's Topex/Poseidon and Jason missions have been making precise measurements of sea surface height used to study climate phenomena such as El Niño and La Niña. Ocean altimetry has since become part of weather and climate models, ship routing, marine mammal studies, fisheries management and offshore operations.

Seasat's synthetic aperture radar monitored the global surface wave field and revealed a wide spectrum of oceanic and atmospheric phenomena from current boundaries to eddies.

Seasat's scatterometer gave us our first real-time global map of the speed and direction of ocean winds, which drive waves and currents and are the major link between the ocean and atmosphere. The technology was later used on JPL's NASA Scatterometer and is now flying on JPL's Quikscat spacecraft and its SeaWinds instrument on Japan's Midori 2 spacecraft. The data help forecasters predict hurricanes, tropical storms and El Niños.

Seasat's oceanographic mission also studied sea ice and its role in controlling Earth's climate. Its synthetic aperture radar provided the first high-resolution images of sea ice, measuring its movement, deformation, age and thickness. Today, synthetic aperture radar and scatterometers are both used to monitor Earth's ice from space.

Beyond the oceans, Seasat's synthetic aperture radar provided spectacular images of Earth's land surfaces and geology. Seasat data was used to pioneer radar interferometry, which can pinpoint land surface changes such as those created by earthquakes, and to measure land surface topography. Three JPL Shuttle Imaging Radar experiments flew on the space shuttle in the 1980s and '90s. In 2000, JPL's Shuttle Radar Topography Mission used the technology to create the world's most detailed topographic measurements of more than 80 percent of Earth's land surface. Beyond Earth, the technology was used on JPL's Magellan mission, which mapped 99 percent of the previously hidden surface of Venus, and the Titan radar onboard the JPL-built and managed Cassini orbiter to Saturn.

For more information on Seasat, visit <http://www.jpl.nasa.gov/flash/seasat>.



Durch Slager / JPL Photolab

JPL Director Dr. Charles Elachi, left, chats with fellow Seasat veterans Tony Spear, John Gerpheide and Ted Pounder during the mission's 25th anniversary celebration in June.

# Special Events Calendar

## Ongoing Support Groups

**Alcoholics Anonymous**—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

**Caregivers Support Group**—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). Call the Employee Assistance Program at ext. 4-3680.

**Codependents Anonymous**—Meets at noon every Wednesday. For more information, call Occupational Health Services at ext. 4-3319.

**Gay, Lesbian and Bisexual Group**—Meets the first Friday and third Thursday of the month at noon in Building 111-117. For more information, call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

**Parents Group for Children With Special Needs**—Meets the second Thursday of the month at noon in the Wellness Place, Building 167-111.

**Working Parents Support Group**—Meets the third Thursday of the month at noon in Building 167-111. For more information, call the Employee Assistance Program at ext. 4-3680.

## Thursday, July 3

**Caltech Ballroom Dance Club**—Summer tango classes begin an eight-week session in Dabney Lounge from 7:30 to 9 p.m., with practice time afterwards. Beginners are welcome. Cost: \$8 per lesson, \$7 if all lessons are prepaid at the start of the series.

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

## Tuesday, July 8

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

## Tues.-Wed., July 8-9

**Investment Advice**—TIAA/CREF representatives will be available for one-on-one counseling. For an appointment, call (877) 209-3140, ext. 2614, or visit <http://www.tiaa-cref.com>.

## Wednesday, July 9

**JPL Amateur Radio Club**—Meeting at noon in Building 238-543.

**JPL Toastmasters Club**—Meeting at 5 p.m. in the 167 conference room. Call Debbie Llata at ext. 3-3690 for information.

## Thursday, July 17

"Staying on Track in a Market Downturn"—Scott Budde, TIAA/CREF's director of equity portfolio analytics, will appear in the 180-101 conference room from 11 a.m. to 12:30 p.m. to address concerns about market volatility and ways to avoid overreacting to it. Areas of discussion will include initial reactions to market fluctuations, when and what to act on, and positive opportunities during down markets. He will also review some of the new tax laws. Seating is limited. Register for the seminar by calling Shelia Kowalski at (877) 209-3140, ext. 2623.

## Thu.-Fri., July 17-18

**Von Kármán Lecture Series**—Robert Hogg, a robotics engineer in JPL's Mobility Systems Concept Development Section, and Brett Kennedy, task manager for the Limbed Excursion Mobile Utility Robot, will present "Searching and Crawling: A Few JPL Research Robots" at 7 p.m. Thursday in von Kármán Auditorium and Friday in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Thursday's lecture will be webcast at <http://www.jpl.nasa.gov/events/lectures/jul03.html>. For more information, call Public Services at ext. 4-0112.

## Friday, July 18

**TIAA/CREF Enrollment Meeting**—This workshop at noon in Trailer 1720-137 is designed to assist employees newly eligible for the retirement plan with selection of investment options and the completion of enrollment forms.

## Ongoing

The Social Security representative will no longer offer one-on-one counseling appointments on Lab. Call the Benefits Office at ext. 4-3760 to arrange a telephone counseling appointment.

# Bon appetit!



Bob Brown / JPL Photolab

Dedicating the newly remodeled 167 cafeteria are, from left, Fred McNutt, chief financial officer and director for Business Operations and Human Resources; Andre Mallie, manager of Caltech Dining Services; Deputy Director Gene Tattini; and Nancy Kapell of JPL's Employee Services and Recognition Group.

## This month in aeronautics and astronautics history

- 7.26.63** **40 years ago** • Syncom 2, the first geosynchronous satellite, was launched.
- 7.28.73** **30 years ago** • NASA's Skylab 3 was launched. The mission would continue for more than 59 days, completing 858 Earth orbits.
- 7.04.97** **6 years ago** • Cushioned by airbags, JPL's Mars Pathfinder spacecraft landed successfully in an ancient flood plain in Mars' northern hemisphere known as Ares Vallis.
- 7.21.98** **5 years ago** • JPL's Galileo spacecraft executed its Europa 16 flyby.



# 'One NASA' responds to Columbia recovery



This article, the fifth in a series that describes how NASA centers are realizing

the 'One NASA' goal, was provided by the Johnson Space Center.



NASA Administrator Sean O'Keefe (left); astronaut John Casper, director of NASA's Safety, Reliability, and Quality Assurance Office; and David Whittle, chairman of the Mishap Investigation Team, discuss the collection and cataloging process of Columbia debris at Barksdale Air Force Base, Shreveport, La.



Teams walked very close together to ensure all ground in the search area was covered.

The NASA family came together as cohesively as it ever has in East Texas this spring as workers from virtually every NASA center helped organize and conduct the search for clues to Columbia's demise. "In all my years with NASA, I have never seen this agency's people band together as effectively as they have in responding to this tragedy," said Jerry Ross, who took turns with fellow astronaut Dom Gorie to coordinate the day-to-day search efforts. "These people worked very long days for weeks at a time away from home without fighting, complaining or shirking their duty. They set an example that our entire country should strive to emulate."

**In all my years with NASA, I have never seen this agency's people band together as effectively as they have in responding to this tragedy.**

Based in Lufkin, Corsicana, Palestine, Nacogdoches and Hemphill, Texas, as well as Shreveport, La., employees from NASA and its contractors worked shoulder-to-shoulder with friends from the Federal Emergency Management Agency, Environmental Protection Agency, U.S. Forest Service, Texas Forest Service and others. In all, more than 90 local, state and federal organizations responded to the challenges of searching a 10-mile-wide, 240-mile-long corridor in East Texas and West Louisiana by land, air and water.

They stretched those efforts as far west as the California coast, using ingenious methods to predict where shuttle material might have landed as Columbia broke up during re-entry on February 1.

And then they shipped the pieces back to Kennedy Space Center, where their colleagues began reassembling them and working with the Columbia Accident Investigation Board to determine the cause of the accident. Many of the NASA workers were friends of the seven astronauts lost after their ambitious 16-day science mission. All of those involved, whether they were in Mission Control on that fateful day or had no previous connection to America's space program, dedicated themselves to the cause of "bringing Columbia home."

"While we are saddened by the events that have led to this activity, we are all pleased with the cooperation, coordination, dedication and hard work that are being exhibited," said Johnson Space Center's Allen Flynt, one of three NASA Oversight Managers directing efforts from the Lufkin Command Center. Flynt took turns overseeing the effort with Dave King of Marshall Space Flight Center and Mike Rudolphi of Stennis Space Center. "We're also thankful for the new friendships we've forged as our various centers, agencies, organizations and personnel have come together to perform this difficult task."

As of the start of April, about 30 percent of Columbia, by weight, had been recovered and King predicted that some 43 percent of the shuttle would be recovered by the time the search concludes. Citizens and local officials will be reporting discoveries for months, possibly years to come, and NASA will respond as one to bring them home.

"We owe this to our seven brave colleagues who died on their way home," said JSC's Dave Whittle, who led the initial Mishap Response Team mobilized just minutes after Mission Control declared a contingency and spent time both the Barksdale Air Force Base, La., and Lufkin Command Centers. "We owe this to the children of this world who will pick up the torch and carry it into the future."

## JPL's Kapell aids recovery efforts



JPL's Nancy Kapell, Boeing's Steven Bradford (left) and an unidentified U.S. Forest Service worker joined the ground search teams.

When William Readdy, NASA's associate administrator for space flight, asked representatives of the agency's Space Flight Awareness program to help support the Space Shuttle Columbia recovery effort in the spring, Nancy Kapell of JPL's Employee Services and Recognition Group gladly made the trip to east Texas.

Space Flight Awareness liaisons from five NASA centers as well as from industry partners supported scores of firefighters and search team members from federal and local agencies—as well as the communities in which the searches took place—with outreach efforts that show "NASA is a family," Kapell said.

The 18 Space Flight Awareness members split up into four areas that served as command posts, providing a human face on the Columbia tragedy that helped to maintain morale and motivation among the volunteers and rescue workers. Kapell made weeklong trips in March and April to the Palestine, Texas, area.

"It was a wonderful experience, one I'll remember my whole life," Kapell said.

"The guys out on the line worked 10 hours a day, seven days straight," she added. Add to that the fact that prior to a Palestine warehouse becoming available for camping, they had pitched tents inside a rodeo stadium.

Kapell described how two crews of 10 each would spread out about 10 feet apart, walking slowly and carefully to search a quadrant of land.

"They were working in very tough conditions—the search areas were rural, some containing heavy brush, thick briar and swamp," Kapell said. "The weather ranged from very cold and rainy to sweltering hot. They also had to contend with poisonous spiders, snakes and scorpions."

When Kapell and her counterparts thanked the workers for their heroic efforts with gifts of NASA memorabilia, they in turn said, "No, we thank you for allowing us to participate in this," she said.

"They were just thrilled to be able to meet an astronaut, and excited to find out about the space program."

Besides Kapell's representing JPL, Space Flight Awareness representatives' from Marshall Space Flight Center, Johnson Space Center, Kennedy Space Center and Stennis Space Center were on hand. In addition, the Space Flight Awareness program was represented by several NASA industrial partners that make space shuttle components.

The Space Flight Awareness outreach activities included traveling to area elementary and high schools, where an astronaut came along to speak to students.

"The community was very supportive of the rescue effort," Kapell said. "There were a lot of donations from local businesses, and it was wonderful seeing everyone work together on a common goal. This was a good way for us to be ambassadors to the community."

## Passings

**RONALD BIGELOW**, 65, retired from Section 393, died May 5 at his home in La Crescenta.

Bigelow worked at the Lab from 1974 to 1999. He is survived by his wife, Joyce, sons Kenneth and Kevin, daughter Donna Becker, and five grandchildren.

Memorial services were held May 9 at Forest Lawn in Glendale.

## Retirees

The following JPL employees retired in June:

David Elliott, 46 years, Section 354; C. Joy Young, 39 years, Section 243; Joe Foster, 36 years, Section 368; Sandra Dewegeli, 31 years, Section 252; Gregor Edwards, 25 years, Section 245; Marge Marquez, 24 years, Section 241; Quiesup Kim, 23 years, Section 387; Albert Kuchler, 22 years, Section 512; Guy Spitale, 20 years, Section 810; Terry Scharton, 16 years, Section 352; John Holbrook, 13 years, Section 387.

## Letters

I wish to thank the ERC for the lovely plant after the death of my father, Jerry Laborde. I also thank my coworkers for their support during his illness. My father met many of you when visiting JPL over the years. JPL's most famous images adorned his office, and he could tell the story behind each one. He kept his group of international colleagues up-to-date on JPL missions. A successful engineer and manager, he thought that NASA saved the impossible jobs for JPL. The work we do here, and his connection to it, made him proud and brought him great pleasure. I am glad we were able to give him that.

Greg LaBorde

My family and I are so grateful for your many expressions of sympathy and flowers following the recent death of my son, Christopher. Your kind words and deeds have been a great source of comfort to us.

Sincerely, Marion Stein

I wish to thank my friends at JPL for their prayers and thoughtfulness on the passing of my father, Chuck. And thank you, JPL, for the beautiful plant.

Mark Koehler

I would like to extend my heartfelt thanks to all my colleagues here at the Lab who sent their condolences and sympathies through comforting words, flowers and plants to me and my family on the recent passing of my mother. They lifted our spirits and confirmed my belief that my family is part of the larger JPL family. Thanks to you all for your kind thoughts and best wishes.

Kris Koliwad

## Classifieds

### For Sale

AQUARIUM, 35-gal., glass Eclipse tank with hood, light, heater, air pump, filter, no stand, \$75/obo. 626/836-4960.

ARMCHAIR, English antique, \$500; AREA RUG, gray & peach, 6 x 9, \$150; CHINESE FAN, large and decorative, golden, 68 x 40, \$75; DESK, glass top, modern design, 30 x 63, \$150; KITCHEN TABLE, wood, 30 x 54, \$50; CROSS COUNTRY SKIS, Fisher Crown, 1.90, as new, \$90; sculptures, Lalique; framed prints, bookcases and more. 310/278-4387.

ARMOIRE, Rustic Pine, 39"L 25"W 57"H, exc. cond., great for TV or storage, \$300/obo. 249-0528.

ART, R.C. Gorman signed print, "Woman in Orange," circa 1977, call for e-photo; AROMATHERAPY SPHERE, by Body Basics, new, \$15. 626/398-4960.

ART WORK, Salvador Dali print "The Quest," 58 of 300, aquatint hand-colored etching, printed in 1981, appraised at \$1,400 in Feb. 1986, e-mail picture available, sell for \$2,500/obo. 661/290-2892.

BASS, Fender Squire2 Precision, black with white pick guard, hard case included, Peavey TKO bass amp, Scorpion equipped, both in exc. cond., \$200/bass, \$100/amp. 687-3766.

BUNKBED, Ikea, "Gutvik," solid pine, lacquered, hardly used, \$125. 395-6804, leave msg.

CARD SHUFFLER, Johnson, collectible, all-metal construction with the exception of the friction wheels which drive the cards and the carved-wood dowel handles, stands -6" handle-high, and -9" by 6", flanges and handle inclusive, \$35; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, \$85; DIET TAPES, Jenny Craig, set of 14, \$50. 790-3899.

CHARGER/CRADLE for Handspring PDA, extra cradle for home or work for your PDA, \$25. 626/395-2590, Mike.

CHESS COMPUTER, Saittek Cosmic Touch Screen Travel, endorsed by Kasperov, small, electronic hand-held LCD with touch sensitive screen, brand new, in blister pack, sells on Amazon.com for \$59.99 and at Sharper-image.com for \$99.95, will sell for \$50/even. 323/842-2042, Zack.

CLOTHING, Jones of New York 2 pc./jacket & slacks, fully lined and slash pockets, new with tags, size 12, dark olive, retail \$200+, \$95/obo; 2 pc./jacket & slacks, Rena Rowan for Saville, white, lined, size 14, never worn; pockets still stitched, \$35/obo. 626/398-4960.

COFFEE MAKER, Braun, 10-cups, white/black, like new, \$30/obo. 626/791-6101.

COFFEE TABLE, brown/black modern Yin-Yang design, \$25. 626/798-6588.

COFFEE TABLES, 2, antique gold ornate pedestal, w/cream marble tops, 24" diameter, good cond., 60.s. \$50/each. 249-1523.

COMPUTER DESK, white, 66" long with 2 file drawers, supplies cabinet, & keyboard drawer, exc. condition, \$100/obo. 790-5024.

DESK, cherry, Queen Anne legs, 3 drawers, exc. cond., \$120. 626/798-6588.

DINING ROOM SET, table, leaf and 6 upholstered chairs, \$125. 626/447-6423.

DINING ROOM TABLE, oak Craftsman/w/4 chairs, \$375; KITCHEN TABLE, oak; glass & wood coffee table, \$75/ea. 626/403-2503.

DINING SET, 7 piece, 3 ft. x 5 ft., pine with painted accents, exc. cond. 249-0528.

DVD PLAYER, Progressive Scan Toshiba SD-3750, like new, features: 3:2 digital cinema progressive conversion, enhanced audio mode/ dialog expander, 540-line output, 4x digital picture zoom, CD/DVD text display for titled discs, plays audio CD, CD-R, CD-RW, DVD, video CD, cheapest price on web is \$199.95, sacrifice for \$100; ORGAN, Yamaha 415 electronic organ w/13 pedals, 3 keyboards, 144 rhythm patterns, \$2,000. 790-3899.

ENTERTAINMENT CENTER, light oak, lighted glass cabinets, \$300. 661/254-7443.

EXERCISE MACHINE, Cardioglide, with electronic readouts, like a rowing machine on a bicycle, like new, orig. cost \$160, sell for \$80/obo. 626/794-0572.

EXERCISER, SportRider, w/monitor for time, reps, calories, vg cond., \$25; ENCYCLOPEDIA Britannica 1993 Sp. Ed, \$225; children's Encyclopedia Britannica \$75. 500-9163, eve.

EXERCISE STEPPER, Precore, low-impact climber 714/718e, w/owner's manual, good-hardly used cond., \$50/obo. 249-1523.

FURNITURE: black leather, \$150/pair; stainless steel tubular leather, \$150/pair; love-seat, \$60; entertainment center, \$75; cocktail table, 39" octagonal glass, \$100. 957-8221.

FUTON, queen size, oak frame, with mattress and cover, exc. shape, http://photos.yahoo.com/bc/aysefranko/1st?.dir=/Futon&src=ph&view= for pictures, \$150/obo. 626/791-0585.

GOLF CLUBS, women's Ping Eye2, irons 3 through wedge, \$200/obo. 248-1102.

GUITAR PACKAGE, Fender Stratocaster Squier Series, exc. cond., barely used, red and white, incl. hard shell case, Crate GX-15 amp, 10-ft. Pro Co Music Mover cable, beginners book, and Tremolo Arm Whammy Bar, photo w/ad at JPL Store, \$350/obo. 846-1280, Nancy.

HOME GYM, Body-Solid EXM-1500S, see at www.bodysolid.com, \$350. 957-5382.

HOUSEHOLD ITEMS: washer (a9800) and dryer (dg 9800), Maytag, \$600; lawnmower, Honda HR2155XA, \$300; trimmer, Echo SRM 2100, \$100; blower, Echo PB1000, \$100; chainsaw, McCulloch 16" electric, \$40; pole pruner, \$25; rug, black/white, \$75; aquarium, 60 gal. acrylic, w/stand, \$180; ficus plant, 6' indoor, \$40. 957-8221.

KARAOKE MACHINE, exc. cond., dual-cass., equalizer, echo, other, \$20; cassettes also avail.; VACUUM, Eureka, 5 yrs. old, Excalibur model, 12 amps, \$15; MICROWAVE, Toshiba, large, works very well, w/orig. microwave cookbook, \$20; pictures avail. 661/263-1795.

LAWN MOWER, McLane, gasoline, reel type, recently sharpened by shop, \$195; EDGER, gasoline, \$145. 626/585-8213.

LOFT BED, w/desk, bookshelves, and mattress, Ikea; like-new cond., over \$700 new, matching dresser also avail., best offer. 714/524-5367.

MOUNTAIN BIKE, Trek 8000, red, good cond., \$500. 626/379-9513.

MOVING SALE: coffee tables, oak 4' x 2', \$20; 2' x 1.5', \$15; table, glass & brass, w/ 5 chairs, \$130; dining table, solid oak, w/6 chairs, \$175; desk, steel case, \$15; 2-drawer lateral files, birch, \$75/ea; office/conference chairs, \$40. 952-8163.

PIANO, Schafer and Sons, great student upright, beautiful brown, exc. cond., bench included, \$/N 150899, will provide e.picture upon request, \$865. 909/621-9722. dk.karmon@verizon.net.

PLAYHOUSE/TENT, Winnie the Pooh, like new, \$15; STATIONARY ENTERTAINER, Kolcraft Rock-It, lots of fun for baby, exc. cond., \$15; pictures available. 661/263-1795.

SAMPLE CASES, 3, multiple compartment, stacked on wheels, good for clothing samples (e.g. shirts, etc.), light instrumentation, or perhaps drums, \$40/ea. 785-7613.

SPA COVER, 8' x 8', vinyl, 2 yrs. old, redwood color; exc. cond., \$100. 626/359-7666.

STROLLER, Spectrum twin side-by-side, \$10. 626/570-1769, Brian.

TREES: red banana plant 5' tall, \$60/obo; fish tail, 6' tall, \$80 obo; ficus, >10' tall, braided, in 30" plastic pot, \$250/obo; ceram-

ic bowl, gray, 2' diameter with planted geraniums, \$40/obo. 626/791-6101.

### Vehicles / Accessories

CAR ROOF CARRIER SYSTEM, Yakima, two bicycle, 2 x 48" roundbars; 4 double cross towers; 2 upright bicycle carriers with locking arms, extra lock devices and instructions, will provide e.pictures upon request, all for \$155. 909/621-9722 or dk.karmon@verizon.net.

'80 DATSUN (NISSAN) 280ZX coupe, 5-spd. manual, blue/silver, grand lux. pkg., 139,000 miles, generally gd. cond. but needs some work, orig. owner, best offer. 626/577-8107.

'90 DODGE Dakota, 4 x 4, automatic, short bed, a/c, \$3,000. 760/868-4788, call Friday, Saturday or Sunday.

'99 FORD Contour SVT, only 37,900 km. exc. cond. very fast, exc. sound syst., new regist., \$9,600. 626/599-8611.

'95 FORD Taurus SHO Limited, dark green, automatic, powerful engine, 89K, loaded, leather interior, AM/FM/cassette/CD, sunroof, spoiler, no accidents, \$4,200/obo. 626/780-2427.

'92 FORD Thunderbird, light blue, 81,365 miles, overall gd cond., requires some mechanical work, idles high, \$3,000/obo. 310/812-0388, day or 310/320-2631, eves, Winona.

'02 HONDA Civic LX sedan, white, manual transmission, only 8,455 miles, Kenwood 10-disc CD changer, power windows/locks/steering, etc., has extended warranty, \$13,000/obo. 626/441-0150, Danny.

'98 HONDA Accord, 4-door sedan, automatic, a/c, front and driver airbag, alarm, anti-lock brakes, bucket seats, cassette radio, cruise control, power locks/steering/windows, remote keyless entry, purple, interior gray, good engine, drives well, new brakes, 138,000 mi., \$6,150. 661/253-2053, evenings, or szia2001us@yahoo.com.

'96 HONDA Civic Dx Hatchback 2 dr., 4-cyl. 1.6 liter, 5 spd. manual, a/c, AM/FM/CD, black ext./ gray int., 135K miles, good cond., great gas mileage, \$3,600. 661/268-8609 or glrinas@yahoo.com.

'97 ISUZU pickup, auto, air, 140K mi., \$1,600. 957-3675.

'94 JEEP Grand Cherokee, 4 x 4, 115K mi., Infinity sound system, running board, roof rack, pwr. seats, 1 owner, recently tuned, excellent cond., \$4,000. 626/441-0150, Danny.

'88 JEEP Cherokee Chief, red, 4-wheel drive, clean interior and body, 30,000 miles on engine, transmission and transfer case, \$2,800. 626/359-7666.

'85 KOUNTRY Lite 5th wheel trailer, 30 ft., orig. owner, alum. frame, 13.5K btu a/c, side bath, microwave, new tires & water pump, sleeps 6, exc. cond., kitchen equip. included, \$5,300/obo. 626/963-5727.

'98 MAZDA MPV, 2-tone hunter green/champagne w/beige interior, keyless entry, AM/FM/ cass/cd, separate front and rear a/c, quad seating for 7, pwr. windows & locks, tilt, cruise, privacy glass, ABS brakes, etc., removable middle and rear seats for large cargo, 76K miles, \$2,500 under blue book, \$7,500/ obo. 714/903-6369.

'95 NISSAN Pathfinder XE, 4 x 4, V6, loaded, tow package, LoJack, 135K mi., \$5,900. 909/596-9007.

'92 NISSAN Maxima, burgundy, moon roof, a/c, stereo w/CD, power antennae, dash and car cover, vg cond., \$3,900/obo. 909/225-2323.

'91 OLDSMOBILE Silhouette minivan, auto, air, leather seats, rebuilt transmission, 145K mi., \$3,500. 957-3675.

'69 OLDSMOBILE Cutlass convertible, classic "Muscle Car," pwr. steering/windows, orig. Delco AM radio, new top, interior, too many items to mention, red w/black interior, see and drive. 952-1538 or tlynch41@aol.com.

'97 TOYOTA Camry 4 dr. LE sedan, white, 4 cylinder, vg cond., automatic, loaded, leather seats, tinted windows, 132K mi., \$6,000/obo. 714/508-7744.

'91 TOYOTA Corolla SR5, 2 dr., dark blue, am/fm/cassette, 100K mi., runs good, recently smogged and licensed, \$2,500/obo. 249-6565.

'02 VOLKSWAGEN Jetta, auto, moon roof, 5K mi., power door/windows, heated power mirror, blue, Monsoon sound system, \$13,995. 909/599-3230.

Wanted

BICYCLE TRAILER KID CARRIER, used to buy, InStep or other similar brand. 626/351-8643.

FEMALE SOFTBALL PLAYERS, with experience for JPL softball team for Monday nights, please contact Angel at 4-1471 or Rick at 4-5425.

PERSIAN RUG, used, 6 x 8 or bigger, reddish colors preferred. 626/844-9286.

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

Free

CLEAN FILL DIRT, 10 cu. yds. avail., haul as little or as much as you like, near Los Robles/Jackson, Pasa. 626/791-3103, dtrask6@its.caltech.edu.

MEDICAL SUPPLIES: hospital bed, electric wheelchair, walker, etc. 909/860-2192.

TURNTABLE, BSR, 1974, plays 33 1/3, 78 and 45 rpm, motor slow, needs home with capable tinkerer, parts avail. online. 626/794-1841, Claire.

Lost & Found

LOST: Medium-to-large black knit wool long-sleeve sweater, zip-up front, V-neck. Ext. 4-1176, Rob.

For Rent

ARCADIA, 2 bd., 1 ba., front unit of quiet 4 plex, fireplace, a/c, stove, laundry room, all new carpet, blinds, paint and ceiling fans, \$1,085. 909/594-0424.

BURBANK, 3 bd., 1 ba., with garage, private backyard, walk to shopping, schools,

excellent neighborhood, remodeled kitchen, hardwood floors, f/p, c/a, gardener paid, \$2,150. 952-1538. tlynch41@aol.com.

LA CANADA, 1 bd., off-street parking (1 car), ~2 mi JPL, tennis court access, water/gardener/trash included, no pets, single preferred, \$980. 952-1304.

MONTROSE, charming, small, 2-bd., 1-ba. home, f/place, paneling & hardwood floors in liv/din. rm., lg. fenced yard w/shade & fruit trees, residential neighborhood, avail. 8/1, \$1,325. 248-7499.

MONTROSE home, 2 bd., 1 ba., extra room, 2-car garage, yard, hardwood floors, fire-place, laundry provided, quiet, 4 min. to JPL, close to shopping areas, \$1,575. 248-5068.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beaut. interi- or, bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy LR w/FP, end unit, frml DR, hdwd. flrs., immac. cond., close to schls. \$1,750. 626/396-9024.

PASADENA, nice home in Upper Hastings Ranch, 3 bd., den, 2 ba., pool, spa and large yard, overlooking golf course, remodeled kitchen and baths, central air and heat, washer/dryer, refrigerator, 2 fireplaces, 1-year lease required, \$3,200 includes gardener and pool service, avail. 7/15. 626/351-9641.

ROSEMEAD, rooms, 1 bd., 1 ba., \$400-450, or 2 bd., 1 ba., \$850, JPL discount, share full kitchen, living room with hard floor and fireplace, wash/dry, a/c, yard, quiet, near groceries, shopping centers, and freeway 10 and Rosemead Blvd. 280-7987.

ROSEMEAD, independent house, 3 bd., 2 ba., JPL discount, full kitchen, living room with hard floor and fire place, wash/dry, a/c, yard, enclosed garage, quiet, near groceries, shopping centers, and freeway 10 and Rosemead Blvd., \$1,450. 280-7987.

SIERRA MADRE townhouse to share with Caltech alumna, 1,000 sq. ft. apt., large patio, 2 bd., 1.5 ba., quiet street, garage parking, washer/dryer, \$605 + 1/2 utils. 626/355-4838, Heather.

TUJUNGA, small 1 bd. guesthouse, on secure and priv. 3/4 acre w/fg. trees and city/mtn. view, 15 min./JPL, has storage, WD, rose garden, patio, fruit trees, and car port, \$875 includes util. 952-7980, Ann.

Real Estate

ALTADENA, 3 bd., 2 ba., 1,569 sq. ft., living rm., dining rm., fireplace, 7,016 sq. ft. lot, built 1960, \$500,000. 909/489-5536, Ray, foothillhome@msn.com.

HAWAII, vacation time share, Kauai, Pono Kai resort, Presidential Suite, \$9,500. 957-3675.

LAKE TAHOE, timeshare at the Ridge Tahoe, Cascade building, gorgeous 5-star resort; floating week in a 2 bd., 2 ba. with lock-off option (turns your one week into two); indoor recreation complex with pool, weight room, racquetball courts, restaurant and lounge; private gondola connects you to Heavenly Valley Ski Resort, beautiful winter and summer, \$13,999. 626/339-2204.

MT. WASHINGTON house, next to Glendale/Pasadena/Eagle Rock/Occidental College, 2,000 sq. ft., large custom 3 bd., 2.5 ba., 2-car garage, lots of storage, exc. Mt. Washington elementary school, 12 min./JPL, canyon view, quiet neighborhood, ask for JPL discount, \$429,000. 626/403 0446.

PASADENA, single fam. home, built 1980, liv. room, din. rm., family rm., fireplace, kitchen, 4 bd., 2 full ba., laundry area in 2-car attached garage, spacious patio, 1,465 sq. ft., 8,098 sq. ft. lot, central heat/air, \$399,000. 626/794-0572, B. Jetter, or 626/432-4625, Max.

VAN NUYS Walnut Gardens, spacious off-st. end unit townhouse; 2 bd. + loft., 1 ba. up-stairs, 1/2 ba. downstairs; vaulted ceilings, skylight, lg. liv. rm., formal dining area, balcony, 2 pools, spa, recreation room, gated parking area; only \$190,000. 822-4000, Carlos.

Vacation Rentals

BALBOA ISLAND, cute beach apt., fully furn. 2 bd., 1 ba., patio, washer/dryer, parking, sleeps 5, steps to bay, available weekly in July for \$1,200/week. 626/351-9641.

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

CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-1102.

HAWAII, Kauai condo, 1 bd., full kitchen, beach in Kapaa, near shops and restaurants, \$575 for 8 days/7 nights. 626/351-1532.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., Low Season rate \$105/nite/2, High Season rate \$120/nite/2, \$15/nite/add'l person. 949/348-8047, or jackandrandy@cox.net.

MAMMOTH, Snowcreek, 2 bd., 2 ba., +loft, sleeps 6-8, fully equipped kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/view to mtns., Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455 or valerie@gps.caltech.edu.

OCEANSIDE condo, fully furn., 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, beautiful beachside setting, BBQ/pool/spa/game rm., great ocean view, easy walk to pier and restaurants, slps. 8, available weekly or monthly. 909/981-7492, Darlene; dfhaug@yahoo.com.

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

'01 PACE ARROW 34-foot RV, queen bed/sofa bed/dinette bed, monthly rentals only, you pay insurance & gas, JPL employees only, no smoking or pets, \$4,000 in advance + \$1,000 sec. deposit, tahoemike@earthlink.net. 530/525-7334.

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

VENTURA beach house, 3 bd., 1 full ba., near Marina Park, with TV, VCR, CD, washer/dryer, enclosed landscaped backyard with covered porch and sun deck, BBQ, short walk to beach on private rd. 248-0521.

JPL'S ONLINE NEWS SOURCE



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I n s i d e

July 18, 2003  
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## Opportunity knocks, enters orbit

Second Mars rover  
on its way to a  
Jan. 25 landing

By Guy Webster

*NASA launched its second Mars Exploration Rover, Opportunity, in the evening of Monday, July 7, aboard a Delta II launch vehicle whose bright glare briefly illuminated Florida Space Coast beaches.*

Opportunity's dash to Mars began with liftoff at 8:18 p.m. Pacific time from Cape Canaveral Air Force Station.

The spacecraft separated successfully from the Delta's third stage 83 minutes later, after it had been boosted out of Earth orbit and onto a course toward Mars. Flight controllers at JPL received a signal from Opportunity at 9:43 p.m. Monday PDT via the Goldstone, Calif., antenna complex of the Deep Space Network.

All systems on the spacecraft were operating as expected, reported JPL's Richard Brace, Mars Exploration Rover deputy project manager.

"We have a major step behind us now," said Project Manager Pete Theisinger. "There are still high-risk parts of this mission ahead of us, but we have two spacecraft on the way to Mars, and that's wonderful."

NASA Associate Administrator for Space Science Dr. Ed Weiler said, "Opportunity joins Spirit and other Mars-

bound missions from the European Space Agency, Japan and the United Kingdom, which together mark the most extensive exploration of another planet in history. This ambitious undertaking is an amazing feat for Planet Earth and the human spirit of exploration."

Two days after launch, NASA announced that Opportunity had successfully reduced its spin rate as planned and switched to celestial navigation using a star scanner.

Prior to the July 9 maneuver, Opportunity was spinning 12.13 rotations per minute. Onboard thrusters were used to reduce the spin rate to approximately two rotations per minute, the designed rate for the cruise to Mars. After the spinning slowed, Opportunity's star scanner found stars that are being used as reference points for spacecraft attitude. One of the bright points in the star scanner's first field of view was Mars.

All systems on the spacecraft are in good health. As of July 10, Opportunity has traveled 6.6 million kilometers (4.1 million miles) since its July 7 launch. The Mars Exploration Rover flight team at JPL is preparing to command Opportunity's first trajectory-correction maneuver, scheduled for July 18.

Opportunity's twin, Spirit, also continues in good health on its cruise to Mars. As of July 10, it will have traveled 82.6 million kilometers (51.3 million miles) since its June 10 launch.

Opportunity is scheduled to arrive at a site on Mars called Meridiani Planum on Jan. 25, 2004, Universal Time (evening of Jan. 24, Eastern and Pacific times), three weeks after Spirit lands in a giant crater about halfway around the planet. JPL's Mars Global Surveyor orbiter has identified deposits at Meridiani Planum of a type of mineral that usually forms in wet environments. Both rovers will function as robotic geologists, examining rocks and soil for clues about whether past environments at their landing sites may have been hospitable to life.

For more information on the mission, visit <http://mars.jpl.nasa.gov/mer>.

Left to right: Bill Bensler, Grace Tan-Wang, Andrew Makovsky and Saina Ghandchi view Opportunity launch in Building 230.



## Terrestrial Planet Finder concepts selected

*Where did we come from? Are we alone?*

**T**he Terrestrial Planet Finder mission seeks to answer these questions as part of NASA's Origins Program, a series of missions to study the formation of galaxies, stars and planets, and to search for life elsewhere in the universe.

It may seem hard to believe now, but until 1995, there was only one known solar system—the one we live in. Since then, scientists have discovered indirect evidence for more than 100 planets orbiting other stars, suggesting that there may be untold numbers of planetary systems. To date, the existence of such planets has been inferred primarily by careful observations of the periodic motions of their parent stars resulting from the gravitational pull of the orbiting planets. Furthermore, these planets are not Earth-like but rather are very massive bodies orbiting very near the stars.

Astronomers and planetary scientists are keenly interested in directly detecting planets by observing and characterizing reflected or emitted light from them and finding out whether there may be planets like the Earth and capable of harboring life. Thus the excitement is building in anticipation of NASA's Terrestrial Planet Finder mission, managed by JPL.

Just last week European astronomers announced the discovery of seven new planets orbiting other stars, bring-

ing to approximately 115 the total number of known extra-solar planets. Six of the new planets orbit stars not previously known to harbor planets, while the seventh orbits a star where another planet had been detected earlier.

In another recent discovery, British astronomers, working with Australian and American colleagues, have discovered a planet similar to Jupiter in mass, circular orbit and distance from its parent star, HD 70642, which is very like our own Sun. Among the 100 found so far, this system is the one most similar to our solar system.

"Most of the systems found so far with very massive planets close to the central star are not places we would expect to find Earths," said Terrestrial Planet Finder Project Manager Dan Coulter. "The exciting thing about the HD 70642 system is that it shows there are systems similar to our own out there where TPF might find something very interesting."

As part of its quest to find Earth-sized planets around stars and look for telltale chemical signatures of life, NASA has chosen two mission architecture concepts for further study and technology development for the Terrestrial Planet Finder mission.

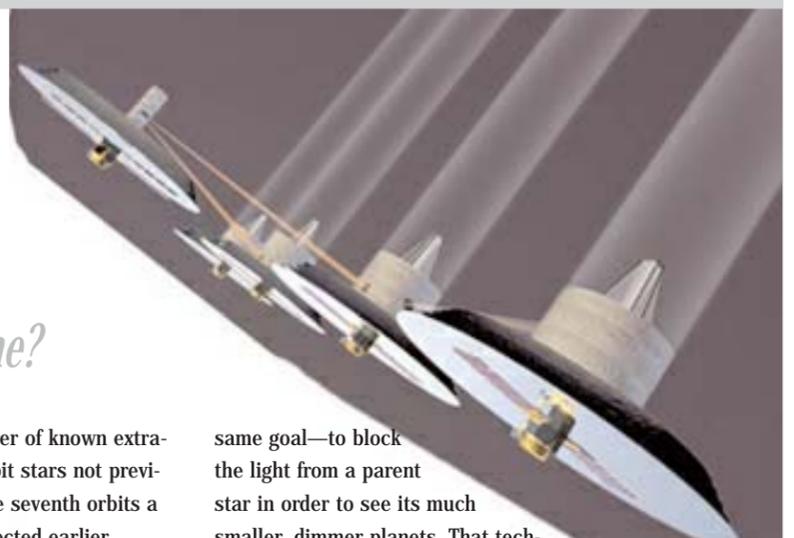
The two architectures being explored for the mission are an Infrared Interferometer and a Visible Light Coronagraph. Each would use a different means to achieve the

same goal—to block the light from a parent star in order to see its much smaller, dimmer planets. That technology challenge has been likened to finding a firefly near the beam of a brilliant searchlight from far away. Additional goals of the mission would include characterizing the surfaces and atmospheres of newfound planets, and looking for the chemical signatures of life.

The Infrared Interferometer is made up of multiple small telescopes on a fixed structure or on separated spacecraft flying in precision formation would simulate a much larger, very powerful telescope. The interferometer would utilize a technique called nulling to reduce the starlight by a factor of 1 million, thus enabling the detection of the very dim infrared emission from the planets.

The Visible Light Coronagraph is a large optical telescope, with a mirror three to four times bigger and at least 10 times more precise than the Hubble Space Telescope, and would collect starlight and the very dim reflected light from the planets. The telescope would have special optics to block the starlight and reduce the scattered or diffracted light by a factor of 1 billion, thus enabling astronomers to detect the faint planets.

The Terrestrial Planet Finder project selected the two





Dutch Slager / JPL Photolab

Dr. William Pickering, Lisa Phillips and Melissa Banks.

## News Briefs

### Pickering hosts NZ students

Retired JPL Director DR. WILLIAM PICKERING recently stopped by JPL to host the winner of an essay contest for high school students in his native New Zealand.

New technologies was the subject of the contest, sponsored by the Institution of Professional Engineers in New Zealand. Part of the prize for the winner was an all-expenses paid trip for two to California, which included the meeting with Pickering and a tour of JPL.

Contest winner LISA PHILLIPS was joined by her guest, MELISSA BANKS.

### Quest spots near-Earth asteroid

NASA astronomers in pursuit of near-Earth asteroids have already made a discovery with the newly installed Quasar Equatorial Survey, or 'Quest,' camera mounted in mid-April on Palomar Mountain's 1.2-meter (48-inch) Oschin telescope.

"The Quest camera is still undergoing commissioning trials," said DR. STEVEN PRAVDO, project manager for the Near-Earth Asteroid Tracking Project at JPL. "But that doesn't mean we can't do some real science in the meantime. What we found was a near-Earth asteroid, estimated to be about 250 meters (820 feet) in size."

The detection of the near-Earth object, 2003 NL7, occurred on the evening of July 8. It has been confirmed by follow-up measurements from three other observatories and subsequently certified by the official clearinghouse of the solar system's smaller inhabitants, the Minor Planet Center. While 2003 NL7 has been labeled a near-Earth asteroid, it is considered non-hazardous, with a 2.97-year orbit of the Sun in which its closest approach to Earth's orbit is about 25.1 million kilometers (15.6 million miles).

The Quest camera is being developed as a multi-purpose instrument by Yale and Indiana universities with DR. CHARLES BALTAY, chairman of Yale's physics department, as the principal investigator. It is designed for use in detecting and characterizing quasars, near-Earth asteroids, trans-Neptunian objects, supernovas, and a large variety of other astrophysical phenomena, by scientists from Yale, JPL and Caltech. The complex camera consists of 112 electronic chips known as charged coupled devices (CCDs) arranged over the Oschin telescope's focal plane. This gives the Quest camera 161-megapixel capability. By comparison, a good store-bought digital camera would probably be in the four-megapixel range.

"When Quest becomes operational, it will be a significant advancement for the Near-Earth Asteroid Tracking team," said Dr. RAYMOND BAMBERY, NEAT principal investigator. "We expect the new camera to increase the efficiency of detection of near-Earth asteroids by some three to four times that of the camera it replaced. This will make a major contribution to NASA's goal of discovering more than 90 percent of near-Earth objects that are greater than 1 kilometer (.62 mile) in diameter by 2008."

### Facilities to open service center

A new service center is being developed by Facilities to better serve the JPL community. The site will be used to request office relocations, modular furniture installation, and office amenities such as white boards, etc.

Beginning Aug. 1, the site will be available in the Services module of the JPL Employee Tool Kit (available at <http://nbs>). The existing Facilities Services site will continue to be used for requesting rearrangement and modification of JPL buildings, engineering and design services, locksmith requests and equipment moves. For Maintenance Services, call ext. 4-4933.

### Blood drive coming in August

JPL Occupational Health Services says the Red Cross is experiencing a critical shortage of all types of blood, and is appealing to all eligible donors for the next blood drive, to be held in von Kármán Auditorium on Aug. 12 from 10 a.m. to 4 p.m. and Aug. 13 from 7 a.m.

to 1 p.m.

Signup is available on the Occupational Health Services website at [http://eis/medical/blood\\_form.html](http://eis/medical/blood_form.html), and advance signup sheets will be available in Building 310-202 prior to the blood drive. For last-minute signups, or to change your appointment, call the Red Cross at (626) 960-6956, ext. 225.

According to Occupational Health Services, the two-day blood drive in May yielded 172 pints of blood, from which 516 lives will benefit. This was an increase from the February collection of 157 pints of blood.

For more information, visit <http://www.redcross.org/services/biomed/blood/supply/tse.html>.

### Software course July 23, 30

A Quantitative Software Management course (formerly known as Software Cost & Schedule Estimation) will be offered Wednesday, July 23 and Wednesday, July 30, 8 a.m. to 4:45 p.m., in the T1705 conference room.

Day 1 trains project element managers and cognizant engineers in how to track task progress using an Excel-based tool and how to use software metrics in managing their development activities. The class covers a variety of basic measures that can be used to monitor software development, including metrics for tracking growth and stability, resources and cost, schedule and progress, and quality.

Day 2 covers various aspects of software cost estimation and cost risk analysis as well as an instruction to using tools and processes that aid in performing these tasks. Topics include software estimating methods and models, software development estimation and metrics, cost drivers, rules of thumb, software productivity databases, and risk reduction and mitigation.

To enroll, visit <http://hr.jpl.nasa.gov/et> or call BRIAN VICKERS, ext. 3-0877.

### NASA's new engineering, safety center

NASA has announced plans to create an independent Engineering and Safety Center at the agency's Langley Research Center in Hampton, Va., to provide comprehensive examination of all NASA programs and projects. The center will provide a central location to coordinate and conduct robust engineering and safety assessment across the entire agency.

"The new NASA Engineering and Safety center will have the capacity and authority to have direct operational influence on any agency mission," said NASA Administrator SEAN O'KEEFE. "When it comes to safety and engineering analysis, we need to improve our ability to share technical information, practices and talent, and independently ensure we are in the best position to achieve mission success."

The center is expected to draw on the talents of about 250 people throughout NASA and will report to former astronaut and current Langley Center Director ROY BRIDGES. BRYAN O'CONNOR, associate administrator for NASA's Office of Safety and Mission Assurance and also a former astronaut, will have policy responsibility for the organization. O'Connor's task will be to assure the effective use of all agency assets and expertise to derive the independent assessments.

Planned activities of the new organization include:

- Independent engineering assessment and testing to support critical NASA projects and programs;
- Engineering and safety review and evaluation through independent analysis, hazard and risk assessment, safety audit, and participation in mishap investigations;
- A central location for independent trend analysis utilizing state-of-the-art tools and techniques;
- A structure to support engineering collaboration for problem resolution;
- Central coordination of engineering and programmatic lessons learned, technical standards, and technical discipline expertise;
- Independent inspection and validation of activities to ensure the constant maintenance of NASA safety standards.

# Special Events Calendar

### Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first Friday and third Thursday 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.

Parents Group for Children With Special Needs—Meets the second Thursday of the month at noon in the Wellness Place, Building 167-111.

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111. For more information, call the Employee Assistance Program at ext. 4-3680.

### Friday, July 18

TIAA/CREF Enrollment Meeting—This workshop at noon in Trailer 1720-137 is designed to assist employees newly eligible for the retirement plan with selection of investment options and the completion of enrollment forms.

Von Kármán Lecture Series—Robert Hogg, a robotics engineer in JPL's Mobility Systems Concept Development Section, and Brett Kennedy, task manager for the Limbed Excursion Mobile Utility Robot, will present "Searching and Crawling: A Few JPL Research Robots" at 7 p.m. in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. For more information, call Public Services at ext. 4-0112.

### Wednesday, July 23

ACW Career Panel—Business careers is the topic for this discussion, one of five hosted this summer by the Director's Advisory Council for Women. Scheduled panelists are Annette Green (Section 2506), Cory Stevens (250), Diane Newmark (212), Jean Milbrandt (213) and Katrina Christian (219) at noon in the 167 conference room.

Career Fair—This event, sponsored by University Relations/Student Programs, will provide networking opportunities for students and will introduce them to the different areas of the Lab. It will be held from 11 a.m. to 1 p.m. in von Kármán Auditorium.

For more information, call Chris Klatka at ext. 4-8160.

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Debbie Llata at ext. 3-3690 for information.

### Saturday, July 26

Caltech Folk Music Society—Guitarist Tom Smith will perform at 8 p.m. in Dabney Hall Lounge. Tickets are \$15 for adults and \$5 for children under 12. For more information, call (626) 395-4652 or check the Folk Music Society website at <http://www.folkmusic.caltech.edu>.

### Monday, July 28

ACW Career Panel—Careers in project management will be discussed at noon in von Kármán Auditorium, one of five hosted this summer by the Director's Advisory Council for Women. Scheduled participants are Peg Frerking (Section 4034), Karla Clark (140) and Ginny Ford (383).

### Tuesday, July 29

JPL Hiking+ Club—Rose Roberto of the JPL Library will present a slide show called "Cultural and Historical Sites In Peru and the Philippines" at noon in Building 238-543. Nonmembers are welcome.

### Wednesday, July 30

Investment Advice—Fidelity representatives will be available for one-on-one counseling. For an appointment, call (800) 642-7131.

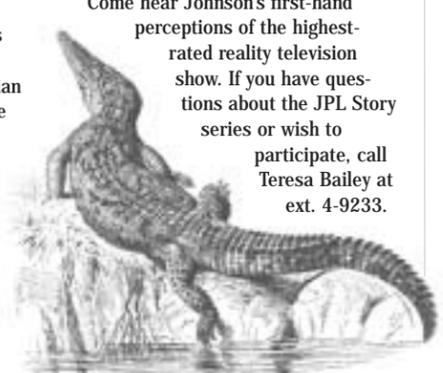
Volunteer Professionals for Medical Advancement—Meeting at 10:30 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

### Thursday, July 31

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

JPL Stories—Dave Johnson of Section 352 will describe his South American escapades earlier this year with "Survivor, the Amazon Adventure: Bikini Models, Gym Teachers, and Rocket Scientists, 'Oh, My!'" at 4 p.m. in the Library, Building 111-104.

Come hear Johnson's first-hand perceptions of the highest-rated reality television show. If you have questions about the JPL Story series or wish to participate, call Teresa Bailey at ext. 4-9233.



## New maintenance contract signed

JPL has signed a new maintenance and operations services contract with All-Star Services Corp. of San Diego. All-Star Services was selected through a Source Evaluation Board, and replaces the outgoing service provider, Jacobs Engineering Remediation Technologies Inc.

Jacobs elected not to propose for this fixed-price contract when the Request For Proposal was issued in September 2002. All-Star Services was selected out of more than 50 interested parties.

"The Source Evaluation Board did an outstanding job in narrowing the candidate field and eventually recommending All Star Services," said Facilities Division Manager Bruce Fischer. "All Star is dedicated to maintenance and operations services and has a record of high customer satisfaction among their other clients."

All-Star started its transition program in June, and will actually begin providing maintenance and operations services on Sept. 17. The contract has a potential 10-year term based on contractor performance. The JPL community will be able to provide instant feedback of their satisfaction via web-based survey. Also, unlike an open-ended cost reimbursable contract, JPL now has a clear, defined cost for a 10-year period.

The new deal is a fixed-price maintenance and operations services contract. Unlike the Jacobs contract, which included some user-funded service request work, the new contract will concentrate only on maintaining and operating the physical plant of the Lab. User-funded service request work will be done by the Facilities Engineering and Construction Section's task-order contractors.

All-Star Services has indicated its intention to hire its workforce from amongst the incumbent workforce and subcontractors. They held an Open House for employees of the current Maintenance & Operations Services contract on July 9 at La Canada High School.

"We are happy to welcome the All-Star Services Team to JPL," said Facilities Maintenance and Operations Section Manager Vaji Nasoordeen. "We are looking forward to a successful partnership with improved maintenance and operations services for the JPL community."

Photos: Yale University



Quest camera CCD array



Quest camera internal wiring harness.

# HIGH SPIRIT, GREAT OPPORTUNITY



WITH OPPORTUNITY'S JULY 7 LAUNCH, BOTH MARS EXPLORATION ROVERS ARE NOW ON THEIR WAY TO THE RED PLANET, AND TEAM MEMBERS WAIT WITH ANTICIPATION FOR TWO JANUARY LANDINGS. MER PROJECT SCIENTIST DR. JOY CRISP DISCUSSES UPCOMING SCIENCE TEAM ACTIVITIES WITH UNIVERSE.

Pathfinder had rather modest science objectives. MER is seeking to answer questions about past liquid water activity and past environments that may have been favorable for life. Landing site selection, science instruments calibration, and operations planning have all been done with the MER science objectives in mind.

**ONCE THEY LAND, THE ROVERS HAVE A THREE-MONTH MISSION. HOW MUCH OF A SET SCHEDULE WILL YOU HAVE? OR WILL IT BE DAY BY DAY?**

First of all, we'll be working on Martian days, called "sols," which are equivalent to 24 hours and 39 and a half minutes on Earth.

We have a fairly firm idea of what we want to do during the first six sols of the mission, which will include the rovers' health checkout and stand up, severing the connection between the rover and lander, an assessment of the options for driving the rover off the lander, and the acquisition of color stereo and infrared science panoramas. But even during those first few sols, we will be ready to adapt to off-nominal situations that could arise.

Beyond that, each day we will respond to what the rovers have accomplished and to what science we've learned, and prepare a set of commands for the rovers' next day's activities. In our operations tests, we're practicing the different kinds of typical rover activities that we can implement on Mars when the real science mission begins in January.

**COULD THE FINDINGS OF ONE ROVER AFFECT THE PLANS FOR THE OTHER?**

Yes. This would most likely apply to the performance of an instrument. Insight or discoveries from science team members on one team might help the other team. One team might discover a technique for visualizing or interpreting the data that could benefit the other team, or a specific way to use an instrument that works well. The same thing could happen in the engineers' assessment of rover performance, with lessons learned by one rover team benefiting the other.

**BASED ON WHAT YOU KNOW NOW ABOUT THE SITES, GUSEV AND MERIDIANI, WHAT COULD YOU FIND THAT WOULD PROVE THE CONDITIONS FOR LIFE ONCE EXISTED? ON THE OTHER HAND, WOULD A SPECIFIC FINDING DISAPPOINT YOU, IN TERMS OF RULING OUT WATER OR LIFE CONDITIONS?**

Gusev is a crater that looks like it once held ponded water, and should contain lakebed sediments. We're going to look for minerals and rock texture clues to try to confirm that. Meridiani contains gray hematite, which on Earth usually forms in association with liquid water. We will look there for other water-formed minerals, and things like water-related features such as ripple marks and layers, to confirm our suspicions.

If we can confirm the signatures for past water, we'll want to know how long the water was there, whether it was warm or cold, and if that environment was favorable for life.

There are findings that could disappoint us with regard to past water activity on Mars, but we would still learn a lot about Mars geology. At Meridiani, if we're not lucky, we could find out that an originally magnetite-rich lava flow was oxidized at high temperature to form the hematite mineral signature, with no liquid water involved. An unlucky scenario for Gusev would be to find out that any lakebed sediments have been completely covered by wind-blown dust.

**WILL IT BE A CHALLENGE FOR TEAM MEMBERS TO LIVE ON THAT MARTIAN SCHEDULE?**

The longer Martian sol means that two weeks after the rovers land, team members' wake-up and meal times will have shifted by about nine hours. So it certainly will be a challenge. We've consulted with experts on fatigue, who told us we will never fully adapt to that extra 39 and a half minutes each day. We just have to try to minimize the effects.

We did get some good advice, such as taking naps (not too long or too short), working shorter shifts—especially when working at night—and taking more days off. We're also going to have a "buddy system" to look out for each other, so we can honestly tell someone they look too tired to be working.

People have worked so long and so hard for this mission; they have to be convinced that they can't push their bodies too hard, or they won't perform at their best.

**HOW EXCITING IS THIS FOR YOU AND THE SCIENCE TEAM?**

This is a thrill, and we can't wait for the rovers to drive around on Mars and look at rocks up close. We're set for the challenge to become geology "detectives" and read the clues in the rocks to figure out how they formed and whether the past environments were favorable for life.

*By Mark Whalen*

**H**OW DO THE 150 MEMBERS OF THE SCIENCE TEAM KEEP BUSY THESE DAYS, IN THE MONTHS LEADING UP TO THE LANDINGS?

In May and June, we completed a science process test and our first flight-like surface operations test. We have eight more operations tests to complete, some of which will be dual-mission simulations where one team is operating one test rover while a second team works the other test rover. The software that will be onboard the rovers is still being improved, along with the software we use on Earth to visualize the images and data from the rovers and to prepare the rover commands. Each operations test provides further training experiences and lessons learned that we will use to improve the next test.

**WHERE DOES THE MER MISSION FIT IN WITH YOUR CAREER SO FAR? WAS MARS ALWAYS YOUR GOAL?**

I have a geology background, with a particular interest in volcanic rocks. My early studies were focused on Earth volcanoes. Soon after I came to JPL in 1987, I began studying Viking images of lava flows on Mars, measuring their dimensions and comparing them to models for lava flows on Earth to put constraints on the rocks' composition. For Mars Pathfinder, I served as the investigation scientist for the Alpha Proton X-Ray Spectrometer, which measured elemental composition of rocks and soil. I worked with the project engineers to make sure that rover design decisions and operations plans would enable the best science return possible from the spectrometer.

Mars was never my original goal, but I happened to be in the right place at the right time, and I'm glad I ended up becoming a "Martian."

**COMPARE MER TO PATHFINDER.**

The Pathfinder mission had a stereo camera on a mast, but it was fixed to the lander and it was used to image the local area and watch the Sojourner rover drive around. Sojourner put a total of 100 meters on the "odometer" but never strayed very far from the lander that had the communication system for receiving commands from Earth and sending the data back to Earth. Sojourner had three cameras and a simple device to deploy an Alpha Proton X-ray spectrometer onto specific rocks and soils. Meteorology instruments on the Pathfinder lander monitored wind, pressure and temperature. On MER, which is focused primarily on geology, our rovers are much larger and can go exploring much further distances. Each rover is outfitted with nine cameras, three spectrometers, a rock grinding tool, and a sophisticated robotic arm. The ability to carry this equipment tens of meters in a day and not be tied to a lander will allow us to go exploring and to seek out different kinds of rocks and soils for investigation.



# Planet Finder

Continued from page 1

candidates based on results from four industrial-academic teams that conducted a 2-1/2 year study of more than 60 possible designs. The two architectures were determined to be sufficiently realistic to warrant further study and technological development in support of a launch of Terrestrial Planet Finder by the middle of the next decade.

"I can't imagine a more exciting or profound quest than searching for another planet like our own out there somewhere," said Coulter. "We're privileged that NASA and the American people have given us the opportunity to be part of it."

## Passings

**BILL HOLMAN**, 88, a retired liaison engineer in Section 351, died May 22.

Holman joined JPL in 1945 and retired in 1980. He is survived by his wife, Dorothy, daughter and son-in-law Vicki and Dennis Smith, and three grandchildren.

Memorial services were held at Claremont United Methodist Church.



Bill Holman

## Letters

I would like to thank the JPL family and Section 353 for the thoughtful gifts and support upon the passing of my Sister Clarice Niccoli on July 6 in Myrtle Creek, Oregon. Thanks to all of you for your kind thoughts and prayers.

William Neiderheiser

My family and I wish to thank our friends at JPL for their prayers and words of sympathy following the recent passing of my mother. Thank you for the contribution to the American Cancer Society in her memory and thanks to JPL for the beautiful plant.

Terry Fisher

## Retirees

The following JPL employees retired in July:

Judith Castagno, 28 years, Section 273; Edward Greenberg, 19 years; Steven Morris, 17 years, Section 344; Alice Tangney, 15 years, Section 260.

## Classifieds

### For Sale

ART WORK, Salvador Dali print "The Quest," 58 of 300, aquatint hand-colored etching, printed in 1981, appraised at \$1,400 in Feb. 1986, e-mail picture available, sell for \$2,500/obo. 661/290-2892.

AUTOMOBILE PASS, for Canada's National Parks, expires 7/31/03, \$5. 790-3899.

BASSINET, Graco 3-in-1 Bedside sleeper, changing table, rocker, music, vibration, light, used 6 wks., pd. \$80, sell \$45/obo. 682-6760.

BED, fancy antique, "Trailing Vine," brass/iron, ca. 1885, double, Indiana Iron Foundry, would make a terrific child's bed, \$1,300/obo; DESK, secretary, antique "countinghouse," from Eastern shore Maryland, ca. 1835, cherry, long drawer in base w/turned legs and fitted interior, brass h/w dated 1878, \$5,000/obo. 249-0453 betw. 5-9 or jkbonner@gte.net.

BIKE, Mongoose Toast BMX single speed, 20," front and rear hand brakes, brand new. \$50. 502-0478.

CARD SHUFFLER, Johnson, collectible, all-metal construction with the exception of the friction wheels which drive the cards and the carved-wood dowel handles, stands -6" handle-high, and -9" by 6", flanges and handle inclusive, \$35; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new. \$85; DIET TAPES, Jenny Craig, set of 14, \$50. 790-3899.

COFFEE MAKER, Braun, 10-cups, white/black, like new. \$30/obo. 626/791-6101.

COMPUTER DESK, lots of storage space and place for printer / CPU, \$60. 243-8255.

COUCH, gray/blue w/oak/brass trim, \$175/obo; DESK, white w/glass top and 3 drawers, \$50/obo; moving, must sell before 8/1/03. 626/294-1927.

DOG HOUSE, Dogloo II igloo style w/vent in roof, outside dimensions about 36"x36", for medium-size dog, good cond., about 3 years old, \$40/obo. 909/596-4390.

DOG HOUSE, Dogloo XT for small dog, up to 45#, good cond., \$40. 626/303-1927.

FISHING GEAR: 1 Sportfisher 6-ft. trolling rod, 1 Garcia 2-piece 7 ft. tackle rod, 1 Fenwick 2-piece 8 ft., 3.5 oz fly fishing rod w/ Olympic reel, 1 telescoping Olympic 6-ft. rod

w/Daiwa spinning reel, 1 telescoping 7-ft. fly fishing rod, 1 antique bamboo 7-section, 9-ft. fly fishing rod, 1 Gladding 820 spinning reel, 1 Daiwa 1500C spinning reel, 1 Garcia Mitchell 300 spinning reel, 1 K-Mart level wind trolling reel, 1 tackle box + misc. tackle, 2 fishing fly Tying kits, sell all for \$150 or separate; make reasonable offer. 626/963-5727.

FURNITURE: black leather chair, \$150/pair; chair, leather, stainless steel tubular, \$150/pair; loveseat, \$60; ent. center, \$75; cocktail table, 39" octagonal glass, \$100; all items obo; HOUSEHOLD ITEMS: Maytag washer and dryer, \$600; lawnmower, Honda hr215sxa, \$300; trimmer, Echo SRM 2100, \$100; blower, Echo PB1000, \$100; chainsaw, McCulloch 16" electric, \$40; pole pruner, \$25; rug, black/white, \$75; aquarium, 60 gal., acrylic, w/stand, \$180; 6' indoor ficus plant, \$40. 246-2319.

GRILL, king-size Forman, white, \$45/obo. 368-7861.

GUITAR PACKAGE, Fender Stratocaster Squier Series, exc. cond., barely used, red and white, includes hard shell case, Crate GX-15 amp, 10 ft. Pro Co Music Mover cable, beginners book, and Tremolo Arm Whammy Bar, photo with ad at JPL Store, \$350/obo. 846-1280, Nancy.

HEADBOARD, walnut, single, \$20; CARD TABLE, folding, Samsonite, and 4 folding chairs, \$50; SEWING MACHINE, built-in cabinet with chair and flip top, \$70. 790-3543.

KID'S LOG CABIN, sturdy green plastic with brown doors and white fence, \$110/obo. 805/493-4163.

LAPTOP COMPUTER, NEC Versa SXi PIII 650, 14.1" TFT, 12GB, 128MB (1 bank; 1 free), DVD, SuperDisk LS-120 (regular floppies plus 120MB optical disks), Li-ion battery, power adapter, vg cond., slim, nice-looking, dual boot Windows 98-Debian Linux 3.0 (latest), DVD software for watching movies under Win incl.: http://support.neccomp.com/hardware/notebooks/versasxi/, \$570. albertobig@libero.it.

MATTRESS SET, queen size, 3 yrs. old, incl. matr., box spring, frame, all exc. cond., price reduced to \$250, free bedding w/purchase. 626/644-3453 or rocketgal99@hotmail.com.

PIANO, antique, good cond., upright, 1923, \$600/obo. 242-4402.

POOL TABLE, 8 ft., all accessories + 10-cue corner rack, light bar, and spill-proof table cover; exc. cond., \$950/obo for all; FISH TANK, 40 gal., w/black stand, incl. pumps, heater, etc., \$150/obo. 626/405-9701, leave message.

PUPPIES, English Bulldogs, 8 weeks, males and females, -\$2,000. 626/255-5306.

REFRIGERATOR, Frigidaire, top freezer, 18.6 cu. ft., adjustable sliding shelves, fruit/veggie/snack drawers, separate controls, energy saver switch, very clean in & out, vg cond, \$170. 626/398-0921.

REFRIGERATOR, Kenmore, top of the line; 35.5" W x 68.5" H x 31" D; exc. cond.; auto ice maker, water spigot; avail. 7/31; \$250/obo. 249-0453 betw. 5-9 or jkbonner@gte.net.

SOFA / SLEEPER, w/deluxe mattress, 4 yr. old, exc. cond., 84", truffle color, \$750/obo. 248-1793.

SOFTWARE, PrintShop CD Label Creator, brand new in orig. box, Windows XP compatible, incl. device for applying labels to the CD, \$10; COMPUTER POWER CONTROL CENTER, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; ORGAN, Yamaha 415 electronic organ w/13 pedals, 3 keyboards, 144 rhythm patterns, \$2,000. 790-3899.

STEREO, vintage hi-fi in walnut cabinet 17" x 49", exc. cond., plays 33 1/3 record albums & 45s, AM/FM also, made by Silvertone, \$100; OLD ALBUMS also. 952-7940.

STEREOPHILES, Rotel RB-985 5 channel, THX, 800W, power amp; Rotel RDA 980 digital surround adapter; Rotel RDP digital audio processor; Rotel RSP 980 surround sound processor, slight cosmetic blemishes but all in exc. working cond., orig. purchased at \$2,500 +; will sacrifice all 4 pcs. for \$875/obo. 249-9437, eves.

SYNTHESIZER KEYBOARD, KORG model X3 clean and in exc. cond., over 500 natural sounds plus 200 combination sounds, has a 16-channel sequencer to record your favorite compositions, \$700/negotiable. 626/584-4614 or 632-0650, cell.

TEA SET, pottery, made by Maine artisan, nautical theme, matching lighthouse design on all pieces, incl. tea pot, creamer, sugar, platter, small serving bowl, 2 mugs, 2 Japanese tea cups, never used, \$100/set. 249-4316.

TELEVISION, 19", color, w/remote, only 2 years old, \$80/obo; ANTENNA, \$8; STEAM IRON, \$5; COFFEE MAKER, 2 years old, \$6. 626/282-5815.

TOY WOOD CONSTRUCTION SET, Brio Mech Set 4, 152 pieces plus work board, very good cond., original cost -\$150, sell for \$50. 626/303-1927.

TREADMILL, Image 10.6; 2.5 hp, 0-10 mph, 1-12% power incline, cordless pulse sensor, programmable, great cond., \$500. 249-9534. TREADMILL, ProForm Sears #585, spd. control, power incline, pulse rate, distance/speed/time indicators, exc. cond., \$275. 626/355-9723, Neil or Pat.

TREADMILL, basic, with movable arms for upper body workout too, \$125/obo; REFRIGERATOR, full size, side-by-side, great cond., white, \$125/obo. 626/405-9701, leave message.

TREES: red banana plant 5' tall, \$60/obo; fish tail, 6' tall, \$80 obo; ficus, >10' tall, braided, in 30" plastic pot, \$250/obo; ceramic bowl, gray, 2' diameter with planted geraniums, \$40/obo. 626/791-6101.

WASHER-DRYER, Maytag washer, wht. approx. 6-7 years old, full size, works, Kenmore gas drvr. wht. rust spots on ton. but works fine.

It is anticipated that one of the two architectures will be selected in 2006 to be implemented for the mission, which may include international collaboration. NASA and JPL will issue calls for proposals seeking input on the development and demonstration of technologies to implement the two architectures, and on scientific research relevant to planet finding.

For more information on the Terrestrial Planet Finder, visit <http://tpf.jpl.nasa.gov>. More information on the Origins Program is available at <http://origins.jpl.nasa.gov>. Additional information on JPL's planet-finding missions is available at <http://planetquest.jpl.nasa.gov>.

new gas line incl. both \$75, you pick up. 626/351-9483, Steve.

WEDDING GOWN, white duchess silk sheath by Amsale, low back, gorgeous detachable train, fit -size 2 to 4 American, elbow length white tulle veil, \$1,000/for set/obo. 249-4316.

WEIGHT BENCH, 45 lb. bar, curling bar, 45, 35, 25, 10 lb. + more plates, dip/push-up stand, abs bench, near JPL, \$135. 790-6395.

### Vehicles / Accessories

'01 AUDI A6 2.7T 6 spd. manual, silver w/black int., orig. owner, 50K mi., \$22,000/obo. 626/396-4966.

'01 BMW Z3 3.0i Roadster, silver 21K mi., like new cond., "pampered" car, no accidents, pic. avail. upon request, \$27,999/obo. 679-2622.

'00 BMW 323Ci Coupe, 24K mi., 2.5 liter/6 cyl. eng., black exterior, leatherette int., Steptronic auto trans., moonroof, premium pkg., 1 owner, mint condition, still under warranty, \$24,000. 502-1282.

'96 BMW 328i, white w/light gray int., 4-dr automatic, a/c dual temp controls, pwr. seats/moonroof/windows, maintenance/trip onboard computer, keyless entry/alarm, sport pkg. w/upgraded wheels, very clean, super cond. in/out, 90K mi., \$10,450/obo. 661/294-3857.

'87 BMW 528e, 4D, V6, good cond., metallic gray, 5 speed, manual, power doors, sunroof and more to see, 199K miles, runs great, \$1,750/obo. 626/798-3658 or 626/791-6712.

'85 CHEVROLET Silverado Dually, 30 series, V8, 6.2 diesel, 150,000 mi., new tires, a/c, runs great, \$4,800. 626/963-8288.

'80 DATSUN (NISSAN) 280ZX coupe, 5-sp. manual, blue/silver, grand lux. pkg., 139,000 miles, orig. owner, best offer. 626/577-8107.

'94 FORD Escort, blue, manual trans., a/c, CD, new Michelin tires, 130K, not a beauty but works perfectly, \$2,000. 626/797-5488.

'00 HONDA Accord coupe EX, V6, 2 dr., 6 cyl. 3.0L eng., white, eng./ext/int in exc. cond., a/c, 4-sp. AT, AM/FM/CD, alum/alloy wheels, leather seats, keyless entry, climate ctrl., 4-wheel anti-lock brakes, c/c., garage dr. opener, pwr. door locks, pwr. mirrors/l/r, pwr. steer., moonroof, pwr. wind., rear spoiler & flr. mats, dual front & side air bags, lightly tinted wind., remote trunk release, 45K miles, \$15,900/obo. 626/584-4537.

'94 MAZDA, MX6, red, black interior, sunroof, manual, 140,000 mi., good cond. \$2,800/obo. 626/945-7040, Alex.

'84 MERCEDES BENZ 190 E, 2.3, silver, blue lthr. int., pwr. win, doors, sunroof., a/c, 136K mi., clean car, \$4,000/obo. 626/967-4802.

'96 MITSUBISHI Eclipse GS-T, 2 dr. hatchback, 4 cyl., turbo, a/c, standard, 110K, 1 owner, runs great, no accidents, gd. mileage, well-maintained, pwr. sunroof/ locks/windows, 10 CD changer, \$6,500/obo. 626/296-1810 or meyoung@sbcglobal.net.

'95 NISSAN Pathfinder XE, 4 x 4, loaded, LoJack and security syst., V6, new tires, tow package, 135K mi., \$5,900. 909/596-9007.

'92 NISSAN Maxima, burgundy, moonroof, a/c, stereo w/CD, power antenna, dash and car cover, vg cond., \$3,600/obo. 909/225-2323.

'98 PONTIAC Sunfire, great running cond. 626/858-0742.

'87 TOYOTA Cressida, power accessories, a/c, good cond., \$1,950/obo. 952-1518.

### Wanted

CARPPOOLER, from Chino Hills/Diamond Bar area, work schedule 9:15 a.m.- 6 p.m., non-smoker. 4-1753.

COMPANION/DRIVER, energetic, teen/college age, to lead day trips & activities with 2 Altadena boys, 12 & 13, to beach, museums, parks, etc.; needed Mon-Fri for all or part of July 28 through Aug. 22, flexible schedule. 626/797-6824.

ROOMATE(S), male preferred, to share apt. or house, non-smoking. 281-2494, Alex.

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

VOLLEYBALL PLAYERS, coed, no beginners please, Tuesday nights 8 to 10 at Eagle Rock High School, \$4/night. 956-1744, Barbara.

### Free

PRINTER CARTRIDGE, Apple Laserwriter model M1960 G/A. 626/286-2752.

SHOWER DOORS, two pairs used chrome trim frameless glass, 57" opening x 57" tall with all mounting hardware. 246-2319.

### Lost & Found

LOST: Medium-to-large black knit wool long-sleeve sweater, zip-up front, V-neck. Ext. 4-1176, Rob.

Editor's note: A Lost & Found is also available at the JPL Store.

### For Rent

ALTADENA, room in 3 bd., 2 ba., beautiful cyn home, share w/2 Caltech-affiliated friends, steep but short mtn. bike ride to work, fantastic backyard that abuts Nat'l Forest, cable modem, relaxed living environment, \$550 and 1/3 util. 653-6140.

ALTADENA, 3 bd., 2 ba., view home, min. from JPL, borders Angeles Nat'l Forest & trails, furn. incl. refrig., stove, extra freezer, washer/dryer, 2-car garage with workshop, spacious living/dining areas, fireplace, courtyard, shaded patio, fruit trees, English garden, quiet

\$2,200 + util. 626/798-3235, Lori.

ARCADIA apt, 2 bd.+den, 1 ba., garage, remodeled, refrigerator/washer/dryer in unit, a/c, dishwasher; spacious, walking distance to shops, exc. neighborhood, no pets, w/gar/den/trash incl. available, \$1,350. 626/576-7333.

GLENDALE, townhome-like duplex, 2 bd., 1.5 ba, din. rm., liv. rm., private patio, marble flr., family neighborhd., close to JPL, \$1,300. 246-7365, Rose.

GLENDALE house, 3 bd., 1 ba, din. rm., liv. rm., priv. patio & garden, family neighborhd., close to JPL, \$1,600. 246-7365, Rose.

HACIENDA HEIGHTS, 2 bd., 2.5 ba., detached condo, beautiful yard, upscale neighborhood, convenient to local school/shops/community services, avail. last week of July, prefer non-smoker, no pets. \$1,400. 281-9676, Charli, or Charlie561@aol.com.

PASADENA apt., share 2 + 2 + loft in luxury complex near Colorado and Lake, living and kitchen fully furn., DSL/balcony/pool/jac/gym, \$750. 626/644-5431, Gary.

PASADENA, spacious home for lease, 3 bd., 2 ba., lr + fireplace, family rm., d/r, 2,300 sq. ft., w/g. attic (1,000 sq. ft.) suitable for storage, generous yard (1/4-acre lot) with fruit trees and water feature, 2 miles from JPL, \$2,350 includes gardener and water. 626/794-7979.

PASADENA, large 3 bd., 2.5 ba., 2-story townhome, lg. kitchen, patio, vaulted ceilings, fireplace, carpeted living room, central air/heat, fridge/washer/dryer in-unit, quiet, water, trash and landscaping incl., assoc. pool, hot tub and sauna; close to JPL and Caltech, walking dist. to Old Town/Goldline/Metro, partially furn., avail. 9/1, \$2,000. 626/644-5699, Lucas.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beauty, inter., bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy LR w/FP, end unit, flml DR, hdwd. flrs., immac. cond., close to schls. \$1,750. 626/396-9024.

PASADENA, townhome-style apt., 2 bd., 1.5 ba., patio, dishwasher, central a/c, new carpet & floors, laundry, parking, avail. Aug., furnished \$1,375, unfurn. \$1,325. 626/429-3677.

SAN MARINO house, 3 bd., 2 ba., 2-car garage w/automatic opener, newly painted, remodeled kitchen, dishwasher, a/c, laundry hookups, fireplace, spacious family rm. overlooking yard, no pets, exc. neighborhood & school district, \$3,000. 626/576-7333.

SIERRA MADRE townhouse to share w/Caltech alumna, 1,000 sq. ft. apt, lg. patio, 2 bd., 1.5 ba., quiet st., garage parking, washer/dryer \$605 + 1/2 utils. 626/355-4838, Heather.

TUJUNGA, small 1 bd. guesthouse, on secure and private 3/4 acre w/lg. trees and city/mtn. view, 15 min. from JPL, has storage shed, W/D, rose garden, patio, fruit trees, and car port, \$825 includes utilities. 952-7980, Ann.

### Real Estate

ALPINE FOREST, 3.2 acre view lot, just 25 min. from Tehachapi, property sits among pine and oak trees at 6,300 ft. elevation, 4 seasons are part of the enjoyment, buildable for a vacation retreat or secluded home site, property ass'n is responsible for road maintenance and security, gated w/guard, closest neighbor is 3/4 mile, \$40,000. 249-6071.

### Vacation Rentals

BALBOA ISLAND, cute beach apartment, fully furnished 2 bd., 1 ba., patio, washer/dryer, parking, sleeps 5, steps to bay, available weekly July & August, \$1,200-\$1,500/week depending on week. 626/351-9641.

BIG BEAR LAKEFRONT, luxury town home, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.

ESCONDIDO, golfers' paradise, Lawrence Welk Villa timeshare, fixed week #23 w/high RC / trading value, Wild Animal Park/Zoo/Sea World closeby, spacious 1,600 sq. ft., 2 bd., 2 full ba., all amenities, incl. cathedral vaulted ceiling & outside veranda overlooking a beautiful 18-hole golf course, \$17,000. 249-6071.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., Low Season rate \$105/nite/2, High Season rate \$120/nite/2, \$15/nite/add'l person. 949/348-8047, or jackandrandy@cox.net.

HAWAII, Pono Kai resort on Kauai, 30 August to 6 September, \$800. 957-3675.

MAMMOTH, Snowcreek, 2 bd., 2 ba., -loft, sleeps 6-8, fully equipped kitchen incl. microwave, 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 or valerie@gps.caltech.edu.

OCEANSIDE condo, fully furnished, 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, beautiful beachside setting, with barbecue, pool, spa, game room, and great ocean view, easy walk to pier and restaurants, sleeps 8, available weekly or monthly. 909/981-7492, Darlene or dfhaage@yahoo.com.

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

'01 PACE ARROW 34-foot RV, queen bed, sofa bed and dinette bed, monthly rentals only, you pay insurance and gas, JPL employees only, no smoking or pets, \$4,000 in advance plus \$1,000 security deposit. taohemike@earthlink.net. 530/525-7334.

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

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