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# Titan images show active, Earth-like world

By Carolina Martinez

*This mosaic of Titan's south polar region was acquired during Cassini's first distant encounter with the smog-enshrouded moon on July 2, 2004, at a distance of about 340,000 kilometers (211,000 miles).*

Saturn's largest and hazy moon, Titan, has a surface shaped largely by Earth-like processes of tectonics, erosion, winds, and perhaps volcanism. The findings are published in this week's issue of the journal Nature.

Titan, long held to be a frozen analog of early Earth, has liquid methane on its cold surface, unlike the water found on our home planet. Among the new discoveries is what may be a long river, roughly 1,500 kilometers long (930 miles). Scientists have also concluded that winds on Titan blow a lot faster than the moon rotates, a fact long predicted but never confirmed until now.

Tectonism (brittle fracturing and faulting) has clearly played a role in shaping Titan's surface. "The only known planetary process that creates large-scale linear boundaries is tectonism, in which internal processes cause portions of the crust to fracture and sometimes move either up, down or sideways," said Dr. Alfred McEwen, Cassini imaging team member from the University of Arizona. "Erosion by fluids may accentuate the tectonic fabric by depositing dark materials in low areas and enlarging fractures. This interplay between internal forces and fluid erosion is very Earth-like."

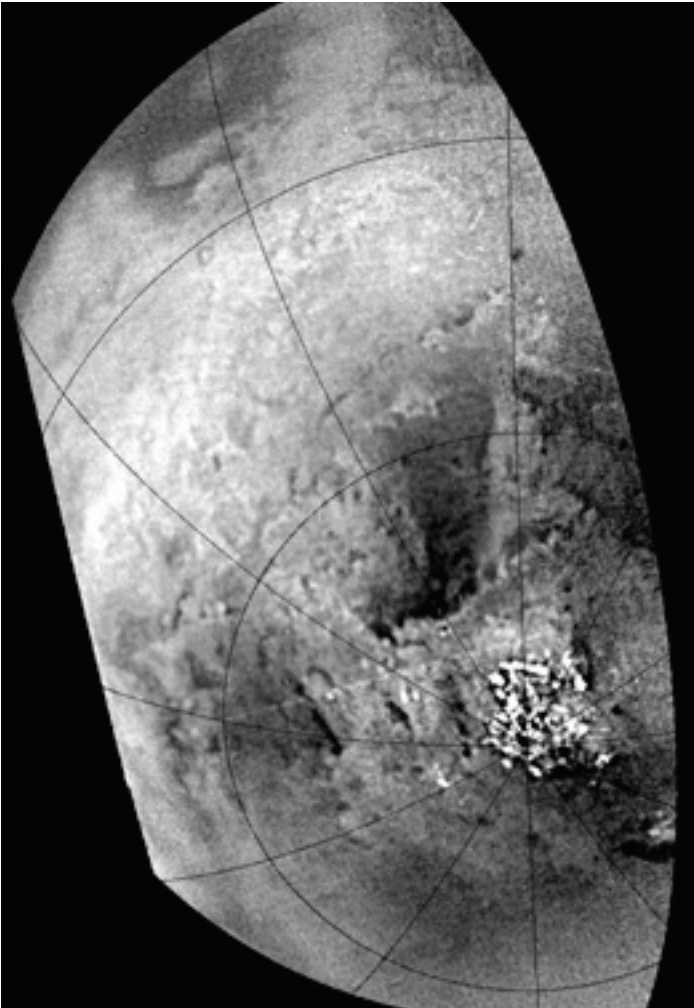
Cassini images collected during close flybys of the moon show dark, curving and linear patterns in various regions on Titan, but mostly concentrated near the south pole. Some extend up to 1,500 kilometers (930 miles) long. Images from the European Space Agency's Huygens probe show clear evidence for small channels a few kilometers long, probably cut by liquid methane. Cassini imaging scientists suggest that the dark, curved and linear patterns seen in the Cassini orbiter images of Titan may also be channels, though there is no direct evidence for the presence of fluids. If these features are channels, it would make the ones near the south pole nearly as long as the Snake River, which originates in Wyoming and flows across four states.

Since most of the cloud activity observed on Titan by Cassini has occurred over the south pole, scientists believe this may be where the cycle of methane rain, channel carving, runoff and evaporation is most active, a hypothesis that could explain the presence of the extensive channel-like features seen in this region.

In analyzing clouds of Titan's lower atmosphere, scientists have concluded that the winds on Titan blow faster than the moon rotates, a phenomenon called super-rotation. In contrast, the jet streams of Earth blow slower than the rotation rate of our planet.

"Models of Titan's atmosphere have indicated that it should super-rotate just like the atmosphere of Venus, but until now there have been no direct wind measurements to test the prediction," said Cassini imaging team member Dr. Tony Del Genio of NASA's Goddard Institute for Space Studies, in New York. Del Genio made the first computer simulation predicting Titan super-rotation a decade ago.

Titan's winds are measured by watching its clouds move. Clouds are rare on Titan, and those that can be tracked are often too small and faint to be seen from Earth. Ten clouds have been tracked by Cassini, giving wind speeds as high as 34 meters per second (about 75 mph) to the east—hurricane strength—in Titan's lower atmosphere. "This result is consistent with the predictions of Titan weather models, and it suggests



that we now understand the basic features of how meteorology works on slowly rotating planets," Del Genio said.

"We've only just begun exploring the surface of Titan, but what's struck me the most so far is the variety of the surface patterns that we're seeing. The surface is very complex, and shows evidence for so many different modification processes," said Dr. Elizabeth Turtle, Cassini imaging team associate in the Lunar and Planetary Laboratory at the University of Arizona and co-author of one of the papers in Nature.

"Throughout the solar system, we find examples of solid bodies that show tremendous geologic variation across their surfaces. One hemisphere often can bear little resemblance to the other," said Dr. Carolyn Porco, Cassini imaging team leader, Space Science Institute, Boulder, Colo. "On Titan, it's very likely to be this and more."

These results are based on Cassini orbiter images of Titan collected over the last eight months during a distant flyby of the south pole and three close encounters of Titan's equatorial region. Cassini cameras have covered 30 percent of Titan's surface, imaging features as small as 1 to 10 kilometers (0.6 to 6 miles). Cassini is scheduled to make 41 additional close Titan flybys in the next three years.

For images and information on the Cassini mission, visit <http://www.nasa.gov/cassini>.



# Apollo experiment resurfaces

By Jane Platt

Thirty-five years after moon-walking astronauts placed special reflectors on the lunar surface, scientists have used these devices to test Albert Einstein's general theory of relativity to unprecedented accuracy. The findings, which also confirm theories from Galileo Galilei and Isaac Newton, may help to explain physical laws of the universe and benefit future space missions.

"Our research with the Lunar Laser Ranging experiment probes the equivalence principle, a foundation of Einstein's general theory of relativity, with extreme accuracy," said Dr. James Williams, a JPL research scientist. Galileo established this principle in 1604 when he dropped objects of various weights and composition from Italy's Leaning Tower of Pisa. All the objects were affected equally by gravity, so they fell at the same rate.

Newton published a supporting explanation in 1687 in his Principia, and Einstein extended the principle nearly 100 years ago. Einstein's premise, called the strong equivalence principle, holds that all forms of matter accelerate at the same rate in response to gravity. This principle became a foundation of Einstein's general theory of relativity.

The Lunar Laser Ranging experiment confirms that the moon and Earth "fall toward" the Sun at the same rate, even though Earth has a large iron core below its rocky mantle, while the moon is mostly rocky with a much smaller core. The findings by Williams and Drs. Slava Turyshev and Dale Boggs, also of JPL, have been published in the Physical Review Letters.

"Lunar laser ranging can conduct very accurate tests of gravity and fundamental physics," said Williams, who pointed out that small variations in gravity are difficult to study because the force is weak, unless very large masses are used. The new results of this experiment provide a bonanza for modern physics.

"An important property of gravity is its universal effect on massive objects, despite their size and composition," Turyshev said. "This is why, as we understand more about gravity in the solar system, we learn a lot about gravitational and cosmological processes in the entire universe."

Great strides have been made over the past decade in refining the theories of Einstein, Galileo and Newton. The latest findings are twice as accurate as any previous results on the strong equivalence principle, and 10 times as accurate as anything previously published on the variation of Newton's gravitational constant.

The JPL team tested the theories by beaming laser pulses to four moon reflectors from McDonald Observatory in western Texas, and an observatory in southern France. The lunar reflectors bounced the laser beams straight back to Earth, where the roundtrip travel time was measured. Three of the reflectors were installed by the Apollo 11, 14 and 15 astronauts, and one built by France was carried on the unmanned Soviet Lunokhod 2 rover.

The current moon reflectors require no power and still work perfectly after 35 years. As NASA pursues the vision of taking humans back to the moon, and eventually to Mars and beyond, new, more precise laser ranging devices could be placed first on the moon and then on Mars.



News Briefs



Dr. Mark Adler

Adler earns engineering honor

As part of its celebration of National Engineers Week, Drexel University in Philadelphia last month named DR. MARK ADLER “Engineer of the Year” for his vital role in the development of the Mars Exploration Rovers.

Adler received the award from Drexel at a Feb. 25 banquet. In connection with National Engineers Week, Adler presented an overview of Mars exploration to undergraduate and graduate students from the school of engineering, and also presented the banquet’s keynote address, which highlighted the Spirit mission.

On the MER project, Adler has served as deputy mission system manager; acting project engineer; deputy assembly, test and launch operations manager; landing site selection engineer; and Spirit mission manager.

Currently, he is the Mars sample-return preproject manager, directing system design and technology development to enable a Mars sample-return mission in 2013.

Software competition underway

The call for candidates for the NASA Software of the Year Award has been announced by NASA’s Office of the Chief Engineer. This competition selects one or more software packages developed within NASA for a special Space Act award. Each center typically submits one candidate.

Last year, JPL’s submission—the Science Activity Planner/Maestro package, submitted by JEFF NORRIS and his team from the Mars Exploration Rovers mission—was co-winner of the award.

A general description of the Software of the Year competition and statement of eligibility requirements may be found at <http://icb.nasa.gov/swy.htm>.

Employees are invited to submit candidate packages for consideration by the JPL selection board by Monday, April 11. Candidate packages should be sent to [SOYA-2005@jpl.nasa.gov](mailto:SOYA-2005@jpl.nasa.gov) with “NASA Software of the Year 2005 Candidate” as the subject.

Each package must include a completed Form 1329—available at <http://icb.nasa.gov/aeqchoice.html>—and a New Technology Report number, obtained prior to the April 11 deadline. If you are unsure of the New Technology Report status of your software, or know that you need to initiate a report, call CARLA BAGDASARYAN ext. 3-3421. The form is available at <https://nbs.jpl.nasa.gov/login> under “New Technology and Software Reporting.”

An initial down-selection will be made by the JPL selection board. Finalists will be asked to make a presentation and demonstration of their software. The board will select one of the finalists as JPL’s Software of the Year candidate to go forward to the NASA review panel; the remaining finalists will be submitted for Space Act awards.

Summer camp signups March 19

Signups for the JPL/Caltech Child Educational Center’s 2005 summer camp will take place Saturday, March 19, from 9 a.m. to noon at the CEC’s administrative offices at 140 Foothill Blvd. in La Cañada.

The 10-week camp program will be offered June 20 to Aug. 25 from 7 a.m. to 6 p.m. In addition to the CEC site near JPL, camp will be held at the Pasadena site near Caltech. Both sites will serve children who are entering first through seventh grade. Families can apply for the full summer or for weekly sessions.

Enrollment is limited at each location. Registration will be accepted in the order received.

The CEC’s summer camp program features a wide range of activities such as creative arts and crafts including fabric dying, weaving, paper mache and clay sculpting; creative expression through writing, music, dance and drama; swimming, water play, gardening; and organized sports and games. A science component includes demonstrations of basic concepts and related activities that will provide children the opportunities to hypothesize, investigate, perform experiments, and document their findings. Field trip destinations such as the IMAX Theater, California Science Center, the Pasadena Junior Theater, bowling, ice skating, and special tours of JPL and Caltech are fun and educational.

The CEC also offers, “The Zone,” a program with specialized trips and activities for children going into the fifth through seventh grades, such as roller skating, miniature golf and the beach. Older children at each camp site have the opportunity to participate in the Zone’s weekly activities, which focus on the interests of this age group and allow them time to connect with peers.

This year, the CEC will offer its new performing arts camp, The Traveling Troubadours, to a limited number of children who are entering grades 3 through 7. Children will be involved in all aspects of producing a play that will be presented to parents, peers and the public.

Due to the specialized nature of the Performing Arts Camp, and in order for children to participate fully in the creative process, enrollment is scheduled on a full-time basis in two-week sessions. Space is limited in both Session I, Aug. 1–12, and Session II, Aug. 15–25.

In addition to the performing arts and summer camps, the CEC will provide before- and after-summer school care from June 27 to July 29 to children attending summer school in La Cañada at Paradise Canyon Elementary School.

For more detailed information, to obtain a brochure and application or to arrange a site visit, call the CEC at ext. 4-3418 or visit [www.ceconline.org](http://www.ceconline.org).

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meets Wednesdays at 11:30 a.m.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (the Wellness Place).

Codependents Anonymous—Meets at noon every Wednesday.

Lambda (Gay, Lesbian, Bisexual and Transgender Networking Group)—Meets the first Friday and third Thursday of the month at noon in Building 111-117. For more information, call Randy Herrera, ext. 3-0664.

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

For more information on any of the support groups, call the Employee Assistance Program at ext. 4-3680.

Saturday, March 12

Wild Weather: Wind—This high-definition film screening, to play at 2 p.m. in Caltech’s Beckman Auditorium, will be followed by a discussion about the film by Shane Murphy of Caltech’s Division of Chemistry and Chemical Engineering. Tickets are \$5. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Sunday, March 13

Chamber Music—The Primavera Trio will perform a free concert at 3:30 p.m. in Caltech’s Dabney Lounge. For more information, call (626) 395-4652.

Monday, March 14

“How Does the Sun Shine?”—John Bahcall, professor of natural sciences at Princeton’s Institute for Advanced Study, will give this free lecture at 8 p.m. in Caltech’s Beckman Auditorium. For more information, call (626) 395-4652.

“Planetary Science Beyond the Solar System: Extrasolar Giant Planets”—Jonathan Lunine, professor of planetary sciences and physics at the University of Arizona and a JPL Distinguished Visiting Scientist, will lecture at 11:30 a.m. in von Kármán Auditorium.

Tues.-Wed., March 15-16

Investment Advice—TIAA/CREF will offer one-on-one counseling in T1720. For an appointment, visit [www.tiaa-cref.org](http://www.tiaa-cref.org) or call (877) 209-3140, ext. 2614.

Wednesday, March 16

JPL Library Orientation—Stop by at 11:30 a.m. at Building 111-104 for an overview of the Library’s products and services, and learn how to access numerous electronic resources from your desktop. For more information, call the reference desk, ext. 4-4200.

“Photoionization Studies of Highly Charged Ions Relevant to Astrophysics”—Alex Aguilar of the National Institute of Standards and Technology will speak at 11 a.m. in Building 180-101.

Thursday, March 17

“Albert Einstein in 1905: Finding New Paths to the Depths of Physics”—Martin Klein, professor of physics and history of science at Yale University, will give a free lecture at 8 p.m. in Caltech’s Beckman Auditorium. For more information, call (626) 395-4652.

Thu.-Fri., March 17-18

Von Kármán Lecture Series—Robert Dean Abelson of JPL’s Near Earth Mission Architecture Group will present “Big Things Come in Small Packages: Mission Concepts Potentially Enabled by Small-RPS Technology” 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 [www.jpl.nasa.gov/events/lectures/mar05.cfm](http://www.jpl.nasa.gov/events/lectures/mar05.cfm). For more information, call Public Services, ext. 4-0112.

Sunday, March 20

Chamber Music—The St. Lawrence Quintet will perform at 3:30 p.m. in Caltech’s Beckman Auditorium. Tickets are \$29, \$25, \$21 and \$17. For more information, call (626) 395-4652.

Wednesday, March 23

JPL Library Orientation—Stop by at 11:30 a.m. at Building 111-104 for an overview of the Library’s products and services, and learn how to access numerous electronic resources from your desktop.

JPL Toastmasters Club—Meeting at 5 p.m. in conference room 167. Call Dirk Runge, ext. 3-0465, or visit [www.jplcaltechoastmasters.com](http://www.jplcaltechoastmasters.com).

Thursday, March 24

Caltech Architectural Tour—Hosted by the Caltech Women’s Club, from 11 a.m. to 12:30 p.m. Free and open to the public. Meet at the Athenaeum front hall, 551 S. Hill Ave. For reservations, call Susan Lee, (626) 395-6327.

Huge antenna makes a move

By Susan Braunheim-Kalogerakos

Crew in Madrid, Spain, slowly moves a 34-meter antenna.



A Deep Space Network (DSN) antenna was relocated February 20 at the Madrid Deep Space Communications Complex due to unstable ground below its foundation.

The antenna, known as Deep Space Station 65, or DSS-65, has a dish diameter of 34 meters (about 111 feet). It weighs more than 800,000 pounds (about 363 kilograms) and is more than 34 meters tall.

Years of subsurface water flow had caused the ground under DSS-65 to become too weak to adequately support the antenna. DSN antennas require precise pointing, which necessitates stable soil. Despite remedial measures and track realignment, DSS-65’s performance had deteriorated and there was a fear that eventually the condition would lead to major pointing degradation during critical spacecraft tracking.

A new foundation was constructed about 60 meters (66 yards) away from the antenna’s original location. A temporary roadway was built between the two foundations. The antenna was lifted onto four sets of self-propelled transporters that were hooked up to one joystick console. These transporters somewhat resemble large remote-controlled skateboards. The antenna was then driven to the new site, where it was lowered into position and secured. The 60-meter drive took about an hour and 10 minutes to complete.

The relocation effort went off without a hitch. Benjamin Saldua, the antenna structural cognizant development engineer from JPL’s Antenna Mechanical and Structural Engineering Group, was the responsible technical representative. “We considered all possible failure scenarios that could happen during the move and we prepared for it. We were confident the move would be successful,” Saldua said. “Sure enough it ran very smoothly.”

Kenneth Bartos was the task manager and site rep for the project. Dennis Buck, manager of JPL’s Antenna Front End and DSN Science Support Office, helped manage the antenna relocation project. “The most challenging part of the entire relocation process was getting it done when antenna downtime was available, which happened to be the middle of winter,” Buck said. “There were significant wind restrictions, and we obviously didn’t want to move the antenna during inclement weather. Looking at the weather forecast we had to step the move up by two days. We were very lucky the weather worked for us.”

The DSS-65 relocation contract was awarded to MTC Technologies of Pasadena. The actual relocation procedure was carried out by Mammoet Europe B.V. Mammoet, headquartered in The Netherlands, specializes in heavy lifting and transport solutions worldwide.

In the past year, DSS-65 has supported many spacecraft, including Cassini, Genesis, Mars Exploration Rovers, Mars Global Surveyor, Mars Odyssey, Messenger, Rosetta, Stardust, Spitzer and Voyager 1. No spacecraft operations were effected by the move.



# Realizing the future

Dr. Firouz Naderi has been named Associate Director of JPL for Programs, Project Formulation and Strategy by Lab director Dr. Charles Elachi. Naderi, who previously led the Mars Program for five years, discusses his new role with Universe.

**Q. Overall how would you describe your new job?**

What is amazing about JPL is its ability to come up with fresh ideas, formulate projects based on these ideas, develop the technology that would make them possible, implement projects, return science data and interpret the observation—the total end-to-end capability. JPL's new business is generated in the front end of this life-cycle process. This will be my focus. In short, I think of my job as lubricating the engine that will generate JPL's future.

**Q. Your new title, Associate Director for Programs, Project Formulation and Strategy, suggests that there are three components to your new job. Is that right, and what does each of them entail?**

Your observation is correct. In the first component, Programs, I will serve as the senior JPL officer for oversight of programs assigned to JPL, such as the Mars, New Millennium and Navigator programs. This includes providing strategic guidelines and best practices for planning and management of these programs.

In the second component, Project Formulation, I hope to provide complementary leadership to that provided by our other Associate Director, Tom Gavin. Tom has been very successful putting in place the infrastructure needed for successful execution of the projects when they get to the implementation phase. My position, on the other hand, will concentrate on all resources and processes required by JPL to acquire and initiate projects, both assigned and through competition. These include our advanced studies, preprojects, proposal processes and initiation of project formulation phase through Preliminary Missions System Requirements Review for our assigned missions, and through the end of Step II for our competed missions.

Organizations that do not plan strategically will fumble the future. In the third component of my job I am tasked to look five to 15 years out into the future and suggest where JPL should be and suggest strategies that will position to get us there. This will be done in the framework of JPL's Strategic Management Council, for which I will continue to serve as Chair. The annual allocation of JPL's investment budget, now approaching \$100 million, and generation of a set of Implementation Plan Actions, are the levers that we will use to help steer us in the right direction.

**Q. What draws you to the front end of the JPL end-to-end life cycle?**

I am attracted to it because it is the creative phase. You are working with a blank canvas. You get to carve the statue from a shapeless block of marble. You get to work with other original thinkers in a creative collaboration finding boundary-busting solutions. This is also the phase when you get to sketch out the silhouette of missions or architect programs. I started out studying to be an architect and ended up an engineer. But in some sense JPL has allowed me to realize my dream, except instead of architecting buildings I get to participate in architecting programs to search for other worlds.



It is my ambition to attract the most gifted JPLers, those who can dream and conceptualize and can give birth to new ideas, into a virtual community that will forge the future of JPL. We have many talented individuals at JPL but great achievements result from interplay of distinguished minds and I hope to find mechanisms where this exchange can happen more easily and more often.

**Q. You have also participated in the implementation phase of missions both as a project manager and a program manager. How rewarding was that for you?**

That is what is great about JPL. It allows you to experience all facets and phases of a project. Architecting a building gives you one kind of reward; seeing the floors actually go up and take shape gives you another sense of fulfillment. I will actively work to encourage our project people to cycle through preprojects/proposals, formulation phase and implementation phase. They will ultimately become more well rounded and JPL will be a better place for it.



**Q. Is it hard for you to leave the Mars Program?**

Yes, it is hard to leave the Mars Program, but fortunately my new position still allows me to be in touch. I generally do not like to stay in a job more than five years. Change will keep you on your toes and force you to get back to your creative peak. That is why my tenure as NSCAT project manager and Origins and Mars program managers have all been around five years.

**Q. What is your favorite memory of your time as the head of the program?**

Clearly it has to be my association with the MER Team. This was a team fueled by an invigorating, completely unrealistic view of what they could accomplish — a sense of confidence bordering on delusional. Yet it was this belief in themselves and each other that allowed them to pull off one of the most remarkable accomplishments in JPL history. MER was not a job, it was a mission carried out by the people with fire in their eyes. Now, with the intensity of the moment past, I can savor the moment and enjoy it like the aftertaste of a great wine.

## Li, Theisinger, Cook begin new positions

Dr. Firouz Naderi's appointment as Associate Director for Programs, Project Formulation and Strategy has also resulted in several other management changes.

Naderi's deputy manager for Mars exploration, Dr. Fuk Li, has been named manager of that program. Peter Theisinger, project manager for the Mars Science Laboratory mission in development, is the new deputy manager of the Mars Exploration Program. Richard Cook, Theisinger's deputy, is now the Mars Science Laboratory project manager.

Li has been deputy director of the Mars Exploration Directorate since 2004. JPL coordinates the Mars Exploration Program for all of NASA, which currently has two spacecraft studying Mars from orbit, two rovers active on the surface and four spacecraft in development.

From 2001 to 2004, Li was the deputy director of the Solar System Exploration Directorate, and from 1997 to 2001, he managed NASA's New Millennium Program, which develops and tests new technologies in space flight for use in later science missions. Previously, he managed the Earth Science Program, was project engineer for the NASA Scatterometer and was involved in various radar remote-sensing activities. He earned his bachelor's and doctorate degrees in physics from the Massachusetts Institute of Technology, Cambridge, before joining JPL in 1979.

Theisinger had managed the Mars Science Laboratory Project since February 2004. The project is developing a rover with a science payload more than 10 times as massive as those on the current Mars Exploration Rovers. The project's advanced landing techniques will make many of Mars' most intriguing regions viable destinations for the first time.

Theisinger managed the Mars Exploration Rover Project from its inception in mid-2000 until after the successful landings and initial surface operations of the rovers Spirit and Op-



Dr. Fuk Li



Peter Theisinger



Richard Cook

portunity. Prior JPL positions included deputy manager for the Mars Sample Return Project, mission support and development manager for the Mars Surveyor Operations Project and project engineer for the Mars Global Surveyor spacecraft development project. He first joined JPL in 1967, the year he received a bachelor's degree in physics from Caltech.

Cook became deputy project manager for Mars Science Laboratory in June 2004 after four months as project manager for the Mars Exploration Rovers. He had earlier helped lead the development and operation of Spirit and Opportunity as flight systems manager and deputy project manager. Previously, Cook was flight operations manager for the Mars Pathfinder Project, which put a lander and small rover on Mars in 1997. He joined JPL in 1989 and worked on the Magellan mission to Venus prior to Pathfinder. He earned a bachelor's degree in engineering physics from the University of Colorado and a master's in aerospace engineering from the University of Texas.



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



Trekking with NASA

Media Relations Office members Whitney Clavin (left) and DC Agle flank actor Scott Bakula, who plays Captain Archer on Star Trek Enterprise, during a recent visit to the show’s sound stage at Paramount Studios. Bakula recorded a video greeting used in support of NASA TV and NASA’s online return to flight coverage, as well as a farewell video for former NASA Administrator Sean O’Keefe. Bakula is holding a framed photo signed by the STS-114 crew.

Passings

**RUSSELL STOTT**, 82, a retired engineer, died Feb. 16.  
Stott joined JPL in 1947 and retired in 1990. He is survived by his wife, Jane Brun Stott, sister Barbara, son Charlie, daughter Tina and grandchildren Betsy and Nick.  
Memorial services were held Feb. 23 at Caltech’s Athenaeum. In lieu of flowers, the family suggests that remembrances may be sent in the form of donations to the Save the Redwoods League, [savetheredwoods.org](http://savetheredwoods.org).

Letters

As life goes on, we never forget the memories of our parents and what they have passed on to us to help grow and understand life. I want to take a moment to thank both co-workers and friends for the well wishes on the passing of my father. I also want to thank JPL Hospitality for the beautiful plant.

Michael Nieto

Classifieds

For Sale

BEDROOM FURNITURE, gorgeous 5-pc. cherry wood, queen-sized bed frame, ~6 mo. old, incl. queen-sized memory foam bed, all for \$1,750. 626/264-2692 or 626/568-3452, Judy, eves.  
BEDROOM SET, antique, oak, queen size headboard and mattress with beautiful armoire, \$600/obo. 667-5569.  
BOX SPRING for twin bed, low profile, never used, \$25. 998-5570.  
CAMCORDER: Sony DGR-HC40E PAL MiniDV, used so little that it is like new, in original box with user manual, bought for ~\$700 for 2004 Christmas, will sell for \$450. 885-6317 or Peter\_Peng\_888@hotmail.com.  
COMPUTER, nearly new, Fujitsu Lifebook lap-top, model N6010, 3.2GHz, 17" WXGA+ wide TFT LCD, DVD-RW, lovely picture quality, never connected to internet, \$1,400. 626/799-9347, Maria.  
CRIB, Forever Mine All American white crib & mattress, barely used, exc. cond., maple hardwood, converts to youth bed, then double bed, purchased in '02, \$200. 626/355-0474, Julie.  
CRIB with mattress, Bellini, Marni model, natural beechwood finish, converts to junior bed, bottom storage drawer, exc. cond., paid \$499, sell \$250/obo. 952-3971.  
DINETTE SETS: 62" x 38", mahogany, 4 chairs, exc. cond., wood, \$400; corner set, high-back benches, 48" x 30" table, \$150; PATIO SET, 64" x 39" glass table & 6 chairs, 2 ottomans, 1 side table, 1 yr. old, \$300. 626/510-9152.  
DISHES/BAKEWARE, Corelle by Corning, snowflake pattern, 5-pc. service for 8 (dinner and salad plates, cereal bowl, cup & saucer), many matching serving pieces including: 2 serving bowls, salt & pepper, butter dish, sugar & creamer, extra mugs, napkin rings, glassware, 4 mixing bowls, 11 cookware pieces, perfect for someone starting out, exc. cond., all for \$100/obo. 626/791-7645.  
DODGER TICKETS: 4 season seats, outstanding locations in aisle 1, 10 rows directly behind home plate, VIP parking avail. for 20 selected games, \$212.50 per game. 626/836-9280, after 7 p.m.  
DODGER TICKETS: selected games from season ticket package, loge level (orange), aisle 132 (at 1st base), 2 tickets per game at face value of \$30/ticket. [www.delunac.net/tickets](http://www.delunac.net/tickets) or 626/296-1253.  
FURNITURE: office desk, \$25; credenza, \$20; twin bed, wood w/bottom drawers, \$25. 626/818-9325.  
FURNITURE: queen sofa sleeper, 81" (blue/cranberry/tan plaid), good cond., \$75; oak computer desk/hutch and printer stand, good cond., \$75. 626/836-8536.  
FURNITURE: kitchen pine table w/4 matching chairs, table has a tiled top (white tiles & ivy pattern tiles in center), about 61" long x 37" wide, \$150; tall bookshelf w/foldable shelves, \$35; 2-drawer filing cabinet, \$7. 626/394-9629.  
HIGH CHAIR, Fisher Price, white, blue plaid

wipeable chair pad, 4 position reclining seat, 3 height adjustment, exc. cond., brand new re-straint assembly, \$25. 626/355-0474, Julie.  
JEWELRY: ladies new Coach Metropolitan brown leather strap watch, \$50; 14K tri-color gold diamond-cut bracelet, \$140; 14K 2-sided, 18" diamond-cut necklace, \$180. 653-9037.  
LAMINATOR, GBC Ultima 65-1, 18 mo. old, incl. extra film books, etc., was \$2,965, will sacrifice at \$2,400/obo. 626/962-7668, after 6.  
FURNITURE: loveseat, 60", built-in, pull-up footrests, soft colors, subtle pattern, clean, exc. cond., \$250; recliner, rocker, swivel chair, seafoam color that matches colors in loveseat, great for apt., college students, exc. cond., photos available, cash/cashier check, buyer responsible for pick-up, \$190. 626/470-5303, day or 626/358-2208, eve., after 5:30.  
MISC: mailbox, oversized, green, \$10; wig, red, shoulder length, never used, \$20; portable basketball set, adjustable (needs net), \$200; fishing pole (saltwater), \$25; bunk bed mattress, good cond., \$10; baseball glove (small) & conditioner, good cond., \$15; small food chopper, \$5; oil painting, landscape autumn tones, \$100. 626/357-8210.  
MISC: television, color, Sony 32" Trinitron in wood cabinet w/built-in speakers, \$300/obo; scissors and paper trimmer, Fiskar, new; embossing heat tool, Marvy, new; rubber stamps, assorted sets, new, never used, \$50; baskets w/6 Christmas ornaments, beaded, new, in red or gold, \$15/ea.; back brace, Flex Support, double-pull, XL, \$10; crystal heart earrings, Swarovski, pierced, looks like blue topaz & diamonds, \$40. 626/398-4960.  
NECKLACE, new ladies Paloma Picasso Daisy pendant, platinum, round brilliant diamonds from Tiffanys, .15 carat total, G color, VS clarity; on 16" chain, paid \$1,395, sell for \$800. 653-9037.  
PUPPY, female yellow lab, pure breed, AKC registered, not spayed, all shots, family friendly, \$400. 626/351-0774.  
SCOOTER, '01 Amigo Baja, 3 wheel w/battery & basket, like new, \$1,200. 248-3912.  
SPEAKERS (2), Marantz, for floor, exc. cond., \$100 ea./obo; TAPE DECK, Sherwood, exc. cond., \$100/obo. 249-9369.  
STOVE, antique, 1930s(?) Mastercraft, serial #167 from Culver City Stoves, thermometer in oven door, white and teal porcelain, not in working condition, lots of rust but it is 100% complete, \$100/obo. 249-8487, Jeff or LIEVENJA@airproducts.com.  
TELEVISION, RCA 52" big screen, 8 yrs. old, 4:3, orig. manual and remote, s-video input, med. oak colored cabinet, works very well, viewing from all angles, can help deliver locally, can e-mail pics, \$400. 249-8487, Jeff or LIEVENJA@airproducts.com.  
TV, 25" Sharp color; + DVD player, Daewoo, \$100. 952-4444, x104.  
TROPICAL PLANTS, plumerias, variety of colors and sizes; shell gingers. 626/444-6156, Annie & Bob DePonte.

**Vehicles / Accessories**

BED LINER for Chevrolet S-10 short bed truck, like new, \$70. 626/359-7666.  
'98 BMW 740i, V8, 290 HP, 94K mi., white, exc. cond., loaded, beautiful ride & handling, premium sound, sunroof, 6 airbags, stability control, extended warranty for 1 more year, \$14,999/obo. 909/592-2279.  
'85 BMW 318i, 2 door, runs well, power windows, standard, \$500. 323/533-7961.  
CAMPER TOP for small truck, burgundy, \$500. 626/394-9629.  
'01 CHEVROLET Suburban, maroon ext./beige int., exc. cond., chrome rims and after-market wheels, flow master muffler, garaged, all maintenance records, original owner, 47K, \$21,000/obo. 909/482-2236.  
'92 CHEVROLET G20 van conversion, V8 auto, power steering/windows/locks, cruise control, tilt steering wheel, am/fm/cass., running boards, well maintained, good for camping or family outings, 139K mi., \$3,950. 909/899-6216.  
'01 FORD Explorer XLT V-8, black, AWD, 24,300 mi., extended warr., front & rear a/c, leather seats, front & rear pass. airbags, prem. sound, 6-CD changer, power moonroof/seats/doors/locks, cruise, auto dim rear view mirror, alloy wheels, keyless entry, remote alarm, fog lamps, running boards, flared moldings, back-up sensors, rear wiper, roof rack, 4,000-lb. hitch, privacy windows, cargo cover, \$18,750. 909/851-1331.  
'93 FORD Explorer XLT, dk. green, tan leather interior, pwr everything, CD player, gd. cond., well maintained, \$2,600. 951-5952, Dave.  
'03 GMC Sonoma truck, 3 door, extended cab, SLS trim, one owner, auto, 14,400 mi., a/c, power steering, tilt wheel/cruise control, CD player, aluminum wheels, tachometer, heavy duty suspension, white color, exc. cond., under warranty, \$12,995. 952-0047.  
'99 HONDA Civic, silver, 4-dr., 82,500 mi.

(mostly highway), equipped with full Wings West body kit, 18" Enkei 5 spoke rims, AEM cool air intake, Euro taillights & clear headlamps, \$7,500/obo. 909/732-1969 or 626/260-1494.  
'85 HONDA Civic, 4-dr., gd. cond., \$1,200/obo. 626/345-0969.  
'00 JEEP Grand Cherokee Ltd., V8, Quatra-Drive, 71K mi., exc. cond., 1 owner, champagne, leather, warranty (up to 75K mi.), remote engine starter, dual airbags, ABS (4-wheel), heated/memory seats, 10-disc CD changer, premium sound, a/c, power steering/windows/doors/seats/sun roof, tilt wheel, cruise control, am/fm/stereo/cass., running boards, towing pkg., \$12,900/obo. [alanf@caltech.edu](mailto:alanf@caltech.edu), Alan.  
'94 LEXUS SC400 sport coupe, 78,500 mi., black/tan leather interior, exc. cond., 2 owners, me for 8 yrs., \$12,000/obo. 790-6185, Tim Scheck or tscheck1@mac.com.  
'97 MITSUBISHI Eclipse, 2-dr., black/tan, 5-speed, sporty & gas saver, vg cond., stereo am/fm, CD, a/c, sunroof, 99K mi., \$6,300/obo. 626/961-8771, David.  
'99 NISSAN Quest SE, 108K mi., auto, champagne, 7 pass., 2nd sliding door, a/c, power windows/locks, avail. April 9, \$7,950. 626/793-4099 or geraint@sbcbglobal.net.

Free

INDOOR CATS, sweet & cute, black & white, 1.5 yrs. old (1 male, 1 female), spayed/neutered, all shots current, both have had tendenectomies. 909/214-6469, Mike.

Wanted

BOOKS, used or new, paperback, hardback or magazine, romance, science fiction, mystery, etc. 248-0178, [engineerbob4449@yahoo.com](mailto:engineerbob4449@yahoo.com).  
CARPOOLER, one mate is needed, leave from Diamond Bar at 6:45 a.m. Ext. 4-9329, Shu.  
SINGER, 20-26 years of age, influences: Sevendust, 311, Deftones. 626/357-8210.  
SPACE INFORMATION/memorabilia from U.S. & other countries, past & present, for personal use. 790-8523, Marc Rayman.  
VANPOOL, RIDERS from Victor Valley/Hesperia, Ext. 4-1424, Scott.

For Rent

ALTADENA, large second-story loft, 20' x 24' w/lg. 10' x 13' modern kitchen, large bath, central heat & air, very unique space, 1870 N. Allen Ave. 626/798-5277.  
ALTADENA house, 1 mi. from JPL, close to trails for biking/hiking/walking, 587 W. Ventura St., 3 bd., 2 ba., bonus room, formal dining, fire place, central heat & a/c, enclosed washer/dryer hookup, new 2-car port w/patio deck above, lg. storage rm., garaged game room (professional pool table & dart board), several new additional features installed, move-in ready, \$2,400. 626/398-8184.  
ALTADENA, comprehensively furnished for extended stays: 3 bd., study, boundary Angeles Nat'l Forest, 3 mi. from JPL (trails to Lab behind house), view, fireplace, oak floors, antiques; furniture, beds, dinnerware, utensils, pots/pans, all linens & towels, fine soaps, necessities included; just bring toothbrush & clothes; TV/DVD/VHS, Dish satellite, wireless DSL; gardens, patio, parking; private, immaculate, avail. April, 626/798-3235.  
ALTADENA duplex, 2 bd., 1 ba., 1 mi. on foot from JPL thru Arroyo Seco, 2.5 mi. by car, non-smoking, \$1,250, incl. laundry, util. 626/794-5439, Rich.  
ARCADIA, 3 bd., 3 ba. house, beautiful town w/highly ranked school district, great for family w/children; close to mall, entertainment and restaurants; hardwood floors, central a/c and heating, yard, fireplace, stove, refrigerator, washer/dryer, large walk-in closets, double pane windows with Venusian blinds, attic for storage, recently renovated bathrooms; \$2,300. 714/296-0176.  
ARCADIA studio w/full ba., close to mall, entertainment and restaurants, a/c and heating, \$700. 714/296-0176.  
LA CRESCENTA house, 3 bd., 1 3/4 ba., cent. air/heat, hardwood floors, laundry rm., avail. May 1, \$1,750 + security deposit. 402-7507.  
LA CRESCENTA house, 3 bd., 2 3/4 ba., central air/heat, fireplace, 2-car attached garage, built in 2000, avail. April 1, \$1,975 + security deposit. 402-7507.  
MONTROSE, single studio, 5 min. from JPL, exc. neighborhood, kitchenette and full bath, laundry, separate entrance, \$700. 667-5569.  
PASADENA, share house, pool, beautiful backyard, walking distance to Caltech and Lake Ave. stores, lg. private bedroom, mostly furn., full bathroom, kitchen privileges, \$200/wk. 626/792-1082.  
PASADENA, near Caltech, very clean, very

private, lots of green, elegant; prefer male to share 2+2 condo; bedroom w/large closet + large private bath, elec. gated parking, \$600 + \$25 util. 626/796-9221.  
PASADENA, walk to the Rose Bowl, 3 bd., 2 ba., craftsman front house w/master suite & yard, comes with appliances, gardener, Palisade & Arroyo, 5 min. from Lab, \$1,850. 626/794-8517.  
PASADENA home, near Washington & Allen, newly decorated, 3 bd., 1 ba., formal d/r, 20 min. to JPL, 2-car garage, wonderful mtn. view, gardener & water paid, sorry no pets, \$1,500 + util. + \$1,400 security dep. 626/355-4592.

**Real Estate**

ALPINE FOREST, 3.2 acre view lot, 25 min. from Tehachapi, property sits among pine and oak trees at 6,300 ft. elevation, 4 seasons are part of enjoyment, property is buildable for vacation retreat or secluded home site, property ass'n responsible for road maintenance and security (gated w/guard), closest neighbor is 3/4 mi., \$40,000. 249-6071.  
ALTADENA, The Meadows, 3 bd., 3 ba., LR, DR, FR, hardwood floors, pool, great view, private road. 626/797-7905 or 626/826-3843.  
BELIZE forest, 100.1 acres, property has a stream (w/pools & small rock waterfalls), hills, flats, views, thick jungle, good farming soil, land for livestock, visiting howler monkeys, and access roads; located in Cayo district near San Egnacio city, could be used as resort, home, or ranch, solar power & water filtering could be installed, photos avail., \$89,000. 363-9999 or jwishard@socal.rr.com.  
ESCONDIDO, golfers' paradise timeshare (Lawrence Welk Villa), fixed week #23 with high re/trading value, Wild Animal Park, Zoo & Sea World close by, spacious 1,600 sq. ft., 2 bd., 2 full ba. with all amenities; includes cathedral vaulted ceiling and outside veranda overlooking beautiful 18-hole golf course, \$17,000. 249-6071.

**Vacation Rentals**

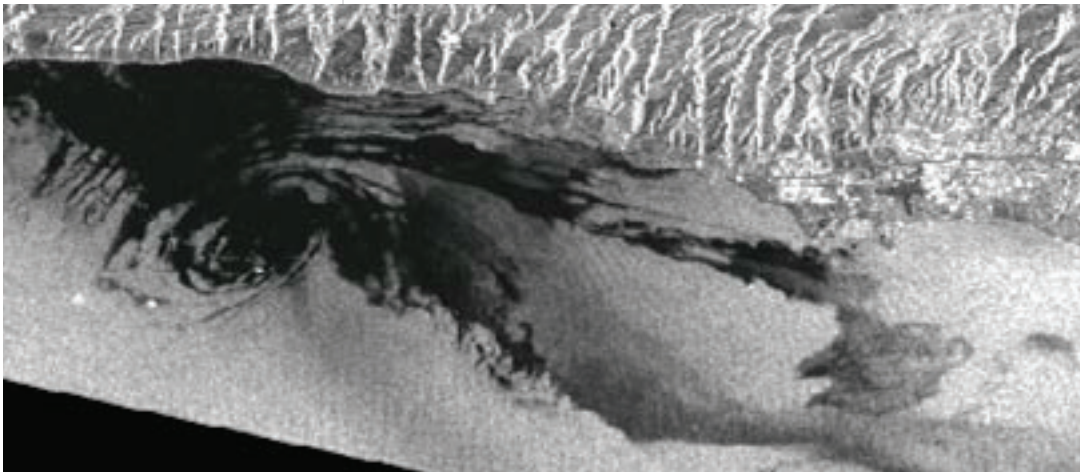
BIG BEAR LAKEFRONT luxury townhome, 2 decks, indoor pool/spa, near skiing, beautiful master bd. suite, sleeps 6. 949/786-6548.  
CAMBRIA ocean front house, exceptional white water view, accom. up to 4 people, all amenities provided. 702/256-1359, [ereynolds2@cox.net](mailto:ereynolds2@cox.net).  
CARMEL, Hyatt Highlands Inn, resort overlooks ocean, 1 bd., living room and fully-equipped kitchen, sleeps 4, wood-burning fireplace, spa tub, private balcony, binoculars, complimentary bicycles, July 2-9, '05, \$135/nt., additional locations avail. 626/794-9579 or fivestarresorts@earthlink.net.  
FLORIDA condo, beautifully furnished 2 bd., 2 ba., 2nd floor, on the surf of New Smyrna Beach, 1/2 hour to Cape Canaveral, 90 min. to Disney World; enjoy all the comforts of home; quiet, relaxing, overlooking the beach and the Atlantic; BBQ, pool, game room; easy walk to stores and restaurants. 760/439-7821, Darlene, or [dhauge@yahoo.com](mailto:dhauge@yahoo.com).  
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 \$115/nite/2, high season rate \$130/nite/2, \$15/nite/add'l person. 949/348-8047, [jackandrandy@cox.net](mailto:jackandrandy@cox.net).  
LAKE TAHOE, Marriott Timber Lodge in Heavenly Village, studio, king bed, full sofa bed, sleeps 4, microwave, small refrig., dishes, coffee maker, 5 blocks from lake, Aug. 5-12, '05, \$60/night, additional locations avail. 626/794-9579 or fivestarresorts@earthlink.net.  
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/view to mtns., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc'nt. 626/798-9222 or 626/794-0455 or [valeriee@caltech.edu](mailto:valeriee@caltech.edu).  
OCEANSIDE condo, on the sand, charming, 1 bd., panoramic view, walk to pier or harbor, pool/spa, game room, slps. 4. 949/786-6548.  
OREGON, Brookings, Moosehead Lodge, [www.mooseheadlodgeoregon.com](http://www.mooseheadlodgeoregon.com), at the Winchuck River Estuary, fully furnished 3 bd., 2 ba. residence, 1 mi. from Cal. border, walk Pelican Bay beach w/tide pools, surf and driftwood, fish Pacific Ocean/Wild Rivers along S. Oregon/N. Cal. coast, enjoy the redwoods and Siskiyou National Forest. 800/221-8175.  
PARK CITY, UTAH studio condo, 2 queen beds, indoor pool/Jac., spa, fitness center, kitchenette includes: small frig/freezer, microwave, stove, toaster, blender, coffee maker, pots/pans, dishes; cable TV, VCR/DVD, phone, balcony, 24-hr. desk, concierge, child care, laundry service, free transportation to ski resort and Main Street (both within 1-2 mi.), JPL discount. [garyglass500@charter.net](mailto:garyglass500@charter.net).



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## Radar detects coastal pollution

By Alan Buis



European Remote Sensing 1 satellite radar image depicting natural oil seeps in the Santa Barbara Channel off Coal Point, California, Jan. 13, 1996.

A NASA-FUNDED STUDY OF MARINE POLLUTION in Southern California concluded space-based synthetic aperture radar can be a vital observational tool for assessing and monitoring ocean hazards in urbanized coastal regions.

“Clean beaches and coastal waters are integral to Southern California’s economy and lifestyle,” said JPL oceanographer Dr. Paul DiGiacomo. He is lead author of the study recently published in the Marine Pollution Bulletin. “Using Southern California as a model system, we’ve shown existing high-resolution space-based radar systems can be used to effectively detect and assess marine pollution hazards. This is an invaluable tool for water quality managers to better protect public health and coastal resources,” he said.

DiGiacomo and colleagues from JPL, UC Santa Barbara and USC examined satellite radar imagery of the coastal waters of Southern California. The area is adjacent to 20 million people, nearly 25 percent of the U.S. coastal population. The imaging radar data from the European Space Agency’s European Remote Sensing Satellites 1 and 2 and

Canada’s Radarsat were complemented by shore-based surface current radar data and other field measurements.

“The key to evaluating and managing pollution hazards in urban coastal regions is accurate, timely data,” DiGiacomo said. “Since such hazards are usually localized, dynamic and episodic, they’re hard to assess using oceanographic field sampling. Space-based imaging radar works day and night, regardless of clouds, detecting pollution deposits on the sea surface. Combined with field surveys and other observations including shore-based radar data, it greatly improves our ability to detect and monitor such hazards,” he said.

The study described three major pollutant sources for Southern California: storm water runoff, wastewater discharge and natural hydrocarbon seepage.

“During late fall to early spring, storms contribute more than 95 percent of the region’s annual runoff volume and pollutant load,” said JPL co-author Ben Holt. “Californians are accustomed to warnings to stay out of the ocean during and after storms. Even small storms can impact water quality. Radar data can be especially useful for monitoring this episodic seasonal runoff,” he said.

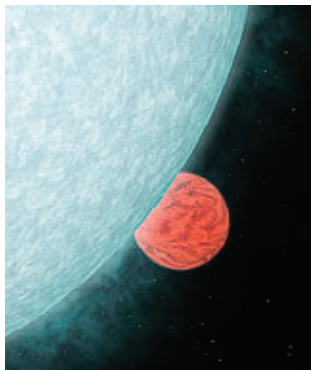
DiGiacomo noted a regional Southern California marine water quality monitoring survey is under way involving JPL and more than 60 other organizations, including the Southern California Coastal Water Research Project. Its goal is to characterize the distribution and ecological effects of storm water runoff in the region. Space radar and other satellite sensor data are being combined, including data from NASA’s Moderate Resolution Imaging Spectroradiometers. The sensors provide frequent observations, subject to clouds, of ocean color that can be used to detect regional storm water runoff and complement the finer resolution but less frequent radar imagery.

The second largest source of the area’s pollution is wastewater discharge. Publicly owned treatment works discharge daily more than 1 billion gallons of treated wastewater into Southern California’s coastal waters. Even though it is discharged deep offshore, submerged plumes occasionally reach the surface and can contaminate local shorelines.

Natural hydrocarbon seeps are another local pollution hazard. Underwater seeps in the Santa Barbara Channel and Santa Monica Bay have deposited tar over area beaches. Space imaging radar can track seepage on the ocean surface, as well as human-caused oil spills, which are often affected by ocean circulation patterns that make other tracking techniques difficult.

Further research is necessary to determine the composition of pollution hazards detected by radar. “From imaging radar, we know where the runoff is, but not necessarily which parts of it are harmful,” Holt said. “If connections can be established, imaging radar may be able to help predict the most harmful parts of the runoff.”

While the researchers said environmental conditions such as wind and waves can limit the ability of space radar to detect ocean pollution, they stressed the only major limitation of the technique is infrequent coverage. “Toward the goal of a comprehensive coastal ocean observing system, development of future radar missions with more frequent coverage is a high priority,” DiGiacomo said.



## Spitzer marks start of new age of planetary science

### Extrasolar planets' light detected

By Whitney Clavin

THE JPL-MANAGED SPITZER SPACE TELESCOPE has for the first time captured the light from two known planets orbiting stars other than our Sun. The findings mark the beginning of a new age of planetary science, in which “extrasolar” planets can be directly measured and compared.

“Spitzer has provided us with a powerful new tool for learning about the temperatures, atmospheres and orbits of planets hundreds of light-years from Earth,” said Dr. Drake Deming of NASA’s Goddard Space Flight Center, lead author of a new study on one of the planets.

“It’s fantastic,” said Dr. David Charbonneau of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass., lead author of a separate study on a different planet. “We’ve been hunting for this light for almost 10 years, ever since extrasolar planets were first discovered.” The Deming paper appeared March 22 in Nature’s online publication; the Charbonneau paper will be published in an upcoming issue of the Astrophysical Journal.

So far, all confirmed extrasolar planets, including the two recently observed by Spitzer, have been discovered indirectly, mainly by the “wobble” technique and, more recently, the “transit” technique. In the first method, a planet is detected by the gravitational tug it exerts on its parent star, which makes the star wobble. In the second, a planet’s presence is inferred when it passes in front of its star, causing the star to dim, or blink. Both strategies use visible-light telescopes and reveal the mass and size of planets, respectively.

In the new studies, Spitzer has directly observed the warm infrared glows of two previously detected “hot Jupiter” planets, designated HD 209458b and TrES-1. Hot Jupiters are extrasolar gas giants that zip closely around their parent stars. From their toasty orbits, they soak up ample starlight and shine brightly in infrared wavelengths.

To distinguish this planet glow from that of the fiery hot stars, the astronomers used a simple trick. First, they used Spitzer to collect the total infrared light from both the stars and planets. Then, when the planets dipped behind the stars as part of their regular orbit, the astronomers measured the infrared light coming from just the stars. This pinpointed

exactly how much infrared light belonged to the planets. “In visible light, the glare of the star completely overwhelms the glimmer of light reflected by the planet,” said Charbonneau. “In infrared, the star–planet contrast is more favorable because the planet emits its own light.”

The Spitzer data told the astronomers that both planets are at least a steaming 1,000 Kelvin (727 degrees Celsius, 1,340 degrees Fahrenheit). These measurements confirm that hot Jupiters are indeed hot. Upcoming Spitzer observations using a range of infrared wavelengths are expected to provide more information about the planets’ winds and atmospheric compositions.

The findings also reawaken a mystery that some astronomers had laid to rest. Planet HD 209458b is unusually puffy, or large for its mass, which some scientists thought was the result of an unseen planet’s gravitational pull. If this theory had been correct, HD 209458b would have a noncircular orbit. Spitzer discovered that the planet does in fact follow a circular path. “We’re back to square one,” said Dr. Sara Seager, Carnegie Institution of Washington, co-author of the Deming paper. “For us theorists, that’s fun.”

Spitzer is ideally suited for studying extrasolar planets known to transit, or cross, stars the size of our Sun out to distances of 500 light-years. Of the seven known transiting planets, only the two mentioned here meet those criteria. As more are discovered, Spitzer will be able to collect their light—a bonus for the observatory, considering it was not originally designed to see extrasolar planets. NASA’s future Terrestrial Planet Finder coronagraph, set to launch in 2016, will be able to directly image extrasolar planets as small as Earth.

Shortly after its discovery in 1999, HD 209458b became the first planet detected via the transit method. That result came from two teams, one led by Charbonneau. TrES-1 was found via the transit method in 2004 as part of the NASA-funded Trans-Atlantic Exoplanet Survey, a ground-based telescope program established in part by Charbonneau.

Artist’s concepts and additional information about the Spitzer Space Telescope are available at [www.spitzer.caltech.edu/Media](http://www.spitzer.caltech.edu/Media).



News Briefs

One NASA Peer Awards bestowed

Two One NASA Peer Awards were presented at JPL on March 11 and 18. SETH CHAZANOFF of Section 352 and KASTHURI VENKATESWARAN of Section 376 were recognized individually, by their peers, for their efforts to foster NASA-wide collaboration.

Chazanoff was honored for the coordination he facilitated between Johnson Space Center and JPL to test NASA's TransHab for the Bigelow Aerospace Corporation. Venkateswaran was honored for the collaboration he has facilitated between JPL, Johnson Space Center, Kennedy Space Center and Marshall Space Flight Center to leverage resources to improve NASA's understanding of the microbial environment in space. Suzanne Bradfield Spencer, manager, Employees Services and Recognition, Section 114, made both presentations.

The One NASA Peer Awards seek to reward individuals and teams who demonstrate the One NASA behaviors of decision-making for the common good, collaborating to leverage existing capabilities and standardizing to achieve efficiencies agency-wide. Candidates must be nominated by their peers, rather than by their supervisors. Employees may not nominate their supervisor.

In addition to winning this award, these individuals are eligible to be considered for the "Center Best Award." The JPL Center Best Award winner will then eligible for the NASA "Best of the Best Award."

To nominate someone or for more information about this award, see <http://hr.jpl.nasa.gov/esr/OneNASA>.



Employee Services and Recognition Manager Suzanne Bradfield Spencer presents Peer Awards to Seth Chazanoff (top) and Kasthuri Venkateswaran.



Natural gas system installed

A new, on-site compressed natural gas system is operational as of March 14 to meet the fuel needs of the Laboratory's vehicle fleet.

Increasingly used across the United States, natural gas is an efficient, cost-effective, environmentally friendly and domestically abundant alternative fuel that is completely compatible with today's vehicle engines.



Terry Durham (left) of Section 2722 and Frank Malinowski of the NASA Management Office check out JPL's new compressed natural gas system.

JPL's compressed natural gas system, the FuelMaker Vehicle Refueling Appliance, compresses natural gas for storage in pressurized cylinders from which the fuel can be delivered to any vehicle in the Laboratory fleet. Fueling is as easy as "pumping gas"—one simply inserts the fuel-hose nozzle into the vehicle receptacle and pushes "Start." The Vehicle Refueling Appliance will automatically shut off when fueling is complete, about two to three minutes.

As the cleanest burning fossil fuel, natural gas emits fewer pollutants than conventional or other alternative fuels and meets the government's clean air requirements. Lighter than air, natural gas is also among the safest fuels available; leaks simply dissipate into the atmosphere.

The compressed natural gas system also offers an economic incentive. With the price of natural gas between 50 and 75 percent of its gasoline equivalent, the Laboratory expects substantial savings in fueling costs.

"In all, compressed natural gas is the vehicle fuel of the future, at least at JPL," said JAMES BLACK of Logistics and Materiel Services.

For more information about CNG or the FuelMaker system, contact Black at ext. 4-1961 or via e-mail.

Advanced tech workshop a success

JPL representatives played key roles in an advanced technology workshop held last month in Pasadena.

DR. RAJESHUNI RAMESHAM of the Engineering Assurance Advanced Technology Group (5126) chaired an organizing committee for the Advanced Technology Workshop on Reliability of Advanced Electronic Packages and Devices in Extreme Cold Environments, sponsored by the International Microelectronics and Packaging Society. About 75 people attended the three-day event, some from as far away as Canada, Brazil and Japan.

JPL participants who presented papers at the event were Drs. ADRIAN STOICA (Group 3453), JIM CUTTS (4000), GARY BURKE (3456), REZA GHAFFARIAN (512) and Ramesham, and PHIL ZULUETA (512) chaired a session on advanced packaging.

Ramesham said areas of discussion included the characterization and assessment of newly available and advanced electronic parts/packages for NASA's current and future needs, and studies in extreme environments extended beyond nominal operating temperatures. "Validation of the electronic packages assembled with various electronic parts over a wide temperature range to infuse into future space missions is of significant value for our space applications," he said.

Correction

An article in the March 11 issue of Universe about the relocation of a Deep Space Network antenna in Spain contained an incorrect metric conversion of the antenna's weight. The antenna weighs more than 800,000 pounds (about 360,000 kilograms).

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meets Wednesdays at 11:30 a.m.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (the Wellness Place).

Codependents Anonymous—Meets at noon every Wednesday.

Lambda (Gay, Lesbian, Bisexual and Transgender Networking Group)—Meets the first Friday and third Thursday of the month at noon in Building 111-117. For more information, call Randy Herrera, ext. 3-0664.

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

For more information on any of the support groups, call the Employee Assistance Program at ext. 4-3680.

Monday, March 28

Caltech Ballroom Dance Club—An eight-week course of professionally taught bolero will commence from 7:30 to 9 p.m. in Winnett Lounge. Classes continue Mondays through May 23 (no class May 9). Cost: \$40 for the series or \$8/class for nonstudents. No partner or dance experience is required.

Wednesday, March 30

JPL Library Orientation—Stop by at 11:30 a.m. at Building 111-104 for an overview of the Library's products and services, and learn how to access numerous electronic resources from your desktop. For more information, call the reference desk, ext. 4-4200.

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

Thursday, March 31

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

"What's a Girl Got to Be Angry About?"—Cartoonist and filmmaker Lela Lee will offer a free presentation at 8 p.m. in Caltech's Beckman Auditorium. For more information, call (626) 395-4652.

Friday, April 1

"DARPA: Bridging the Gap from Research to Applications"—Dr. Robert Leheny, deputy director of the Defense Advanced Research Project Agency, will speak at 10:30 a.m. in conference room 180-101. DARPA is the Department of Defense's "innovation engine," whose mission is to invest in high-risk, high-payoff, revolutionary research programs that bridge the gap between fundamental discoveries and paradigm-shifting military applications. Leheny will discuss the process DARPA uses to create and manage programs consistent with this mission.

Saturday, April 2

"A Walk Through Harlem"—Michael Cunningham, co-author of *Spirit of Harlem*, will give this free lecture at 6:30 p.m. in Caltech's Ramo Auditorium.

For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Girls Choir of Harlem—A varied program of choral music will be performed at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$29, \$25 and \$21; high school age and younger, \$10. For more information, call (626) 395-4652.

Tuesday, April 5

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

JPL Genealogy Club—Meeting at noon in Building 301-271.

Wednesday, April 6

Associated Retirees of JPL/Caltech—Meeting at 10 a.m. at La Cañada United Methodist Church, 104 Berkshire Place, La Cañada. Call (626) 794-1698 to leave a message for an ARC board member.

JPL Library Orientation—Stop by at 11:30 a.m. at Building 111-104 for an overview of the Library's products and services, and learn how to access numerous electronic resources from your desktop. For more information, call the reference desk, ext. 4-4200.

Thursday, April 7

Clogging Class—Meets at noon in Building 300-217. For more information, call Shary DeVore at ext. 4-1024.

Investment Advice—Fidelity will offer one-on-one counseling in T1720. For an appointment, call (800) 642-7131.

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

"Simple Ways to Save More for Retirement"—This Fidelity workshop, held at noon in T1720-137, is designed for employees new to retirement savings, or not currently investing at the maximum allowable amount, who would like to find easy ways to increase the amount they are contributing to their 403(b) tax-deferred account. Topics include the advantages of tax-deferred savings, identifying various ways to save and how to set a retirement goal and create a plan to meet that goal.

Friday, April 8

Caltech German Language Film Series—"Hot Summer," a 1968 East German film, will be presented with English subtitles at 7:30 p.m. in Baxter Lecture Hall. This is a teenage musical with two pop stars of the time. Free admission and reception after the movie. For more information, e-mail [aebi@hss.caltech.edu](mailto:aebi@hss.caltech.edu).

Saturday, April 9

Professor Kubínek, Certified Lunatic—Tomás Kubínek, an acrobat, magician and clown, will perform at 2 p.m. in Caltech's Beckman Auditorium. His experiments use outrageous theatrics and surreal feats and include such antics as a backward somersault while drinking a glass of water balanced on his forehead. Tickets are \$12 for adults, \$7 for children. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Sign up for kids' day, April 28

Registration begins on Monday, March 28, for "Sharing Power and Possibility," this year's theme for JPL's Take Our Children to Work Day, to be held Thursday, April 28.

Patterned after the Ms. Foundation's national "Take Our Daughters and Sons to Work Day," this event is designed to expand your child's awareness of his or her potential and the many future options available in exploring our future in space.

Though the intent of the event is for children 9 to 17 years of age to shadow their parents during the day, some morning interactive activities have been planned for you and your child to enjoy. Please visit <http://hr.jpl.nasa.gov/toworkday> for more information.



# MARS WORKSHOP:HIKING BOOTS REQUIRED

By Christine Johnson and Mark Whalen



Huffing, puffing and sweating, 40 ambitious elementary school, high school, and community college science teachers from across the nation hiked through Arizona to learn about Mars and bring back the spirit of exploration to their students.

And on this particular February trip, a few Mars experts from JPL came along—to teach and also to learn.

Granite Wash Mountain is a geologist's dream location to study the history of the formation of Earth—and all planets—for its diverse array of mineralogy in a compact area. Granite Wash reveals the same 400-million-year-old layering of the Grand Canyon within a 10-foot stretch of dazzling dirt.

Ten veteran hikers guided the teachers through their Granite Wash journey, answering geology questions and explaining how remote-sensing spectroscopy works on Earth and Mars. The guides are all science graduate students (except one undergrad) at Arizona State University (ASU) who work on multiple Mars missions led by Dr. Phil Christensen, an enthusiastic researcher who is dedicated to figuring out how Earth works and how Mars formed, as well as his commitment to getting young minds interested in science.

Mars Odyssey team members Gaylon McSmith, Bob Mase, Paul Fieseler and Pat Esposito joined the expedition to school the teachers not only in their particular areas of expertise—McSmith is Odyssey's science operations manager, Mase is the mission manager, Fieseler is the sequence team lead and Esposito is the lead navigator—but also to provide some context in terms of the overall Mars program.

"It's great that the teachers received an engineering viewpoint in addition to the science outlook," Esposito said. "This was primarily a science workshop, but we also answered general questions about the Mars missions."

The day before the Granite Wash trek, the teachers experienced a nine-hour adrenaline rush of knowledge administered by six ASU scientists and the Odyssey team members from JPL—a semester's worth of geology and electrical engineering courses, including mineralogy, geology and the theory of the operation of remote-sensing instruments.

Mase offered a viewgraph presentation on spacecraft operations and a video about the role of the entire Odyssey team. "It was a brief synopsis of the overall Mars program—past, present and future," he said. "The bulk of it was about Odyssey—the design and building of the spacecraft, the launch, cruise to, and operation around Mars."

Christensen is the principal investigator for the Thermal Emission Imaging System (THEMIS) onboard Odyssey, which was the focus of Mase's presentation. But he also provided information about and results from all of Odyssey's instruments to relate the breadth of the mission. "We described what it takes to build the instruments, operate them on the spacecraft and obtain and analyze the instruments' results."

"The teachers were looking for something to take back to their classrooms that makes this subject exciting and relevant," Mase said.

"We introduced them to the concept of the mission as a whole, including getting the data back and disseminating it to the institutions that use it," McSmith said.

Esposito recalled the time shortly after the Mars Exploration Rovers' landing when Christensen asked people to send their backyard rocks to him so they could be analyzed just like the Mars rocks being studied by the rovers. "In his lab, I saw how Phil identifies and catalogs the infrared spectra of rocks on Earth and compares them to the infrared images from Mars," Esposito said. "I got more insight into how the instrument works, and it showed how science and engineering work together on a mission."

Added Mase: "Coming from the engineering side, I gained a greater appreciation for the science."

Along with Sheri Klug, NASA's Mars Program Education Lead, Christensen epitomizes how to teach space science to students in creative ways. Klug leads more than 35 teacher workshops a year around the United States, with a few extra-special field trips from the home base of the Mars Space Flight Facility at ASU. (Managed by Michelle Viotti of Mars Public Engagement, Mars Education is based at JPL.)

"We include a few team members each time for the opportunity to take academic training by Dr. Christensen," McSmith said. "While we're there we seize the opportunity to contribute to the classroom experience by providing the group with presentations."

Journeying by clumps of bright, white quartz and Dr. Seuss-style flora, Christensen told stories of how spectrometers flying over this desert revealed hidden minerals underneath layers of dust and varnish, and how infrared instruments orbiting other planets can give us knowledge of minerals and insight into the past that visible light cameras can't reveal.

McSmith noted the study materials provided to the teachers, which included an infrared aerial map photographed from a C-130 airplane of the area being explored in Granite Wash. Christensen showed how what looks like the same material to the eyes could, in reality, be composed of completely different minerals. And knowing where different minerals are is important on both Earth and Mars if you want to understand how a planet formed and how it is continuing to evolve. But, who cares what happened 1,000 years ago? People who want to build houses on Earth and habitats on Mars want to know.

First, humans probably don't want to build anything on a quake fault line, which is often invisible in visible light. Luckily a few superhuman minds invented high-tech instruments to collect infrared light that can reveal various minerals, which each emit its own "fingerprint" through infrared wavelengths.

Secondly, when adventurers have limited time, say on a field trip on Earth or at Mars, they want to go somewhere that will help them solve a geology puzzle quickly. For example, THEMIS revealed the mineral hematite in areas around Mars' equator. Hematite is a mineral that on Earth often forms in the presence of liquid water (a habitat for life), so when scientists were debating about where to land the Spirit and Opportunity rovers, the orbital data helped mark the spot where the rovers could most likely find evidence of past liquid water. Within weeks of landing where Christensen and his fellow scientists suggested, Opportunity confirmed evidence of past liquid water.

The teachers compared the changing rocks under their feet to the changes in color on the infrared maps they carried. They were "ground truthing" what the infrared camera captured overhead versus what they could surmise from the data their own remote-sensing instruments—their eyes—collected about the rocks they picked up. Christensen encouraged them to use their knowledge of how different minerals form to explain why certain minerals were sprinkled across the land or piled up in the form of mountains.

Esposito noted that some of the teachers focused on areas other than math and science. "Most of them were very happy they attended the workshop," he said. "I think they gained many benefits from it and viewed it as a very positive experience."

The desert hike went at a leisurely pace, one that McSmith called "fun, not grueling. It was a good time, a real team-building effort."



Photos courtesy of Gaylon McSmith



Top two photos: bikers make their way up Granite Wash Mountain. Center: Bob Mase. Bottom: Gaylon McSmith.



## Letters

We are grateful to all our friends and co-workers for the kindness and concern expressed during the recent illness and subsequent passing of our dear mother and mother-in law. Your cards, flowers and prayers meant so very much. Also, thank you to the ERC for the lovely plant.

Chris and Cory Stevens, Mary Kunstler

My family and I would like to thank all of the people in sections 352 and 355 for their support during my wife's illness and passing. Your kindness and concern was greatly appreciated. Thanks for the cards and letters and the lovely plant.

Gary Bruner and family

Thank you for all your condolences and support when my father passed away.

Julius Law and family

I wish to thank friends and colleagues for their kind expressions of sympathy for my father's passing. Thanks also to JPL Hospitality for the beautiful plant. Dad was always optimistic and encouraging and he is missed.

Rick Markley

March 15, 2005

Dear Family and Friends:

Davey has been gone now for 16 days. It seems like an eternity to us, but we still feel that he may pull up in the driveway and knock on the door at any minute. We miss him more than anyone can know.

We want to thank everyone so much for their kindness. The cards, letters, beautiful flowers and plants have been a comfort to us. Thank you all for your kind words and donations.

Davey had so many friends, and he touched many lives in ways we are only learning of now. He was truly loved by everyone he met.

We want to especially thank the Bassett USD Council PTA for establishing a scholarship in his name—"The David Brodtkin Community Service Award"—which will be awarded to high school seniors who volunteer and serve the community such as did our Davey.

Davey had a website to which I have added some items to share with you all. Please visit [www.geocities.com/Heartland/Acres/4381](http://www.geocities.com/Heartland/Acres/4381) and see Davey having fun at his last birthday party.

Thank you all again.

Bob and Betty Brodtkin

## Retirees

*The following JPL employees retired in March:*

Douglas Finlan, 43 years, Section 628; George Frascchetti, 37 years, Section 380; Ronald Schlaifer, 29 years, Section 3436; Carl De Silveira, 22 years, Section 512.

## Classifieds

### For Sale

ANGELS TICKETS, 2 season seats, various games, no Yankees, Red Sox or Dodgers. lower view MVP just right of home plate. \$30/pair. 626/354-2337.

APPLIANCES: refrigerator, Kenmore, 18 cu. ft., Echostar, top-mount, less than 2 yrs. old, \$350; dryer, gas, Kenmore, super-capacity, 14 mo. old, \$200; washer, Roper, 4 cycles, 2 speed, 8 yrs. old, \$50. 951-3532.

BABY ITEM, Medela electric breast pump, pump-in-style, exc. cond., \$195. 909/598-0065. BABY JOGGER, blue, gd. cond., w/sun shade, \$85. 626/351-8643.

BABY/TODDLER ITEMS: Baby Jogger Twinner II stroller, 20" alloy wheels, gd. cond., \$150/obo; Pump in Style breast pump, used for two kids, \$50/obo. 623-9548.

BEDROOM SET, full-size bed w/matching headboard & dresser, carved wood but simple, not ornate, exc. matt. & box spring, \$500. 626/577-6638, Suzanne or susanneb91101@yahoo.com for pics.

BICYCLES, boy's: 20" GT Dyno, exc. cond., \$65; 16" w/training wheels, \$25. 626/798-1839.

CAMCORDER: Sony DCR-HC40E PAL MiniDV, bought for '04 Christmas, used so little that it is like new, in orig. box with all user menu, bought for \$700, sell for \$450. 885-6317 or Peter\_Peng\_888@hotmail.com.

CANOE, Old Town, Katahdyn model, 16', burgundy, used 4 times, \$400. 957-7742.

CARSEAT, Britax, near new, blue denim, no stains or tears, rated 5-60 lb., forward/rear facing, latch system, \$125 (\$210 new). 626/375-4152.

COMPUTER, iMac G3 Graphite, 400 MHz, OS X 10.3.8, 640 MB SDRAM, 12.76 GB HD, optical mouse, external speakers, exc. cond., \$300. 626/445-3864.

COMPUTER, nearly new Fujitsu Lifebook laptop, model N6010, 3.2 GHz, 17" WXGA + wide

TFT LCD, DVD-RW, lovely picture quality, never Internet connected, \$1,400. 626/799-9347, Maria.

COMPUTER, Compaq Presario laptop, brand new, unopened box, model no. 2227US, MRSP \$949.99, sell \$699.99. 626/241-7084, Steve. COMPUTER MONITOR, Philips 19" (109s), \$75. 310/489-8308, Peter.

COUCH and 3 glass tables, exc. cond., photo available, \$75. 726-5129, Natalie.

DINING ROOM TABLE, oak, w/matching chairs in good cond., \$225. 726-6873.

DODGERS TICKETS: 4 season seats, outstanding locations in aisle 1, 10 rows directly behind home plate, VIP parking availability for 20 selected games, \$212.50 per game, call for availability. 626/836-9280, after 7 p.m.

DODGERS TICKETS, selected games from season ticket package, loge level (orange), aisle 132 (at 1st base), 2 tickets/game at face value of \$30 per ticket, [www.delunac.net/tickets](http://www.delunac.net/tickets) or 626/296-1253 for available games.

EXERCISE EQUIPMENT, Club Weider 565 workout cage w/bench and barbells, like new, includes weights and platte tree, owner's manual & exercise guide incl., \$225/obo. 951/675-8292 or e-mail [danegarvin@yahoo.com](mailto:danegarvin@yahoo.com).

FILING CABINET, 2 drawers, wood exterior, exc. cond., \$20. 909/598-0065.

FURNITURE: kitchen table w/4 matching chairs, pine, white tiled top w/ivy patterned center, about 61" L x 37" W, \$150; bookshelf, tall, foldable shelves, \$35; filing cabinet, 2-drawer, \$5. 626/394-9629.

FURNITURE: bookshelf, brown, 5 shelf (slightly damaged corner), \$25/obo; entertainment center, corner unit, \$50/obo; ent. center, full sz., \$50/obo; couch & loveseat, beige & brown striped, \$200/obo for both. 626/284-4080.

FURNITURE: couch & recliner, brown leather, \$150 for both/obo. 249-8178, eves.

FUTON: queen, extra-thick mattress, white-washed oak finish, gd. cond., \$125. 626/641-2274, Marti.

GAZEBO, redwood, 15' x 11', w/bar & 4 bar stools, you disassemble & haul, must sell, \$200/obo. 626/918-0822, 9 a.m.-4 p.m.

GUITAR AMPLIFIER, Peavey Blazer 158, 15W TransTube practice, exc. cond., features: clean/lead channel switching, modern/vintage voice switching, reverb, \$120/obo. 237-0673.

HUMIDIFIER, Vicks Natural Mist, model V3500, with 2 replacement filters, gd. cond., \$20. 626/351-8643.

JEWELRY: ladies new Coach Metropolitan brown leather strap watch, \$50; 14K tri-color gold diamond-cut bracelet, \$140; 14K 2-sided, 18" diamond-cut necklace, \$180. 653-9037.

LUGGAGE, Travel Pro & Lark, carry-on w/wheels, black, several pieces, unused, exc. cond., \$25-\$50. 626/793-7879.

MICROWAVE OVEN, white, Panasonic, 1000w, gd. size for office or apt., owner's manual incl., \$40. 323/342-9363.

MISC: foot massager, Brookstone, electronic, multi-speed, (orig. \$200+), \$50/obo; neck massager, Shiatzu (orig. \$45), \$15; muscle stimulator, Medtronic elec., (orig. \$600), \$75; Pantsuit, Jones of New York, lined, size 12, new, \$50. 626/398-4960.

MISC: TV, Sony 52" big screen, 3.5 yrs. old., perfect cond., bought \$1,000, sell \$850; 2 dining chairs, \$120; chandelier, \$35. 731-0470.

MOVING SALE: household goods, fridge-freezer, furniture, etc., due to relocation to Europe, some items avail. now, details of major items and open house to be held April 2, 11a.m., at [www.geocities.com/geraint@sbcglobal.net](http://www.geocities.com/geraint@sbcglobal.net).

NECKLACE, ladies Paloma Picasso Daisy pendant, platinum, round brilliant diamonds from Tiffanys., 15 carat total, G color, VS clarity; on 16" chain, pd. \$1,395, sell for \$800. 653-9037.

NETWORKING EQUIPMENT: wireless AP/router/switch/print server w/modem port, D-Link 613P, \$25/obo; external modem with 14 status lights, zoom V.92, \$15/obo. 957-2173.

ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. \$7,500, sacrifice \$2,000; PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, \$85; ULTRA ATA CONTROLLER CARD with cable, fits into 32-bit PCI 2.1 or 2.2 expansion slot on motherboard, brand new, \$20. 790-3899.

PIANO TUNING KIT, Schaff, complete w/wooden handle tuning lever (plus spare 3" L head useful for reaching over high case fronts of grand pianos), star tip tuning head, A440 tuning fork, 4 rubber string mutes w/wire handles, 4 felt wedge string mutes and 1 temperament strip, easy to follow instruction book for owners with no experience; brand new, \$85. 790-3899.

PLAYHOUSE, Little Tykes, Barbie Cottage, gd. cond., \$50. 249-6248.

POSTER PRINT, Monet's "The Artist's Garden at Vetheuil," professionally framed, size 27.5L x 39H, \$50. 626/289-2795.

RECLINER, blue print, orig. purchase from local Swansons, \$150. 790-5341.

REFRIGERATOR, Whirlpool, exc. cond., 18 cu. ft., top freezer, cream color, icemaker, \$195. 626/914-7853.

STEREO, Sony LBT-G2000 bookshelf system w/3-disc CD changer, remote, owner's manual, \$75. 323/342-9363.

TYPEWRITER, Smith Corona electric, model SL 600, like new, manuals, StyleWriter, \$85. 790-5341.

WASHER & DRYER, Maytag, electric, white, 1 year old, like new cond., cost \$900 new, sell for \$625. 726-6873.

WASHING MACHINE, Kitchen Aid, white, 3 cycles, 3 temps, 8 yrs. old, fair cond. (works), \$25; RANGE, Magic Chef, 4 burners, elec. ignition, self-clean, 6 yrs. old, stove top in exc. cond., oven fair, \$50/obo. 694-0190.

WHEELCHAIR, electric, Jazzy brand, exc. cond., barely used, \$1,000. 909/620-9234.

### Vehicles / Accessories

'90 AUDI 100, 187K mi., runs well, regular dealer service, recent smog, small radiator leak, \$1,500. 248-8619.

BED LINER for Chevrolet S-10 short bed truck, like new, \$70. 626/359-7666.

'99 BMW M3 coupe, silver, 6 CD changer, premium sound, rear spoiler, sunroof, leather, power bucket seats, exec. cond., 79K mi., \$20,000/obo. 323/304-2112.

'98 BMW 740i, V8, 290 HP, 94K mi., white, exc. cond., loaded, beautiful ride & handling,

premium sound, sunroof, 6 airbags, stability control, extended warranty for 1 more year, \$14,999/obo. 909/592-2279.

CAMPER TOP for a small truck, burgundy, \$500/obo. 626/394-9629.

'98 CHEVROLET Corvette, LS-1 engine (short block), 70K mi., includes heads, water pump, intake manifold, intake body, spark plug coils, also a heavy duty folding eng. stand, \$1,000. 951/675-8292 or [danegarvin@yahoo.com](mailto:danegarvin@yahoo.com).

'97 DODGE Dakota truck, red, 2.5 liter, a/c, 5-speed manual trans., low mi. (55K), bed liner & lid, new brakes, new tires, exc. cond., great truck, \$5,500. 421-9397, Jim.

'01 FLEETWOOD Prowler, toy trailer, fully contained, super clean, a/c, microwave, shower, upper sleeper; must see to appreciate, \$11,500. 909/931-9366.

'88 FORD Bronco II, 2WD, cream w/stripping, vg interior/exterior, 50K mi. on new P/T, custom truck cover, new Michelin tires (80K warr.), complete service records, runs good, great for collector, \$3,000. 246-3331 or [aswatfigure@earthlink.net](mailto:aswatfigure@earthlink.net).

'66 FORD Mustang coupe, V8, 289, 4 barrel carb., black plates, always a California car, no accidents, exc. orig. shape, drives like new, mature owners, beautiful, blue/blue, \$16,000. 626/296-3441.

'98 HARLEY DAVIDSON 1200S Sportster, 36K mi., black, runs great, very fast, lightwt, bike, maintained by authorized HD shop, Thunder-header exhaust, factory pipes, shop manual included, \$5,000/obo. 951-4187, Greg. eves.

'02 HONDA CR250R dirt bike, FMF pipe/silencer, Vforce reed, Renthal sprocket/chain, new Dunlop D756 tires, regularly maintained, never raced, adult owned and ridden, \$3,600. 626/582-8562, Eric.

'98 HONDA Civic LX, 4-dr., automatic trans., power windows/locks, CD player, a/c, black color, 90K mi., recent major service, exc. cond., \$6,300. 310/968-4803, Deborah.

'94 HONDA Civic DX, 4 dr., 5 spd. manual, 112K mi., new factory-quality paint (dk. blue), recent timing belt, battery, near perfect interior, \$3,900. 626/303-5814, Steve or Eileen.

'85 HONDA Civic, 4-dr., gd. cond., \$1,200/obo. 626/345-0969.

JAGUAR Series 2, XJ6 parts, tools, manuals, inquire re costs. 694-0190.

'00 LEXUS RX300, runs great, extra clean, orig. owner, new tires, 76K mi., \$21,000/obo. 249-9437, eves.

'97 MITSUBISHI Eclipse, 2 dr., black/tan, 5 speed, sporty, gas saver, vg cond., stereo, am/fm, CD, a/c, sunroof, 99K mi., \$6,300/obo. 626/961-8771, David.

'87 MITSUBISHI LS van/wagon, 7 passenger, 110K mi., great body & interior, new alternator/belts/license, newer exhaust, needs work on leaky injector, intermittent fuel pump, \$500 firm. 248-2931.

'93 NISSAN 240SX Fastback, 180K mi., 4 cyl., power windows/locks, sunroof, 10-disc CD changer, rear wheel drive, cruise control, a/c/heat, serviced & smogged 1/24/05, runs great, \$2,000/obo. 626/7WEASEL or [hans.p.smith@gmail.com](mailto:hans.p.smith@gmail.com).

'00 SATURN SL-1, 4-dr. sedan, deep ivy green w/tan interior, meticulously maintained, excellent cond., automatic, 4 cylinder, a/c, am/fm stereo w/CD player, only 43K mi., \$5,800/obo. 626/357-8547, Rick.

'02 TOYOTA Highlander Ltd, exc. cond., orig. owner, 37K mi., green, 3.0L V6, auto, sunroof, 6 CD player, \$21,000. 249-4602.

'99 TOYOTA Camry LE, auto, a/c, am/fm/cass./CD, cruise control, all power, ABS, dual airbags, 89K mi., vg cond, new tires/brakes, \$7,100/obo. 831-2923.

### Free

AIR CONDITIONERS (2): 220 volt, still works; 15,000 BTU, 12 amps, 110 volts, still works; you haul. 249-6629.

CARPET, off white cut pile, approx. 250 sq. ft., gd. cond. 694-0190.

SCRAPBOOKING MATERIALS, lots of paper and stickers. 626/793-3408.

### Wanted

BOOKS, used or new, paperback, hardback or magazine, romance, science fiction, mystery, etc. 248-0178, [engineerbob4449@yahoo.com](mailto:engineerbob4449@yahoo.com). COFFEE TABLE, modernist or mid-century style. 626/345-0681.

MATH TUTOR, Jr. & Sr. high school level geometry, pre-algebra, algebra I & II, SAT math, etc, eves, and/or weekends. 888/784-1639, David, please leave msg.

MEMORABILIA from X-Files TV series: anything, posters, hat/cap, T-shirt, mouse pad, cards, watches, clock, etc. 909/263-5271, Shu.

SMALL COTTAGE, quiet engineer looking for 1 bd. house in "nice" quiet neighborhood close to Lab. 310/647-7983, Charles.

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

VANPOOL RIDERS, from Victor Valley/Hesperia. EXL. 4-1424, Scott.

VOLLEYBALL PLAYERS, coed, no beginners please, Tues. 8 to 10 p.m. at Eagle Rock High School, \$4/nt. 956-1744, Barbara.

### Lost & Found

LOST: Cashmere scarf, cream color w/blue stripes, Bldg. 171 lobby. Ext. 3-2500.

FOUND: Sunglasses, north of Bldg. 183, Ext. 4-4607, Ken.

### For Rent

ALTADENA, comprehensively furn. for extended stays: 3 bd., study, boundary Angeles Nat'l Forest, 3 mi. from JPL, trail access, view, fireplace, oak floors, antiques: furniture, beds, dinnerware, utensils, pots/pans, all linens & towels, fine soaps, necessities incl.; just bring toothbrush & clothes; TV/DVD/VHS, Dish satellite, wireless DSL; gardens, patio, parking, private, immaculate, avail. April. 626/798-3235.

ALTADENA room, share 2 bd., 1 ba. home, w/1 focused student and a cat, ~ 3 mi. from JPL \$525 + half util. and DSL. 626/345-0625.

EAST HOLLYWOOD, lg. single apt., 1 block from Metro & shopping, stove and ref., sec. building, newly decorated, \$700, util. incl., 1-yr. lease required. 310/377-0316.

GLENDALE/EAGLE ROCK area, 1 bd. in a 3 bd. 1 ba. with closet; laundry & kitchen privileges incl., close to all, 12 min./JPL, \$615, util. inc. 323/340-8605.

LANCASTER townhouse, across from AV hospital, 2 bd., 2 ba., walk-in closet, fireplace, washer-dryer hookup, pool, spa, recreation rm., new carpet/paint/tile floors/appliances/ blinds, 2 covered parking w/storage, \$1,100 + security. 661/947-9504 or [joyce4tmi@yahoo.com](mailto:joyce4tmi@yahoo.com).

MONROVIA, 2-story duplex: 2 small studio units, 2 blocks from Old Town, downstairs unit completely renovated, immaculate, new stove, refrigerator, tile, carpet, cabinets, windows, small garage for storage, share 1/2 util., \$850; upstairs unit remodeled, clean, new stove, refrigerator, tile, share 1/2 util., fenced yard area, \$700. 626/914-2775.

MONTROSE, 1 bd., 1 ba., Stancrest condo to lease; near Montrose shops, theater, hiking trails, washer/dryer, gas fireplace, private patio by pool, spa, gym, entertainment suite, secure parking for 2 cars, \$1,275. 790-4097.

MONTROSE house, spacious, 3 bd., 2 1/2 ba., exc. location & school district, townhouse style, 5 min. from JPL, \$2,000. 667-5569.

PASADENA, beautiful 3 bd., 2 ba. home in Hastings Ranch, remod. kitchen w/new appliances, remod. baths, central heat and a/c, hardwood floors, refrig., washer/dryer, den wired for 4 computers, speakers throughout, pool & covered patio w/wet bar: \$3,200 + utils + sec. dep., gardener & pool service included. 626/351-9641 or [bettysr@earthlink.net](mailto:bettysr@earthlink.net).

PASADENA, premiere house in historic Orange Heights district, unfurnished, 5 bd., 2 ba. plus den, 949 North Madison, w/c pets, hardwood floors, a/c, w/d hookups, quiet neighborhood, Craftsman style (circa 1911), Jacuzzi tub in bath, lg. dining rm., yard, new paint, huge country kitchen, driveway parking, \$3,200. 626/354-8556, Craig.

PASADENA house, 1 1/2 mi. Caltech, near Allen/Orange Grove, pretty street, 2 bd., lg. master, lots of closets, 2 full ba., dw, stove, frig., washer/dryer, ac/fireplace/fenced yard 2-car garage. water/trash/gardener pd., \$1,900 + security dep. 626/793-2320.

SIERRA MADRE, 2 bd., 1.5 ba., 1,000 sq. ft. townhouse-style apt. to share; lg. patio, garage parking, a/c, washer/dryer in unit, \$635 + 1/2 util. 626/355-5667, Linda.

SIERRA MADRE 2 bd. 1 ba. house, \$1,200 + gas & electric, \$2,000 security deposit. 626/797-5804, leave message.

TUJUNGA house, 8 miles/JPL but "out of city & in the woods;" 2 bd./ba. suites w/walk-in closets, laundry; comfortable living area w/ba., bonus room; attached 2-car garage/ shop; HW floors in K & D. FAU; refridge, washer & dryer; quiet, lots of windows & trees; stream across the street; avail May; \$2,200 + deposits. 352-7892.

TUJUNGA condo, large 2-story, 2 bd., 2 ba., like a home, separate dining area, central air, stove & dishwasher, 2-car attached garage w/hookups for w/d, large patio on garage roof, \$1,395. 952-5568.

TUJUNGA house, 2 bd., 1 updated ba., lg. eat-in kitchen, laundry rm., double detached garage, lg. fenced backyard, copper plumbing, view, newer carpet, \$1,500. 679-1471.

### Real Estate

BELIZE forest, 100.1 acres, property has a stream (w/pools and small rock waterfalls), hills, flats, views, thick jungle, good farming soil, land for livestock, visiting howler monkeys, access roads; located in Cayo district near San Egnacio city, could be used as resort, home or ranch, solar power and water filtering could be installed, photos available, \$89,000. 363-9999, [jwishard@esocal.rr.com](mailto:jwishard@esocal.rr.com).

LA CANADA house, fully remodeled, 4 bd., 3 ba., pool, guesthouse, 4903 Ocean View Blvd., formal liv. rm., fireplace, recessed lights, bay window, new windows throughout, skylights, new a/c & heat, attached 2+ car garage w/new door; guest house: kitchen new cabinets, stove/ zephyr hood, pot rack, granite countertops, skylight, full ba., separate entrance, pool, covered patio; \$995,000. 468-6504 or 949-5739.

### Vacation Rentals

CAMBRIA ocean front house, exceptional white water view, accom. up to 4 people, all amenities provided. 702/256-1359, [ereynolds2@cox.net](mailto:ereynolds2@cox.net).

CARMEL, Hyatt Highlands Inn, resort overlooks ocean, 1 bd., living room and fully-equipped kitchen, sleeps 4, wood-burning fireplace, spa tub, private balcony, binoculars, complimentary bicycles, July 2-9, '05, \$135/nt., additional locations avail. 626/794-9579 or [fivestarresorts@earthlink.net](mailto:fivestarresorts@earthlink.net).

FLORIDA condo, beautifully furnished 2 bd., 2 ba., 2nd floor, on the surf of New Smyrna Beach, 1/2 hour to Cape Canaveral, 90 min. to Disney World; enjoy all the comforts of home; quiet, relaxing, overlooking the beach and the Atlantic Ocean; BBQ, pool, game room; easy walk to stores and restaurants. 760/439-7821, Darlene, or [dhaughe@yahoo.com](mailto:dhaughe@yahoo.com).

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 \$115/nite/2, high season rate \$130/nite/2, \$15/nite/add'l person. 949/348-8047, [jackandrandy@cox.net](mailto:jackandrandy@cox.net).

LAKE TAHOE, Marriott Timber Lodge in Heavenly Village, studio, king bed, full sofa bed, sleeps 4, microwave, small refrig., dishes, coffee maker, 5 blocks from lake, Aug. 5-12, '05, \$60/nt., additional locations avail.. 6