Jet Propulsion Laboratory

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Lab wins Discovery mission

Deep Impact will send a projectile into the interior of a comet in 2005

JPL has been selected to lead a radical mission to excavate the interior of a comet, one of two missions selected Wednesday as the next flights in NASA's Discovery Program.

The Deep Impact mission will send a 500-kilogram (1,100-pound) copper projectile into comet P/Tempel 1, creating a crater as big as a football field and as deep as a seven-story building. A camera and infrared spectrometer on the spacecraft, along with ground-based observatories, will study the resulting icy debris and pristine interior material. Jim Graf is the JPL project manager, and the principal investigator is Dr. Michael A'Hearn of the University of Maryland in College Park.

The other Discovery mission selected will be the first comprehensive mission to map pock-marked Mercury. The Mercury Surface, Space Environment, Geochemistry and Ranging mission, or Messenger, will carry seven instruments into orbit around the closest planet to the Sun. It will send back the first global images of Mercury and study its shape, interior and magnetic field. Dr. Sean Solomon of the Carnegie Institution, Washington, D.C., will lead Messenger.

Deep Impact will attempt to send a projectile into Comet P/Tempel 1 on July 4, 2005.

Wednesday was a great day for Graf. No sooner did the QuikScat project manager observe his team turning the spacecraft's SeaWinds instrument on for the first time in orbit than he heard NASA Headquarters' announcement about the selection of Deep Impact for the Discovery Program.

"I'm ecstatic. What a great day for all of JPL," Graf said. He thanked the whole proposal team, whose efforts made the new mission possible. "We had a great team and it's wonderful to become a part of the Discovery family."

Deep Impact will be launched in January 2004 toward an explosive July 4, 2005 encounter with P/Tempel 1. It will use a "smart" copper projectile because that material will not interfere with the spectral observations of the material blasted off the comet by the impact, which will occur at an approximate speed of 10 kilometers per second (22,300 mph). The impactor's attitude-control mechanism will target a spot on the sunlit side of the comet, Graf said.

"The mission will return great science and the encounter itself will have tremendous sizzle," Graf said. "We will send images of the encounter back to Earth live, and people will be able to see science being made in real time."

He added that the mission's public outreach efforts will include amateur astronomers who will focus their telescopes on the comet to see the impact as it happens.

Co-investigators on the project from JPL are Kenneth Klaasen and Dr. Donald Yeomans. Klaasen is the interface to the mission operations system and will coordinate all aspects of scientific mission planning and flight operations, while Yeomans, manager of the Near-Earth Objects Project Office, will be responsible for optimizing the ephemeris of P/Tempel 1 and developing the targeting strategy for both the impactor and the spacecraft.

The formulation phase of the mission will start Jan. 3, 2000 and continue for 15 months. The implementation phase will proceed in April 2001, with a Cape Canaveral launch targeted for Jan. 3, 2004.

"These low-cost missions are both fantastic examples of the creativity of the space science community," said Dr. Edward Weiler, associate administrator for space science at NASA

See Deep Impact, page 6

Champollion mission is canceled

By MARK WHALEN

JPL has been directed by NASA to discontinue development of the Space Technology-4/Champollion Project, a mission to flight-validate advanced technologies needed for the exploration of small solar system bodies that included landing on the nucleus of a comet.

NASA cited budget constraints in its Space Science Program as the reason for the cancellation. The savings from the termination of ST4/Champollion will be used to cover increases in costs for the Hubble Space Telescope servicing mission that resulted from delays in the Chandra X-Ray Observatory. Also, some of the budget targeted for ST4/Champollion will be used to replenish critically needed reserves in the Mars Surveyor Program.

"This is a big loss to the Laboratory," said ST4/Champollion Project Manager Brian Muirhead. "We had put together such a strong team for this mission, and we were ready to do this mission." He noted that the core of the approximately 40 full-time staff members working on ST4/Champollion had also worked on the highly successful Mars Pathfinder mission in 1997, which Muirhead also managed.

"The spirit of Pathfinder was alive on ST4/Champollion and we were doing this mission with less money than we had on Pathfinder," he said. "Expectations were high, and the mission had the potential to be as exciting as Pathfinder was."

ST4/Champollion had been scheduled for launch in 2003, with an arrival set for early 2006 at Comet Tempel 1. The spacecraft would then have flown in the same orbit as the comet, studying its nucleus for several months before landing the entire spacecraft, anchoring and

See Champollion, page 6

News Briefs

The winners of JPL's Notable Organizational Value-Added (NOVA) awards for June have been announced:

Section 210: Steve Kuan.

Section 215: Kathie Reilly, Rodney Stanley.

Section 220: Jienming Jou, Krishna Kunamaneni, Peter Lin, Carl Liu, Charles Pecot, Vuong Phan, Alice Smilgis, Haiyan Wang, Jin Wang, Kai-Cheng Wu, Ida Young.

Section 312: Charles Acton, Vijay Alwar, Peter Breckheimer, P. Daniel Burkhart, John Ekelund, Pasquale Esposito, Gregory Garner, Eric Graat, Martin Johnston, Pieter Kallemeyn, Clifford Kettemborough, James McDanell, Brian Portock, Tom Rebold.

Section 334: Edward Caro, Bruce Carrico, Scott Hensley, Alina Moussessian, Lisa Nguyen, Mimi Paller, Wu-Yang Tsai, Kevin Wheeler, Leilan Williams.

Section 335: Dale Boggs, Maggi Glasscoe, Richard Gross, Michael Kelsay, Michael Lough, Todd Ratcliff, Tom Runge, Mark Smith, Rabi Wang.

Section 344: Annie Aroyan, James Dillon, Barbara Lam, Minnie Perry, George Reyes, William Rousey, Anilkumar Thakoor, Carlos Villalpando, Hanying Zhou.

Section 351: Richard Bannister, David Brinza, Sandra Capaldi, James Granger, Donald Hagood, Denise Howard, Alejandro Levi, Steven Lewis, Gary Milam, Melody Moore, David Pass, Tracy Pellegrino, Walter Walker.

Section 353: Henry Awaya, David Bame, Barbara Bonzo, Gani Ganapathi, Keith Goodfellow, Shyh-Shiuh Lih, Charles Porter, Sylvia Rivera.

Section 357: Dennis Maciej, Scott Premo, Werner Schwarz.

Section 361: Son Ho, Trinia Ray.

Section 386: Tracy Lee, Robert Lin, Mario Loo, Andrew Pease, Vincent Perun, Raymond Tsang, James Velebir Jr., Rolf Wyss.

Section 500: Susan Lee.

Section 620: Bunny Bundschuh, Jim Constantine, Wendelin Donahue, Dion Duarte, Jane Lee, Patricia Parrett, Michael Salsman, Michele Schneider, Cassandra Sellers, David Spencer, William Stewart, Patricia Vitti, Jean Walker, Scott Yeats.

Section 622: Carmen Diaz. ❑

More than 300 participants and 60 suppliers attended a recent conference presented by JPL and the Southern California Chapters of the International Microelectronics and Packaging Society, exchanging the latest technology information and breakthroughs in commercial, NASA, and JPL space applications in electronic packaging.

Coordinated by JPL's Quality Assurance Office 506, Electronic Packaging & Fabrication Section 349 and selected local members of the society, attendance by workshop participants and vendors was at an alltime high for the two-day conference at the Pasadena Convention Center, said **Andrew Shapiro** of Section 506.

The focus of the technical presentations centered on new electronic packaging technologies, with selected emphasis on packaging technologies for space vehicles, he said. Twenty-four presentations were given from NASA, JPL and industry, including. "Fabrication Lessons Learned from an Advanced Packaging Technology Project" by **Genji Arakaki** of Section 349.

To meet NASA's "faster, better, cheaper" strategy for space missions, the electronics packaging, a key part of any space vehicle, needs significant reductions in volume and mass, Shapiro noted, adding that this reduction can only be achieved through the latest electronic packaging breakthroughs. Space applications impose especially harsh conditions for microelectronics that most new technologies, such as those found in cell phones or personal computers, have not endured.

"Attendees, presenters and vendors were all impressed by the array of new technologies and the quality of the symposium," Shapiro said. ❑

Special Events Calendar

Ongoing

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

Codependents Anonymous—Meeting at noon every Tuesday. For more information, call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. For more information, call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6400.

Senior Caregivers Support Group—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. For more information, call (626) 397-3110.

Friday, July 9

ERC Ticket Deadlines—Last day to purchase tickets for the Brian Setzer Orchestra's Aug. 13 appearance at the Greek Theatre (tickets are $49.50) and the Ringling Brothers and Barnum & Bailey Circus July 24 at the Los Angeles Sports Arena (tickets are $16.25).

JPL Dance Club—Meeting at noon in Building 300-217.

JPL Perl Users Group—Meeting at noon in Building 301-127.

Tuesday, July 13

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

Wednesday, July 14

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

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. For more information, contact Mary Sue O'Brien at ext. 4-5090.

Thursday, July 15

JPL Astronomy Club—Meeting at noon in Building 198-102.

Von Kármán Lecture Series—Dr. Michael Kobrick, project scientist for the Shuttle Radar Topography Mission, will present "Mapping the Earth in 3-D" at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, July 16

ERC Ticket Deadlines—Last day to purchase tickets for the Dodgers' July 27 game against the Cincinnati Reds (Bean Pal Night, 7:05 p.m.) and July 31 matchup against the Arizona Diamondbacks (Hollywood Stars Day). Tickets for each game are $13.

JPL Dance Club—Meeting at noon in Building 300-217.

Von Kármán Lecture Series—Dr. Michael Kobrick, project scientist for the Shuttle Radar Topography Mission, will present "Mapping the Earth in 3-D" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Wednesday, July 21

Dance Lessons—Intermediate Argen- tine Tango instruction will be offered starting today for three consecutive Wednesdays, from 7:30 to 9 p.m. in Winnett Lounge. Cost: $6 per session. Sponsored by the Caltech Ballroom Dance Club.

JPL Drama Club—Meeting at noon in Building 301-127.

JPL Hiking Club—Meeting at noon in Building 238-543.

Friday, July 23

JPL Dance Club—Meeting at noon in Building 300-217.

JPL Perl Users Group—Meeting at noon in Building 301-127.

NASA bestows annual honor awards to JPLers

JPL employees, contractors and partners were recognized by NASA for their outstanding work over the past year as the Laboratory held the agency's annual Honor Awards ceremony July 1.

JPL Director Dr. Edward Stone, Deputy Director Larry Dumas and NASA Deputy Associate Administrator for Space Science Dr. Earle Huckins presented 95 awards to teams and individuals.

"JPL is the envy of the space world," Huckins told the honorees. "You are doing the impossible and making it look easy."

Following is a list of teams and individuals receiving Honor Awards.

Public Service Group Achievement Award

Given to a group of nongovernment employees in recognition of an outstanding accomplishment that has contributed substantially to the NASA mission.

The Boeing Corporation, NASA and Commercial Delta Launch Services, Spectrum Astro, Inc., Deep Space One Industry Partner.

Group Achievement Award

Given in recognition of an outstanding accomplishment that has been made through the coordination of many individual efforts and has contributed substantially to the accomplishment of the NASA mission. May be used to recognize the accomplishments of either a total government employee group or, as a team award, a group comprised of both government and nongovernment personnel.

Advanced Development for the Deep Space Mission System, Atmospheric Effects of Aviation Laboratory Studies Team, Building 525 Return Team, Computer Algorithm for Trajectory Optimization Software Development Team, Deep Space One Project Team, Enterprise Information System Project, Flight Hardware Logistics Program Flight Computer Team, Global Positioning System Calibration Tracking System/Kalman Earth Orientation Filter Earth Rotation Measurement Team, Industrial Hygiene and Worker's Compensation Team, Ka-band High-Electron-Mobility Transistor Low-Noise Amplifier Development Team, 1998 Mars Climate Orbiter and Mars Polar Lander Project Team, Mars Global Surveyor Solar Array Anomaly Recovery and Aerobraking Team, Miniature Integrated Camera-Spectrometer Team, Multi-Mission Spacecraft Analysis System Development Team, NASA Solar Electric Propulsion Technology Application Readiness (NSTAR) Team, Pollution Prevention/Targeted Chemicals Release Reduction Committee, Quakefinder Development Team, TOPEX/Poseidon Autonomous Maneuver Experiment Team, United States Space Very Long Baseline Interferometry Project Team.

Public Service Medal

Awarded to any individual who was not a government employee during the period in which the service was performed. Granted for exceptional contributions to the NASA mission.

Michael Freilich.

Stardust Project Manager Dr. Kenneth Atkins, left, former Mars Exploration Director Norm Haynes and Space and Earth Sciences Director Dr. Charles Elachi were among those receiving NASA Honor Awards at JPL on July 1.

Exceptional Engineering Achievement Medal

Awarded for unusually significant engineering contributions toward achievement of the NASA mission. May be given for individual efforts or applications of engineering principles or methods that have resulted in a contribution of fundamental importance in this field or have significantly enhanced understanding of this field.

James Donaldson, Robert Rasmussen.

Exceptional Service Medal

Awarded for significant, sustained performance characterized by unusual initiative or creative ability that clearly demonstrates substantial improvements or contributions in engineering, aeronautics, space flight, administration, support or space-related endeavors that contribute to the NASA mission.

Arden Acord, Mark Adler, Steven Alfery, Belinda Arroyo, Stephen Giacoma, Roger Gibbs, Winston Gin, Kathleen Hahn, Paul Hardy, Richard Hasegawa, Richard Horttor, Nancy Kapell, Edward Kopf Jr., Lawrence Koss, Michael Leeds, Charles Leising, Robert Lubold, Marilyn Morgan, William Patzert, Thomas Shain, Steven Simpson, David Spencer, Carolyn Stevens, R. Frank Tillman, Charles Weisbin, Steven Wissler, Victor Zlotnicki.

Exceptional Achievement Medal

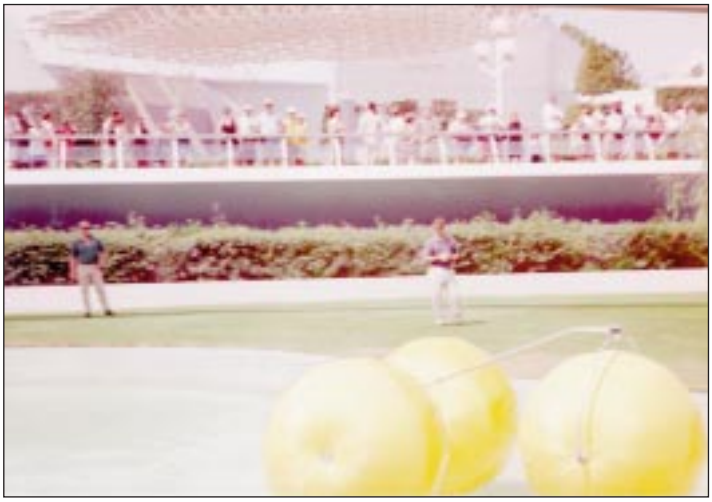
Awarded for significant, specific accomplishment or contribution clearly characterized by a substantial and significant improvement in operations, efficiency, service, financial savings, science or technology that contributes to the NASA mission.

Charles Beichman, Charles Bell, John Casani, Janis Chodas, Karla Clark, Claudia de Luna, Roger Diehl, Keith English Daniel Erickson, Richard Grammier, Charlene Hazelton, Pamela Hoffman, Sanford Krasner, Charles Lawrence, Dankai Liu, Nathaniel Livesey, John Miller, Phillip Morton, Mary Beth Murrill, Jonathan Perret, Marc Rayman, Ralph Roncoli, Nicolas Rouquette, Ross Salawitch, Michelle Santee, Suzanne Spitz, Thomas Starbird, Michael Turmon, Bert Turney, Charles Whetsel, Steven Williams, Samuel Zingales, Richard Zurek.

Outstanding Leadership Medal

Awarded for notably outstanding leadership that has had a pronounced effect upon NASA technical or administrative programs. May be given for an act of leadership or for sustained contributions based on an individual's effectiveness as a leader, the productivity of the individual's program, or demonstrated ability to develop the administrative or technical talents of other employees.

See Awards, page 6



Left, Jurrie van der Woude of JPL's Media Relations Office helps an EPCOT Center visitor in controlling the Marie Curie rover. Above, a crowd gathers to see a demonstration of a prototype inflatable rover.

On stage at EPCOT

Marie and the inflatables

By BETTY SHULTZ

Thousands of people from all over the world visited JPL's rover exhibit and demo during EPCOT Center's "Explore Space Celebration" in Orlando, Fla., June 11-15. The celebration was a special event designed to allow people to experience and learn about space exploration—both human and robotic.

Other participants included Kennedy Space Center and Boeing. A working model of the 11-kilogram (25-pound) Marie Curie rover (Sojourner's "sister," scheduled to be launched to Mars in 2001) was on display in a Mars "sandbox" and operated by Jurrie van der Woude of the Media Relations Office and Betty Shultz of Public Affairs.

"I talked to people from England, Scotland, Russia, Germany, Puerto Rico, and from almost every state in the U.S.—as well as people from Montrose and La Cañada," van der Woude said. And nearby, Richard Shope, outreach coordinator for the Outer Planets/Solar Probe Project, encouraged kids and adults to participate as "rocks" and "rovers" as he explained and demonstrated what the Sojourner had accomplished on Mars in July 1997.

"It was amazing to meet so many people from so many places who knew about Pathfinder," Shope said. "Most, however, were surprised at the actual size of Marie Curie and Sojourner; they thought the rover would be much larger than it actually is."

Also on display was a new rover technology currently under development—inflatables. Weighing 20 kilograms (44 pounds) and remotely operated by Tim Connors (Section 357) and Mike Schmelzel (Section 354), the balloons rolled out of the exhibit tent onto the grass and into a nearby pond, catching the interest of people passing by. Shope was on hand to answer questions and explain about the giant yellow inflatable "balloons."

Visitors were also able to view NASA's Planetary Photojournal on a computer screen, and obtain information about JPL's web sites.

EPCOT would like JPL to participate in future events, and the Laboratory expects to work with them to create some innovative and educational activities that will involve adults and children in JPL's exploration of the universe. ❑

LETTERS

I would like to thank my friends, colleagues and co-workers on the Voyager and Ulysses missions for the beautiful flowers, and their support and many wishes of sympathy after the passing of my father. I would also like to express my appreciation to ERC for the beautiful flowers, and OAO Corporation for the lovely plant sent to my house; it was very nice. Thank you all.

William Mogensen

❑❑❑

I thank all of my friends who attended and contributed to my retirement party. Special thanks to Vivian Williams, Katrina Melendez and Lute Maleki for bringing it all together. My career at JPL has been more rewarding than anyone should expect. I am very proud of what we have accomplished together over the last 35 years.

George Lutes

❑❑❑

My family and I would like to express our sincere appreciation to my many fellow JPL friends for their support during the illness and passing of my wife Rose on June 10, 1999—which strangely is also my late father's birthday!]

John Repar

FOR SALE

AUDIO EQUIPMENT, CD/AM-FM/dbl. cassette/ turntable, 10 yrs. old, all working fine, $45, in La Verne. 909/593-4046.

BEANIE BABIES, '99 McDonalds's, 12 in set; BASEBALL/FOOTBALL CARDS, unopened '87-'99, $30-$100; full sets of baseball/football cards, major brands, rookies & major stars included, $25 to $100. 626/914-6083.

BEDDING, comforters & quilts/king-size and twin, $20-25. 626/398-4960.

BEDSPREAD, double, yellow floral, quilted 2/skirt-ruffles, brand new, never used, $25, in La Verne. 909/593-4046.

CANOE, used, cheap. 310-476-8941, Wilcox

CD PLAYER, Denon DCD 1300, single play, remote control, perfect working order, $200. 626/281-2179, Mike.

CHINA SET, 60 pc., $70/obo. 909/592-0780, Ana.

COFFEE GRINDER, Melita, used once, paid $40, sell for $20. 248-9432, Stan.

COFFEE TABLE, white marble, 23 x 69 inches, $120. 626/797-6982.

COMPUTER, Pentium 133 MHz, 16 MB RAM, 1.7 GB HDD, IDE CD-ROM, 16-bit sound blaster, 60w speakers, mid tower case, DS PCI 2MB video, 15" monitor, 2.5yrs old, $1000. 626/356-0697, Manuel.

COMPUTER, Mac II FX, Conner 140 MB HD, 780 kB 3.5" FD, 1.4 MB 3.5" FD, 20 MB RAM, System 7.5.3, 32-bit addressing, 14" color monitor (16 colors), Global Village Teleport 33.6 fax/modem, Netscape Communicator, $150. 541-0062.

DINING ROOM FURNITURE: cherry wood server from Ethan Allen (Georgian Court Collection), dimensions 40"x21"x34", exc. condition, $850/obo; unrelated 5-piece dinette set (table dimensions 48"x36"x29"), $75. 626/577-8107.

DRESSES, Halston (new) blank floor-length, size 12; royal blue (new), size 14, $25 ea. 626/398-4960.

EXERCISE EQUIPMENT, Weslo pursuit 600, very good condition, original price $179, will sell for $50: STAIR STEPPER, $10. 626/345-0079.

FILE CABINETS, 2 drawer, oak veneer, $25. 626/398-4960.

FOOTLOCKER / TRUNK, $20. 626/303-1927.

FURNITURE, Ethan Allen set, end table and coffee table, solid walnut wood (dark stain), good/vg condition, $150. 952-9463, after 6 p.m.

FURNITURE, 10 bookcases; 2 complete bedroom sets, one king, one queen; all excellent condition. 790-4811.

GARMENT BAGS: plastic hanging bags w/zippers, $5 each. 626/398-4960.

JEWELRY, costume, some vintage, $3-20; various pieces of Indian jewelry. 626/398-4960.

KEYBOARD, Casiotone MT-500 electronic, $25. 626/398-4960.

LAMPS, decorator-type gold leaf welding art, spray of flowers, value $600/ea. new shades, sell both for $300/obo., will include Egyptian end tables. 626/447-5768, eves.

LAWNMOWERS: MacLane 21 inch, vg condition, $75; Honda 21 inch, vg cond., $100. 626/447-1888.

LIGHT FIXTURES (2), florescent 2-bulb for ceiling, covers & bulbs, good cond., $10/each; 2-way big hurricane for ceiling w/glass chimney & lg. great down spotlight, very nice, $40; in La Verne. 909/593-4046.

MODEM, Apple Geoport adapter fax/modem, Model M1694 express for power Mac, $25. 541-0062.

MOVING SALE, tables (white), 59 x 31.5", $35; 47 x 31.5", $30; coffee table (white), 35.5 x 22", $15;TV table (white), $10; book shelf (black), $35; folding chairs (6, black), $6/each; vacuum cleaner, $40; tent (4 people), $35; camping mattress (2), $7 each; mountain bikes, 15 spd., men's 26", women's 24", $50/each. 626/577-5471.

MOVING SALE: misc. large & small furniture items; color TVs (2); Chefmate bread machine & misc. 626/799-6196.

PHOTOGRAPHS, 40" x 30", color, framed; 2 tall-ship pictures by a prof. photog., vg cond., 1 of a Spanish ship in SF bay, one of a

Continued on page 6

Cassini family celebrates Venus flyby

The Cassini spacecraft, on the 617th day of its voyage to Saturn on June 24, successfully completed its second flyby of the planet Venus, once again on time and on target.

As planned, Cassini came within 600 kilometers (about 370 miles) of the planet at 1:30 p.m. Pacific time, with Venus' gravity giving the spacecraft a boost in speed to help it reach Saturn, more than 1 billion kilometers (620 million miles) away. The spacecraft, launched on its voyage Oct. 15, 1997, remains in excellent condition as it travels its nearly seven-year trajectory to Saturn. Most of Cassini's scientific instruments were set to make observations during the Venus flyby.

Troy Goodson, who worked on Cassini's flight path control navigation, said that on June 2, the navigation team predicted that on June 24 at 1:29:55.4 Pacific time the spacecraft would come as close as 358 miles, would reach a peak speed of 29,475 mph (relative to Venus) during the encounter, and its path would be bent 41.66 degrees by Venus' gravity. These predictions were checked by measuring how long it takes for a radio signal from Cassini to reach Earth and by measuring the Doppler-effect frequency shifts in that radio signal.

Best estimates based on that data, he said, indicate that at 1:29:54.9 Pacific time. Cassini came as close to Venus as 362 miles, its peak speed was 29,469 mph, and its path was bent by 41.64 degrees.

Four flybys of planets—two of Venus and one each of Earth and Jupiter—give Cassini the speed it needs to reach Saturn. Cassini first flew past Venus on April 26, 1998 at a distance of 284 kilometers (about 176 miles). The spacecraft will next execute a 1,166-kilometer (725-mile) flyby of Earth on Aug. 18 (Aug. 17 Pacific time at 8:28 p.m. PDT), then it's on to Jupiter for a Dec. 30, 2000 flyby. The giant planet's gravity will bend Cassini's flight path to put it on course for arrival into orbit around Saturn on July 1, 2004.

Cassini's mission is to study the ringed planet, its magnetic and radiation environment, moons and rings for four years. Cassini will also deliver the European Space Agency's Huygens probe to parachute to the surface of Saturn's moon Titan. Titan is of special interest partly because of its many Earthlike characteristics, including a mostly nitrogen atmosphere and the presence of organic molecules in the atmosphere and on its surface. Lakes or seas of ethane and methane may exist on its surface. ❑

TOM WYNNE / JPL PHOTO LAB

Stargazers check out Venus with an 11-inch f/16 refractor, built by Jeff Schroeder of Section 346 and mounted on top of his car. It is both the largest homebuilt and largest portable refractor in the world.

NASA review uncovers WIRE failure

NASA's Wide-Field Infrared Explorer (WIRE) failed because of an incorrectly designed electronics box that prematurely fired explosive devices, causing early ejection of the instrument's telescope cover, a NASA board has found.

The WIRE Mishap Investigation Board found that the design of the instrument's electronics box did not take into account subtle, but known, start-up characteristics of one component within the box. Electrical power created at the start-up of this component reached explosive devices, called pyrotechnics, meant to eject the telescope's cover later in the mission. The power reached the pyrotechnics within a fraction of a second after the box was turned on, and the cover was ejected.

JPL managed development of the WIRE instrument. NASA's WIRE Mishap Investigation Board was supported by a JPL WIRE anomaly review board, chaired by Matt Landano, deputy manager of the Planetary Flight Projects Office. The NASA board was also supported by teams from NASA's Goddard Space Flight Center in Maryland, which built the WIRE spacecraft, and from Space Dynamics Laboratory at Utah State University, which constructed the instrument.

With the premature loss of the telescope's cover, the frozen hydrogen used to cool the telescope's sensitive infrared detectors was exposed to the Sun. As the telescope warmed, the hydrogen converted into a gas and vented entirely into space within 48 hours of launch. Without the frozen hydrogen, the instrument could not conduct its scientific mission.

"There was no component failure," said Darrell Branscome, chairman of the eight-member WIRE Mishap Board and deputy associate administrator (Enterprise Develop-ment) for NASA's Office of Space Flight. "This was simply a case of a design error that allowed power to get to the explosive charges before it should have. The system operated the way it was designed. Unfortunately, the design was flawed."

The report added that simulators and other support equipment used for design and verification tests lacked the fidelity required to detect this potential failure.

"A significant contributing cause of the anomaly was the failure to identify, understand and correct the electronic design of the pyro electronics box," the report said. "Design errors in the circuitry, which controlled pyro functions, were not identified. The pyro electronics box design was not peer reviewed, and other system reviews conducted by the instrument design team did not focus on the electronics box."

WIRE was launched from Vandenberg Air Force Base March 4 aboard a Pegasus XL launch vehicle. Its mission was to detect infrared light in the background cosmos to learn more about the formation of stars, galaxies and the current state of the universe.

NASA has already taken additional steps to ensure that design engineers are aware of this condition. A NASA Parts Advisory was issued on May 27 at the request of the Mishap Board, informing design engineers of the need to consider the startup behavior of electronic devices to prevent unwanted or unexpected power discharges.

In addition to the NASA advisory, "JPL already has design principles and processes in place to prevent similar occurrences in the future," Landano said.

The team's report also included recommendations for future spacecraft designers. These include the use of independent, separate inhibiting devices for pyrotechnics for mission-critical or irreversible events; additional testing for anomalous start-up behavior; detailed, independent reviews to assess the system design; and consideration of the design, location and mounting of external vent hardware in the event of a worst-case venting scenario.

The WIRE spacecraft is now in a stable orbit with its other systems and electronics in good working order. Ground controllers will proceed with tests on new flight-control technology aboard the spacecraft.

The WIRE mission was the latest in a series of Small Explorers, a project under the Explorers Program managed by Goddard.

The full text of the executive summary of the report is available on the World Wide Web at ftp://ftp.hq.nasa.gov/pub/pao/reports/1999/wire_summary.pdf . ❑

Deep Impact

Continued from page 1

Headquarters. "Messenger is a flagship-quality effort that, in tandem with a separate Pluto mission, enables us to seize the opportunity to complete our historic initial reconnaissance of the solar system. Deep Impact presents a special chance to do some truly unique science, and it is a direct complement to the other two comet missions already in the Discovery Program."

"Deep Impact will be a very exciting and challenging mission," noted Dave Jarrett, the Discovery Program manager at NASA Headquarters. "JPL won a very tough competition," he added. "The final selections were very close."

Deep Impact will be built by Ball Aerospace Technologies Corp. in Boulder, Colo. The total cost of Deep Impact to NASA is $240 million.

Messenger, to be launched in spring 2004, will be NASA's first mission to Mercury since the Mariner 10 flybys in 1974 and 1975, which provided information on only half the planet. Its challenging flight plan begins with two Venus flybys, then two Mercury flybys in January and October 2008 and a subsequent orbital tour of Mercury beginning in September 2009.

One of Messenger's goals will be to discover whether Mercury has water ice in its polar craters. The cost of Messenger to NASA is $286 million. It will be built and managed by the Johns Hopkins University's Applied Physics Laboratory, Laurel, Md.

NASA selected these missions from 26 proposals made in early 1998. The missions must be ready for launch no later than Sept. 30, 2004, within the Discovery Program's development cost cap of $190 million in fiscal 1999 dollars over 36 months and a total mission cost of $299 million.

The Discovery Program emphasizes lower-cost, highly focused scientific mission. NASA has developed six other Discovery Program missions.

Two have completed their primary missions (Lunar Prospector and JPL's Mars Pathfinder), two are operational (the Near Earth Asteroid Rendezvous spacecraft is scheduled to enter orbit around the asteroid Eros in February 2000; JPL's Stardust mission to gather samples of comet dust and return them to Earth was launched in February 1999), and two are in development (the JPL-managed Genesis mission to gather samples of the solar wind and return them to Earth, and the Comet Nucleus Tour [CONTOUR] mission to fly closely by three comets are being prepared for launch in January 2001 and June 2002, respectively). ❑

Champollion

Continued from page 1

then sampling and analyzing in-situ the comet's composition.

Comparing ST4/Champollion to Columbus' explorations of the New World, Muirhead said he believed the public appeal for the first-of-a-kind mission would have been substantial. "Comets are 4.5-billion-year-old time capsules, and we have never been to one before. It's disappointing that we won't have the chance to show this to the public."

Among other features, the mission would have provided stereo images of the comet's surface using French cameras. It also called for drilling into the surface of Tempel 1's nucleus and delivering samples to instruments built at JPL and at Goddard Space Flight Center.

JPL hopes to continue to accelerate the advanced technology development that was under way by ST4/Champollion, which included multi-ion-engine propulsion, anchoring, precision guidance and landing, drilling, sample acquisition and transfer mechanisms, and solar arrays.

"There is a strong desire to keep the technology work going to benefit future missions, including Mars Sample Return," Muirhead said.

"If we stop, it may be very hard to get it started again for any future missions that require those technologies." ❑

Awards

Continued from page 3

Richard Brace, Peter Doms, Thomas Gavin, J. Steven Jenkins, Chris Jones, Leslie Livesay, Gary Parker, Richard Stoller, Philip Varghese, Reed Wilcox.

Three Outstanding Leadership Medals were presented by NASA Administrator Daniel Goldin at a special leader recognition ceremony in May:

Kenneth Atkins, David Lehman, John McNamee.

Distinguished Public Service Medal

Awarded to any individual who is not an employee of the federal government or was not an employee of the government during the period in which the service was performed. Granted only to individuals whose distinguished accomplishments contributed substantially to the NASA mission. The contribution must be so extraordinary that other forms of recognition by NASA would be inadequate. This is the highest honor that NASA confers to a nongovernment individual.

Hamid Hassan.

Distinguished Service Medal

Awarded to any person in the federal service who, by distinguished service, ability or courage, has personally made a contribution representing substantial progress to the NASA mission in the interest of the United States. The contribution must be so extraordinary that the other forms of recognition by NASA would be inadequate. This is the highest honor that NASA confers.

The Distinguished Service Medals were presented by NASA Administrator Daniel Goldin at the special leader recognition ceremony in May: Charles Elachi, Norman Haynes. ❑

FOR SALE

Continued from page 4

German ship nr. Puerto Rico, $70/ea., $120/both/obo. 626/568-8298.

PICTURE FRAMES, 3 made of brass, 22" x 28"; $6 each, $15 for all 3/obo. 626/568-8296.

PRINTER, Xerox Diablo 630 daisywheel with print wheels/ribbons, exc. cond., works great, $10/obo. 626/568-8298.

RANGE, Whirlpool gas, almond, 30" self-clean oven, like new, must see, $350. 626/337-6130.

REFRIGERATOR, 20.8 cu ft., glass shelves, ice-maker, 15 yrs. old, exc. running condition, freezer easily maintains 0-10 degrees, $150. 248-9432, Stan.

REFRIGERATOR, full-size JCPenney, frost-free w/energy saver, Harvest Gold w/wood trim, icemaker, exc. condition, very clean inside and out, $125. 353-6369, Nancy.

REFRIGERATOR, Kenmore, 19.9 cu. ft., energy saver, $200. 249-4646, Jackie.

REFRIGERATOR, Kenmore, freezer side by side, 19 cu. ft., d=30", w=36", h=68", ice cubes/cold water, good condition, 626/355-9707, Warren.

RINGS, amethyst, set in 14K w/sm. diamonds, size 6: $75/obo; pearl ring set in 14K, size 5-1/2, $30. 626/398-4960.

RUGS, Afghani, 4' x 6', $200; Mexican, 3' x 4', $70. 626/303-1927.

SNAKE, 3-yr.-old ball python, very gentle, with cage, heat lamp, $50. 626/799-0109.

TABLES, glass, four 2-shelf tables with brass feet, three make up a coffee table (one round 2.5 ft. dia., two "half-moon"); fourth is a round end table, 2.5 ft. dia.; $125/obo. 909/592-0780, Ana.

SWIMMING POOL, above ground, new liner & pump, 15'x 4', complete w/ladder, $300. 626/358-7913, Natalie.

TELEVISION, RCA 17 in., color/remote control, works fine, $65. 951-3653.

TELEVISION, RCA ColorTrak, 25" screen, attractive cabinet, rotates on base, overall dimensions 34" x 19" x 30", good condition, $40; indoor TV antenna (rabbit ears), rotating type, RCA, vg condition, $10. 626/577-8107.

TELEVISION, Sony 19-in . color, with remote, great picture, works fine, $150/obo. 626/963-2565.

TV STAND, oak, on casters, accommodates up to 27" TV, storage & VCR space, $50. 626/398-4960.

WATCH, new, Capezio, w/6 color attachments, retail $125, sell $40. 626/398-4960.

WATCHES, women's (3) circa 1940-60, $10 ea. 626/398-4960.

WATERBED, Calif. King converted, regular mattress, 12 drawer under dresser, $200/obo. 249-4536, Steve.

WEDDING DRESS, exc. cond, used once, in garment bag, white, straight, long sleeves, bow in back, $40/obo. 626/568-8298.

VEHICLES / ACCESSORIES

'91 ACURA Integra GS 4 dr., auto, air, great sound sys. with CD ch., security & keyless entry, tinted, sliding moon roof, & much more, white ext., with black/gray int., 92k miles, all records, immaculate, $7,650. 626/440-1069.

'86 CHEVROLET Suburban, ¾ ton, 454 V8, tow pkg., all pwr., front/rear a/c, 3 rd seat, lim. slip diff., alloy rims, tilt wheel, cruise cont., trailer hitch, roof rack, vg. cond., all records, $6,000. 247-0831, Jim.

ENGINE for Cadillac, never used, factory crated, will work in '91-'95 years, 4.1L, V-8, $1,300/obo. 515-5761.

'85 FORD Ranger pickup, white, 4 cylinder, 170K miles, runs fine, $650/obo. 626/799-6196.

'88 FORD Bronco, Eddie Bauer Ed., V8, p.w., pdl, cc, a/c, custom wheel, well maintained, $6450/obo. 323/255-7932, Fred.

'96 HONDA Accord LX, black ext./gray int., 54K miles, 4 dr., tinted rear windows, loaded, excellent condition, $15,000/obo. 562/869-8045.

'97 HONDA Civic DX, 4-door, 5 spd., a/c, 35K miles, dk. green, 38mpg, excellent condition,$10,000/obo. 909/590-8158, pvaze@hotmail.com, Parag.

'97 NISSAN King Cab 4X2 SE, 70k miles mostly hwy., loaded, CD player, billet specialties rims, 1 owner, maintenance records, Kelly Blue Book $14,575, will sell $12,700/obo. 929-7792.

'86 MITSUBISHI Mirage, lt. blue, new tires, current registration, recent tune-up, runs great, am/fm cassette, very reliable, $1,000/obo. 310/841-1990, pager, Jessica.

TIRES, new compact spares, 13-inch for Toyota, etc., 195-14 for midsize, $10 each. 626/797-6982.

'90 TOYOTA Cressida, 116K miles, excellent cond., $7,500/obo. 310/641-2556.

'93 VW Corrado SLC VR6, classic green/beige leather, ABS, sunroof, a/c, rare AT, alloy wheels, premium sound am/fm/cassette, all avail. Options, low miles, exc. cond, orig. owner, $14,500. 247-0831, Jim.

'86 YAMAHA FZ 750, 36K miles, original owner, great bike, vg condition, $1,600. 345-0075, Albert.

WANTED

BELMONT HIGH SCHOOL (L.A.) GRADUATES from years 1957-62. 956-1744, Barbara.

HOUSEMATE to share 3 bd., 2 ba. house in San Gabriel; 23 minutes to JPL; $500/mo., all amenities included. 626/281-2179, Mike.

PERFORMERS for the JPL Talent/Variety

Continued on page 8

Band of JPLers honors audience with Swingin' tunes

The Big Band Theory, a group composed entirely of JPL employees, entertains following the NASA Honor Awards July 1. In keeping with JPL's space theme, their playlist included "Fly Me to the Moon," "It's Only A Paper Moon" and "Orange Colored Sky." Performing were saxophonists Jeff Knecht, Bob Lineaweaver, Sarah Lundeen, Roy Milligan and Chris Woodcock; trumpeters Brenda Burkhart, Mark Maimone, Steve Noland and Pat Olguin; trombonists Joe Bell, Jay Breidenthal and Rino Passaniti; rhythm section players Ed Baroth, Kevin Bowman, Bill Hyland, Carol Jerome, Rob Sherwood and Jeff Weiss; and vocalists Todd Barber, C. Nelson Carter and Carol DiNolfo.

CD-ROM gives students NASA-eye views and tight closeups of Earth

"Big time cool" is the way one teacher has described the new "DataSlate Plus" educational CD-ROM recently released by the Consortium for the Application of Space Data to Education (CASDE), of which JPL is a partner.

Subtitled "Educational Building Blocks for Exploring the Universe," the CD contains the latest version of a unique image display tool called DataSlate, which allows the user to visually navigate extremely large images by zooming and panning around the scene. The user can quickly switch between data sets covering the same area or can use a second window in order to view two image types at the same time.

DataSlate's power derives from a data structure that geographically co-registers data of different types—as one moves about a particular image, all other image data sets are kept in spatial synchronization. The user can move from a natural color image to an infrared image or a radar image and examine the same region at these different points in a spectrum.

Though geared towards middle- and high-school students, a primary-school teacher could make creative adaptations of most of the 12 data sets and lesson plans on the CD, said Betty Sword, CASDE task manager at JPL.

"The CASDE technology element is at JPL, providing leadership in developing visualization tools and techniques," Sword said. "CASDE staff at JPL also provide expertise in acquisition, archiving and distribution of Earth and planetary data and information."

Funded by NASA's Earth Science Enterprise to promote the use of space-derived, remotely sensed data and information, CASDE is a partnership between JPL, the Center for Advanced Land Management Information Technologies at the University of Nebraska at Lincoln, and the Office of Internet Studies at the University of Nebraska at Omaha.

Data sets on the CD have as many as nine co-registered data types of the same geographical area, taken by different instruments from various NASA spacecraft or at different times.

For example, a data set of Pasadena includes Landsat Thematic Mapper data in seven spectral bands, natural and infrared color images, digital elevation data, and topographic and geologic maps. Other data sets include California, Nevada and Nebraska; further from home, Mars and Milky Way images are also included. The data are stored in a hierarchical structure that allows for rapid loading of images and movement within the image.

The CD's "building blocks" consist of an example lesson plan, a data set, a tool, associated educational standards and links to accessory tutorials. Each building block was designed and reviewed by educators. Among the titles are: "Atlantis of Nebraska," "A Rescue Mission," "Train Traveler," and "Is Snoopy on Mars?"

"Teachers may use the example lessons just as provided, but they are encouraged to use them as starting points to develop their own lessons," Sword said.

Graphically fashioned after a child's slate with control buttons, this version of DataSlate also includes five plug-in tools: the Ruler measures distance and area, the Bearing tool provides an angle in degrees or radians, the global positioning system (GPS) displays latitude and longitude, the Pushpin marks locations and annotates an image, and the Magnifier enlarges selected areas.

DataSlate Plus is the consortium's third CD and has been submitted to the NASA Earth Science Enterprise Educational Product Review. The DataSlate software was selected by JPL to be submitted for NASA's Software of the Year award.

Now in its fourth year, CASDE began as a challenge by Nebraska Senator Bob Kerrey to make space data and analysis tools accessible to primary and secondary students. Among CASDE's other activities are teacher training workshops and development of undergraduate courses.

The CD is available by contacting Sword via e-mail (bsword@pop.jpl. nasa.gov); it may also be downloaded from the CASDE DataSlate web site at http://casde.jpl.nasa.gov/dataslate. ❑

WANTED

Continued from page 4

& other countries, past & present. 790-8523, Marc Rayman.
VOLLEYBALL PLAYERS, all levels of play, every Tuesday night 8-10 at Eagle Rock High School, $4/night. 956-1744, Barbara.

FREE

CAT, orange tabby, 6 yrs. old, female, spayed and shots current, indoor/outdoor; to good home; must find home due to major move. 626/799-6196.
DOG, adorable black lab/Newfoundland mix; large dog, around 4 years old, loves people. 626/794-8737.

FOR RENT

ALTADENA, studio apt. over garage, 3 mi. to JPL, furn. or unfurn., $450. 626/798-8632, eves.
CANOGA PARK house, 2 bd., 1 ba., garage, large yard, 40min/JPL, $800 + utilities. 626/791-9049.
CLOSE TO JPL, 1 rm. furnished in lg. house, shared bath, clean person, must like dogs, $475 + 1/3 util. 626/797-5570, Azita.
LA CRESCENTA guest house, 1 bd., 1 ba., living/dining room, kitchenette, laundry, patio, cable, central air, skylight, carpet, private entrance, parking; quiet, safe neighborhood; no smoking, no pets, all utilities incl., $650. 957-2173, Henry.
MONROVIA condo, share furnished 2 bd., 1.5 ba., full privileges, kitchen, laundry, central heat/ac, close to shops and street fair, no utilities paid, $375 + security deposit. 626/357-5189.
PASADENA, 1 rm. in 3-bd. apt., share with 2 others; pool, parking, a/c, washer/dryer; $460 + 1/3 util. 626/564-1078.
PASADENA, back house, 2 bd., laundry hook-up, hardwood floors, back yard, new kitchen, new bath, a/c, $795. 626/792-9185, Basia.

REAL ESTATE

ALTADENA home in resort-like setting, nestled in foothills on pvt. rd., pool, spa, seclusion, mtn. view, 2 bd. + conv. den, 2 ba, CA, FP, updated kitchen, 12 min. to JPL or Caltech, many amenities, $329,000. 626/797-3156.
BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
GLENDALE Tudor estate, exc. neighb'rh'd, cyn. views, very light and bright, about 4,000 sq. ft., state of the art kitchen, 5 bd. or 4 bd., 1 studio, 3.5 ba., attached gar., rose and herb gardens, 2 water fountains, large fireplace, all wood floors, skylights, newly-remodeled, balcony, lg. spacious rms., washer/dryer/refrig.r, crystal chandeliers, stained glass windows, see to appreciate all features, $675,000. 323/344-7163.
LA CRESCENTA home, 2 bd., 1ba., laundry rm., gd. size front & back yd., great starter house, 10 min./JPL, 15 min./downtown L.A., $174,950. 248-6231, Alok.
N. ALTADENA country charmer, 1,300 sf, walking distance to JPL, 2 minutes by car if you use the east lot. 2 bd. + convtbl den=3 bd, 1-3/4 ba., hw floors, double fireplc., fenced bkyd., $199,000. 626/798-8965.
PASADENA, Heritage area condo, first-floor unit, roomy 1-bd., 1-ba., laundry, pool, spacious living room, parquet floor; secure building, near Old Town, $149,500. 626/798-1700.
PASADENA townhome, built in 1998, near Rose Bowl, 3.5 miles/JPL in gated community; approx. 1,400 sq. ft, 3 bd., 2.5 ba., 2-car attached gar., alarm, ceiling fans w/lights in all bedrooms, covered balcony off master bd., wood floors everywhere, all Corian counters, large landscaped backyard w/auto sprinkler system, palm/fruit trees; pool, Jacuzzi, basketball court; $275,000/obo. 626/568-8298.

VACATION RENTALS

BIG BEAR cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P, TV/VCP, $75/night. 249-8515.
BIG BEAR, 7 mi./slopes; full kitch., f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-nt. min.; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails; 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more; JPL disc price from $65 per night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhome, 2 decks, tennis, pool/spa, nr. skiing, beaut. master bdrm. suite, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4. 248-8853.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba.; rustic, relaxing and beautiful; swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions; low-season rates began May 1. 626/584-9632.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwv., dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: $95/nite/2, 12/15-4/14 rate: $110/nite/2, $10/nite/add'l person. 949/348-8047.
MAMMOTH condo, studio + loft, 2 ba., fireplace w/ wood supplied, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitchen w/microwave, terrace, view, amen. 714/870-1872.
MAMMOTH, Chamonix condo, 2 bd., 2 ba., sleeps 6, fully equipped elec. kitchen, microwave & extras, fireplace, cable TV, VCR , FM stereo, pool & sun area, o/d Jacuzzi, sauna, game, rec. and laundry rms, BBQ area, conv. to shops, hiking, summer events, daily/weekly rates. 249-8524.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft; sleeps 6-8; fully equip'd kitch. incl. microwave, D/W; cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds; close to Mammoth Creek; JPL discount. 626/798-9222 or 626/794-0455.
MAZATLAN, 7 nights, wk. of Oct. 11-18, 1999, Pueblo Bonito Resort on the beach, 1br., sleeps up to 6, partial kitchen, $900. 626/917-0231, Dwaine.
OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.
PACIFIC GROVE house, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kitch. w/microwave, beaut. furn., close to golf, beaches, 17 Mile Dr., Aquarium, Cannery Row; JPL discnt. 626/441-3265.
ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
SAN FRANCISCO, Nob Hill honeymoon suite (for 2 only); full kitchen, maid, concierge; walk to Chinatown, Top o' the Mark, Union Sq.; $125/nite; $750/wk; reserve early. 626/797-3156.
SOUTH LAKE TAHOE KEYS waterfront home, 4 bd./3 ba. (1 bd. & living room upstairs, handicap access fair), sleeps 12+, fireplace on 2 levels, decks overlooking private dock & ski lifts, gourmet kitchen, bicycles, 20' sail & paddle boats, 3 color TVs, VCR, stereo with tape & disk, assn. indoor & outdoor pools, hot tub & beach; 8 lighted tennis courts. 10 min. to skiing, casinos, golf; 1 hour to Western Sierra wine country, $1,095/week for high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/week low season, plus $90 cleaning fee, 3-day min. 626/578-1503, Jim Douglas.

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Universe

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