Jet Propulsion Laboratory

Universe

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New Mars plan targets sample return

International effort to pave way for robotic colonies by 2010

By DIANE AINSWORTH

A new architectural blueprint for international robotic exploration of Mars, resulting in the return of several samples of Martian material to Earth by 2008 and founding of the first permanent robotic colonies by the end of that decade, has been launched by NASA and its international partners in space exploration.

"This plan paves the way for the return of as many as four samples of Martian material from four different sites by 2011, and will lead to the establishment of the first robotic outposts and, eventually, human colonies on Mars," said Norman Haynes, Mars Exploration Program director at JPL.

Under a new plan drafted by NASA and its French, Italian and European counterparts, the consortium of spacefaring nations will begin development of affordable spacecraft and innovative new technologies to obtain in-situ measurements and samples of Martian material in preparation for human exploration of the planet. The plan calls for construction of a fleet of affordable launch vehicles, orbiters, landers, rovers and Mars ascent vehicles designed to wage an all-out effort to begin returning samples of the Martian regolith as early as April 2008.

"This plan lays out the whole framework for our next quantum leap in Mars exploration," said Dr. Charles Elachi, JPL's Space and Earth Sciences Program director and head of the architecture study. "The establishment of the first permanent robotic colonies on Mars, capable of harnessing the planet's natural resources to build a technology base for space flight to and from the planet and biospheres for human settlements well within the lifetimes of our grandchildren, is the most exciting prospect awaiting us as a global community."

The new Mars architecture plan, which is currently being refined by NASA and participating space agencies, underscores the roles and responsibilities of the four space agencies in formulating an integrated, international roadmap for the exploration of Mars.

According to Haynes, the study focuses on robotic surface activities during the early launch opportunities beginning in 2001 through 2011. Many of the early missions will focus on studies of the Martian surface involving science payloads designed to conduct chemical analyses of rocks and soils, obtain rock core samples and tap subsurface water reservoirs and other natural resources that could be used to manufacture propellants to fuel sample-return vehicles.

Work on the architectural redesign began in June. Eight "tiger teams" of experts from the international scientific community, led by Elachi and Dr. Frank Jordan, manager of JPL's Mars Program Planning and Architecture Office, were formed to address issues of spacecraft design, innovative technologies and science goals for missions beginning in 2003, as well as for achieving the overall goals of the long-range Mars Surveyor Program. Recommendations were presented to NASA Administrator Daniel Goldin on Sept. 24 and, subsequently, approved for implementation.

New requirements for the 2001 Mars missions, brought about earlier in the year by Congressional markups of the fiscal year 1999 NASA budget, prompted the redesign effort. The Mars 2001 project went to work to hammer out a compromise of scientific instruments on the proposed orbiter, lander and rover to meet new budget and spacecraft mass requirements.

Under the current mission architecture, the Mars 2001 lander will be equipped with a robotic arm and descent camera to explore materials buried below the Martian surface. The spacecraft will also carry a panoramic camera and mini-

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New images show Martian lava flow plates, active dunes

By DIANE AINSWORTH

The latest images from JPL's Mars Global Surveyor spacecraft show giant plates of solidified volcanic lava and evidence for active dunes near the planet's north pole, with sands that have hopped or rolled across the surface in recent months.

The images were presented Oct. 29 by members of the mission science team at the annual meeting of the Geological Society of America in Toronto, Canada.

The close-up views of Mars' Elysium Basin reveal the first evidence of huge plates of solidified lava, rather than lakebed sediments, that appear to have been broken up and transported across the Martian surface millions of years ago as they floated on top of

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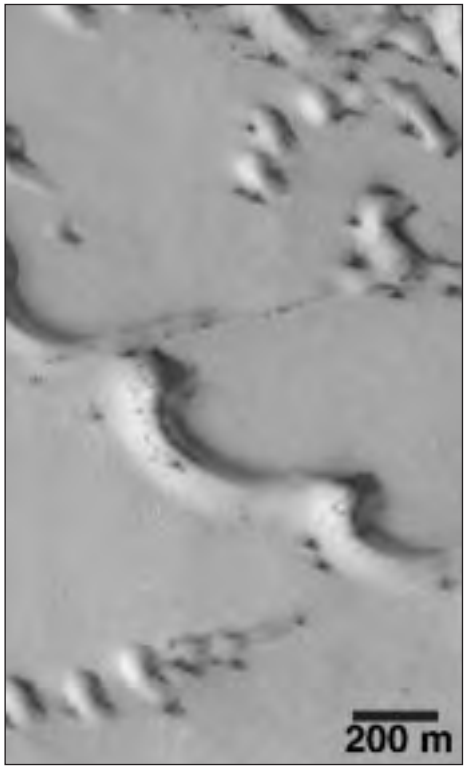

Close-up views of Mars' Elysium Basin reveal the first evidence of huge plates of solidified lava, rather than lakebed sediments, that appear to have been broken up and transported across the Martian surface millions of years ago as they floated on top of molten lava. This implies that the area in the planet's northern lowlands was once the site of giant ponds of lava flows hundreds of kilometers across.

Special Events Calendar

Ongoing

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

Codependents Anonymous—Meeting at noon every Wednesday. 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, November 13

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

"Italy"—This travel film will be presented at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $9 and $7. Call (626) 395-4652.

Fri., Nov. 13-Sun., Nov. 15

"School For Husbands"—This Theater Arts at Caltech production featuring Caltech students, faculty and staff will be presented at the campus' Dabney Lounge Friday and Saturday at 8 p.m.; Sunday at 3 p.m. Tickets are $15.

Saturday, November 14

Caltech-Occidental Concert Band—The program for this free, 8 p.m. performance in Caltech's Beckman Auditorium performance is to be announced. For information, call (626) 395-4652.

Monday, November 16

ERC Holiday Party—Tickets go on sale today for this annual event that includes entertainment, gifts and visits from Santa and Mrs. Claus, to be held Saturday, Dec. 5 at Lanterman Auditorium in La Cañada. Cost: $3 per person.

Musica Angelica—A varied program of Medieval and Renaissance vocal and instrumental music will be performed free of charge at 7:30 p.m. in Caltech's Dabney Lounge. For information, call (626) 395-4652.

Tuesday, November 17

"Depression: Medications and Prevention"—Dr. Todd Hutton of Las Encinas Hospital, assistant clinical professor of psychiatry at USC and a representative for the Southern California Psychiatric Society's East Los Angeles region, will discuss the different types of depression, how to prevent it, and treatment options available, with a focus on medications. At noon in the Building 167 conference room. Sponsored by the Director's Advisory Council for Women.

Investment Workshops—TIAA-CREF representatives will present "Basics of Retirement" at 11 a.m. and "Retirement Income Options" at 2 p.m. Both will be held in Building 180-101. Seating will be limited.

Wednesday, November 18

Investment Advice—Fidelity Investments representative Jasson Rasmussen will be available for individual counseling. For an appointment, call Patrice Houlemard at ext. 4-2549

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

JPL Hiking Club—Meeting at noon in Building 303-209.

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

"Unnatural Selection: The Future of Proteins"—Dr. Frances Arnold, professor of chemical engineering at Caltech, will deliver this free lecture at 8 p.m. in Beckman Auditorium. For information, call (626) 395-4652.

Thursday, November 19

Caltech Architectural Tour—The Caltech Women's Club presents this free service, which is open to the public. The tour begins at 11 a.m. and lasts about 1 1/2 hours. Meet at the Athenaeum front hall, 551 S. Hill, Pasadena. For information and reservations, call Susan Lee at (626) 395-6327.

"Gene Therapy: The Promise and the Progress"—The fifth annual Caltech Biology Forum will feature a panel moderated by Robert Lee Hotz of the Los Angeles Times. At 7:30 p.m. in Caltech's Beckman Auditorium. Admission is free, but tickets are required. For information, call (626) 395-4652.

JPL Atari Club—Meeting at noon in Building 238-544.

JPL Bicycle Club—Meeting at 5 p.m. in the Building 167 conference room.

Social Security—Representative Ann Villeroy will be available in the Building 167 cafeteria, from 1:30 p.m. to 3:30p.m. There will be no Social Security consultation on Lab in December.

Von Kármán Lecture Series—Mars Exploration Director Norm Haynes will discuss "Going Back to Mars—The Mars '98 Missions Revisit the Red Planet" at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, November 20

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

Von Kármán Lecture Series—Mars Exploration Director Norm Haynes will discuss "Going Back to Mars—The Mars '98 Missions Revisit the Red Planet" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Saturday, November 21

Ancient Chinese Dance—The Lily Cai Chinese Dance Company, which blends ancient and modern dance techniques and styles, will perform at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $25, $21 and $17. Call (626) 395-4652.

Sunday, November 22

Caltech-Occidental Symphony Orchestra—The program for this free concert at 3:30 p.m. in Ramo Auditorium will include pieces by Tchaikovsky and Johann and Richard Strauss. For information, call (626) 395-4652.

Chamber Music—The Arditti String Quartet with Ursula Oppens on piano will perform at 3:30 p.m. in Caltech's Beckman Auditorium. Tickets are $25, $21, $17 and $13. For information, call (626) 395-4652.

Wednesday, November 25

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

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

Stardust ships to Kennedy

At the company's facilities near Denver, Lockheed Martin Astronautics technicians prepare JPL's Stardust spacecraft for its shipment to Kennedy Space Center on Nov. 11. Stardust is scheduled to be launched on Feb. 6, 1999. It will use aerogel to capture comet particles and interstellar dust and return them to Earth for detailed analysis.

LOCKHEED MARTIN ASTRONAUTICS PHOTO

DS1 ion engine turns off; team investigates

After operating as expected for approximately 4½ minutes after startup Tuesday, Nov. 10, Deep Space 1's xenon ion engine turned off for reasons that are still under investigation.

After the startup at 11:30 a.m. PST and subsequent shutdown Tuesday, the operations team sent a number of commands to try to restart the ion propulsion system. Each time, the system went through its normal startup routine, but was unable to achieve thrusting.

Valuable diagnostic data were collected, and the team observed that the rest of the spacecraft behaved exactly as planned during the brief interval of thrusting and during subsequent attempts to restart the thruster.

Engine turn-off behavior has been observed in the past in solar electric propulsion systems both in Earth-based test and on Earth-orbiting spacecraft. Deep Space 1 is designed to test and validate the use of such propulsion in deep space for the first time, so the ongoing diagnosis of Tuesday's behavior is in keeping with the mission's goals.

Tuesday's planned activities had included stepping up the thruster through different throttle levels over more than 16 hours, taking the engine to its peak thrusting level. This would allow the team to assess the overall performance of the spacecraft and the ion propulsion system at increasingly powerful levels and to measure the power needed from the spacecraft's pair of solar arrays to achieve each thrust level.

Concurrently, ground-based radio navigation was to take Doppler data to measure the amount of thrust imparted by the ion engine system at each throttle level. These activities will be conducted once the resolution of Tuesday's premature shutdown is found.

On Wednesday, Nov. 11, other technology validation activities will continue while a portion of the team analyzes Tuesday's data and formulates a plan for subsequent ion propulsion system operations. Much of the key testing will be completed within the first eight weeks after launch; the technologies on which the spacecraft depends for its basic operation—such as its solar arrays and the transponder or radio transmitter/receiver—were proven to work within the first hours after launch.

To prepare for Tuesday's planned activities, the spacecraft successfully executed a large turn Friday, Oct. 30, to point the ion engine toward the Sun. Sunlight heated portions of the xenon feed system and the ion thruster core (which reached about 110 C [230 F]), and baked off some contaminants that held the potential to interfere with the engine's operation. While the spacecraft remained in that orientation, a small amount of xenon from the ion propulsion system was allowed to flow through the system to assure there were no blockages. The spacecraft returned to its previous orientation the next day.

On Thursday, Nov. 5, a heater inside the thruster's cathode was turned on and the xenon system was pressurized. As a final test before thrusting, xenon was ionized inside the thruster on Monday, Nov. 9, but was not accelerated. Engineering data show that the test went as planned. The suite of diagnostic sensors onboard to measure the effects of the ion propulsion system on the local space environment worked as planned.

Once Tuesday's behavior is diagnosed and resolved, the engine is scheduled to be turned on intermittently for the remainder of the mission, which ends in late September 1999. ❑

Dr. Richard Doyle

Doyle new Division 39 manager

Dr. Richard Doyle has been appointed manager of the Information Technologies and Software Systems Division 39.

Doyle, who replaces the retired Chris Carl, was previously the technical section manager of the Information and Computing Technologies Research Section and assistant program manager for JPL's Autonomy Technology Program. He served as the technical group supervisor of the Artificial Intelligence Group at JPL from 1989-95. In 1993-94, he spent six months as a Visiting Scientist in the mission operations directorate at the Johnson Space Center in Houston.

Doyle received his doctorate in computer science at the Massachusetts Institute of Technology's Artificial Intelligence Laboratory in 1988, his master's degree in electrical engineering and computer science from MIT in 1984, and a bachelor's degree in mathematics, summa cum laude, from Boston University in 1980.

He originally worked at JPL from July 1980 to December 1991 as an analyst and programmer in the spacecraft Navigation Systems Section. While earning advanced degrees, he returned to JPL during summers to work in the Artificial Intelligence Group. ❑

El Niño studies on display

QuickScat Project Manager Jim Graf, left, and JPL Director Dr. Edward Stone check out one of three new interactive displays in the von Kármán visitor center that highlight the Labor-atory's Earth science missions studying El Niño. The unit Graf and Stone are viewing shows an interactive map that describes El Niño's effects worldwide; another shows three videos describing how TOPEX/ Poseidon and the NASA Scatterometer (NSCAT) function; the third display explains satellite scatterometry, where the visitor sees how the display's surface affects the scattered microwave energy. A similar set of displays is soon to be loaned to the California Science Center in Los Angeles.

PHOTO BY TOM WYNNE / JPL PHOTO LAB

News Briefs

Stephen Prusha

Stephen Prusha has been named the manager of the Cross-Enterprise Techno1ogy Development Program implementation office in the Technology and Applications Programs Directorate.

The program focuses on development of fundamental technologies of relevance to multiple NASA enterprises. This is a new function that JPL will perform agency-wide for NASA's Advanced Technology and Mission Studies Division, Office of Space Science. It resulted from a 2½-year effort to define a new planning and implementation architecture and process for the agency's crosscutting technology development activities.

A JPL employee since 1984, Prusha has developed and managed space flight technology experiments on a variety of flight platforms. From 1994–96, he managed the Technology Flight Experiments Office in TAP's Space Mission Technology Develop-ment Program. Most recently, he worked on technology development analysis and planning for TAP's NASA programs. ❑

Nominations for JPL's Award for Excellence, which recognizes significant contributions made by JPL individuals and teams, will be accepted starting Nov. 30.

This year's call for nominations will cover contributions made from Jan. 1 through Nov. 30, 1998. Submissions will be divided into two segments; nominations from JPL personnel in the technical organizations (3X, 4X, 5X, 7X, 8X, and 9X) will be accepted Nov. 30 through Dec. 18 and nominations from JPL personnel in business operations organizations (1X, 19X, 2X, and 6X) will be accepted Jan. 4 through Jan. 22, 1999.

The Award for Excellence, an employee-owned program, is a cash award. Nominations are submitted to the Reward & Recognition administrator in one of four categories: technical excellence, business operations excellence, exceptional leadership and exceptional quality.

The award ceremony will take place in May 1999. More information and nominations forms are available on the Reward & Recognition home page at http://eis/sec614/reward/ excel.htm . For more information, call the Reward & Recognition Program Office at ext. 4-3825. ❑

The next JPL/Red Cross blood drive will be held in von Kármán Auditorium on Nov. 17 from 10 a.m. to 3:15 p.m. and Nov. 18 from 7 a.m. to 12:15 p.m.

Sign-up sheets will be available prior to the blood drive at the ERC, Occupational Health Services (Building 263) and Occupational Health Services' home page at http://eis/medical .

If you have not signed up ahead of time, or wish to change your appointment, call **Ginger Morris** at the Pasadena Red Cross at (626) 799-0841, ext. 630.

The Red Cross collected 143 pints of blood in the August blood drive on Lab, up from the May collection of 130 pints of blood. ❑

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molten lava. This implies that the area in the planet's northern lowlands was once the site of giant ponds of lava flows hundreds of kilometers (hundreds of miles) across, according to Dr. Alfred McEwen of the University of Arizona, a member of the Global Surveyor science team.

"NASA Viking mission images of the same region showed a surface of dark plates with intervening bright surfaces that did not quite make sense," McEwen said. "Some scientists thought they could somehow be volcanic, while others thought they might be related to differences in the way that wind had eroded a dried lakebed. With these new images in hand, it is now quite easy to understand the older, lower-resolution Viking images."

McEwen and his co-authors believe that lava erupted near this area and the upper surface became crusted, then cooled and cracked. Some cracks widened and portions of the surface crust became rafts of solid rock that moved in the direction that the molten lava was flowing underneath. Other Viking and Global Surveyor images have shown similar plate-like lava textures in nearby Marte Vallis, implying that some of the lava from Elysium Basin spilled into this valley and flowed thousands of kilometers to the northeast.

"The sparse occurrence of impact craters on these plate-like lava surfaces suggests that the eruptions happened relatively recently in Mars' history," McEwen explained. "These eruptions could be much younger than the youngest of the large Martian volcanoes like Ascraeus Mons and Olympus Mons in the Tharsis region, but they would still have occurred many, many millions of years ago. So these images should not be treated as evidence that Mars is volcanically active today."

"Viking mission images of the same region showed a surface of dark plates with intervening bright surfaces that did not quite make sense . . . with these new images in hand, it is now quite easy to understand the older, lower-resolution Viking images.

—Dr. Alfred McEwen
Global Surveyor science team

Additional close-up views of Martian sand dunes in the north polar region are showing scientists detailed patterns of ongoing movement of sand across the planet for the first time. Drs. Kenneth Edgett, staff scientist at Malin Space Science Systems, San Diego, and Michael Malin, Mars Global Surveyor camera principal investigator, report the presence of many fresh dunes that have been active as recently as July or August.

"The north polar cap of Mars is surrounded by a zone of dark dunes," Edgett said. "These were first seen by Mariner 9 as a rippled texture, and by the Viking orbiters as definitive sand dunes. Between late July and mid-September 1998, Mars Global Surveyor's closest passage over the planet took us right over the north polar dune fields four times a day. This provided us with many opportunities to take high-resolution pictures of these mounds."

Martian dunes typically contain granular fragments of rocks and minerals ranging from 0.002 to 0.08 inches (0.06 to 2 millimeters) in size, which puts them in the geologic classification of "sand." The sand appears to have been transported by wind in one of two ways: either by hopping over the ground, a geological process called "saltation," or by rolling along the ground, a process known as "traction."

Some of the dunes appear to be coated with thin, bright frost that was left over from the northern winter season that ended in mid-July, according to Edgett and Malin. This frost is covered with dark streaks emanating from small dark spots that dot the bases of many of the dunes. "The simplest explanation is that gusts of wind have blown the dark sand out across the frost-covered dunes, creating a streak of deposited sand over the frost," Malin said. "Some spots seen in the close-ups have multiple streaks, each one indicating that a different wind gust has moved in a different direction."

The images are available on the Internet at http://photojournal.jpl.nasa. gov and http://mars.jpl.nasa.gov . ❑

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thermal emission spectrometer, which was part of the originally proposed payload, and a Moessbauer spectrometer designed to study Martian materials.

Three human exploration experiments developed under NASA's Human Exploration and Development of Space (HEDS) Enterprise are also included in the lander payload: the Mars Environmental Compatibility Assessment Project experiment, an instrument to investigate potentially hazardous atmospheric conditions that could affect human exploration; a Mars propellant production experiment to explore the feasibility of using atmospheric carbon dioxide to manufacture fuel for return vehicles; and a Mars radiation experiment to detect hazardous amounts of the substance in the Martian atmosphere.

In addition, a simpler, lighter-weight rover modeled after Mars Pathfinder's Sojourner rover was chosen to replace the original, more sophisticated and costly roving vehicle. The new rover, nicknamed Marie Curie, will carry an alpha proton X-ray spectrometer similar to the spectrometer carried on the Sojourner rover to study the chemical composition of rocks and surface soils and a second Mars radiation experiment to detect harmful levels of radiation on the Martian surface.

NASA will begin the series of sample-return mission in 2003, with launch of a lander and a rover that will spend several months searching for and collecting rock and soil samples, said Dr. Daniel McCleese, chief scientist and manager of the Office of Strategy and Science Programs for JPL's Mars Exploration Directorate. The roving vehicle will return the sample to a new, low-cost, low-mass Mars ascent vehicle.

Conceived by Brian Wilcox of the JPL Mars Exploration Technology Development Division, the Mars ascent vehicle is the centerpiece of the program's overarching, short-term goal to explore the Martian subsurface robotically. The vehicle is a simple rocket with with a three-stage, spin-stabilized ascent system, solid-rocket motors, minimal onboard guidance and virtually no moving parts. The launcher, which weighs about 100 kilograms (220 pounds) or less than 30 percent of previous Mars ascent vehicle designs, will place soil and rock sample canisters into a low-Mars orbit, where they will await pick-up by orbiters arriving at Mars beginning in 2005.

NASA will also provide a Boeing Delta 3-class launch vehicle and an Earth entry capsule comprised of a crescent-shaped heat shield and crushable foam material that will shield the Martian soil and rock samples when they plummet to the floor of a desert in Utah in spring 2008.

In partnership with the French space agency, Centre National d'Etudes Spatiales (CNES), NASA will also work toward developing a small "microspacecraft" weighing less than 200 kilograms (440 pounds) for delivery to Mars during this launch opportunity, Elachi said. CNES has agreed in principle to providing a piggyback ride to Mars on its Ariane 5 launch vehicle, which is capable of placing the Martian microspacecraft on a geosynchronous transfer orbit above Earth. If flown, the miniature spacecraft would use its own propulsion and gravity assists from the Moon and Earth to gain enough momentum to reach Mars.

Another collaborative arrangement with the Italian space agency, Agenzia Spatiale Italiana, will add a drill and other robotic elements to the 2003 Martian lander and those following in its footsteps. Additional robotic elements will include radio relay equipment to support the European Space Agency's proposed "Mars Express" orbiter, which will be used for data transmission from landers arriving at Mars in future years. The European Space Agency also plans to supply a sounding radar for the mission.

In 2005, a single Ariane 5 launch vehicle carrying a duplicate of the 2003 lander, rover, Mars ascent vehicle and French orbiter will be launched to Mars. The lander, with its companion rover and ascent vehicle, will land at a different location, collect a second sample of Martian rocks and soils and loft it into low-Mars orbit.

The orbiter will be inserted into a highly elliptical Mars orbit, aerobrake to low-Mars

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JPLers join 3-day walk for breast cancer research

Four JPL employees joined more than 2,000 people who walked three days from Santa Barbara to Malibu last month to raise funds for the fight against breast cancer.

Shari Asplund of Section 870, Cheryl Baker of Section 311, Nancy Feagans of Section 391 and Nancy Neilan of Section 621 did their part for Breast Cancer Awareness Month by walking almost 100 kilometers (60 miles) in the first-of-its-kind event Oct. 23-25, sponsored by Avon Products Inc.

Asplund said the walk's original fundraising goal was $2.5 million, "but with the enthusiasm of the walkers and the generosity of the contributors, more than $5 million in net proceeds was raised. These funds will bring education, screening and care directly to thousands of medically underserved women throughout the United States."

Organizers said the event will benefit at least 30 charities.

Each walker was required to raise a minimum of $1,700. The JPL walkers had no trouble gathering the funds, noting that individual contributions ranged from $5 to $500.

PHOTO COURTESY OF NANCY NEILAN

PHOTO COURTESY OF SHARI ASPLUND

After departing Santa Barbara, the walkers were aided every few miles by "pit stops" for food, drink and bathroom breaks. In addition, almost 500 volunteer crew members organized the event and helped along the route with traffic and other logistics.

In all, the line of 2,382 walkers stretched as far as three miles.

Among the support crew were Asplund's husband, Nils, who helped transport injured walkers, and JPL employee Dennis Byrnes of Section 312, a member of the traffic crew, whose wife Rosalee walked the route.

Participants bedded down at darkness in giant campsites that included hot showers, massage therapy and medical facilities.

All along the route, Asplund said, onlookers lined up to wave, applaud, congratulate and thank the walkers. "The encouragement meant a lot, especially as the miles and blisters added up," she said.

Each year, about one in nine women in the United States is diagnosed with breast cancer, and Asplund said research shows that 1 million American women have the disease without knowing it.

Besides walking for a worthy cause that will aid education programs for the leading cause of death in women between the ages of 40 and 55, the crusade became a personal statement for many, Neilan noted. Numerous breast cancer survivors and survivors' family members joined in, including two of the walkers from JPL who said breast cancer has affected their families.

Avon plans similar events in 1999 in Atlanta, Chicago, Los Angeles and New York. ❑

Lab's ISO pre-assessment audit next week

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

Over the span of a week beginning Monday, Nov. 16, three auditors from the NASA-selected third-party registrar Det Norske Veritas (DNV) will visit the Lab to conduct an audit to assess the Lab's readiness for ISO 9001 certification. This audit is aimed at giving the Lab a chance to improve systems and procedures in order to be ready for certification by March 29, 1999.

Employee notebooks have been distributed Lab-wide and should be kept handy to serve as a guide as work is done and to aid in answering questions during employee interviews with the DNV auditors. Employees need to be able to locate the documents and procedures that govern their work. They should know the JPL Quality Policy that is posted for easy reference throughout the Lab and which states: "JPL will deliver products that meet or exceed customer expectations, while reducing cycle time and cost."

The DNV audit is conducted in part to determine the effectiveness

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orbit, rendezvous and dock with the 2003 orbiting sample container and then rendezvous and dock with the 2005 sample. After 11 months in orbit, the spacecraft will fire its rocket engines to inject itself and the two Earth entry capsules on an Earth-return trajectory. The orbiter will target the two entry capsules carrying Martian samples onto impact trajectories, deploy them and then deflect its own trajectory so that it does not crash into Earth.

Two options are currently on the table with NASA and the French space agency for inserting the 2005 orbiter into Mars orbit. The first option would be to use propulsive maneuvers to lower and circularize the spacecraft's orbit. The second option would be to use a technique called "aerocapture," which is similar to aerobraking but would slow and directly capture the spacecraft in orbit in one step, rather than gradually slowing and lowering the spacecraft through a series of "walk-in" phases used in the aerobraking strategy. With aerocapture, the orbiter would be able to reach its final, circular mapping orbit within about one week instead of approximately nine months.

If international participation and the budgetary outlook remain stable, a total of six samples from six separate locations on the surface of Mars will have been returned by 2013, Haynes said.

To realize this scenario, another Delta 3-class launch vehicle would be used in 2007, carrying a lander, rover and Mars ascent vehicle. The samples collected would be cached on orbit to await pick-up by the 2009 orbiter. In 2009, two launches using Delta 3-class launch vehicles would follow suit. The orbiter would be the first vehicle to be launched, followed by a second lander, rover and Mars ascent vehicle. A French orbiter would collect the Mars samples from both the 2007 and 2009 landers and deploy them on return trajectories to Earth. If successful, that mission scenario would be repeated in 2011 and 2013. ❑

Passings

Merilyn Walker, 70, a retired administrator in Section 514, died of cancer Oct. 21 at her home in Glendale.

Walker joined JPL in 1979 and retired in 1991. She is survived by her sons, Kenyon and Wyatt Winsor.

Services were held at Grand View Memorial Cemetery in Burbank. ❑

Change in *Universe* publishing schedule prompts new deadlines

Universe readers are advised to note changes in publication dates and deadlines for the next several issues of the newspaper.

Due to the Thanksgiving holidays, the next issue of *Universe* will be distributed Wednesday, Nov. 25. The ad deadline for that issue will remain unchanged at Monday, Nov. 16.

To facilitate coverage of the scheduled launch of JPL's Mars Climate Orbiter on Dec. 10, publication of the newspaper will be delayed one week, to Dec. 18. The advertising deadline for the Dec. 18 issue will be extended to Wednesday, Dec. 2.

And because of a spate of JPL holidays coming at the end of December, a second *Universe* will not be published that month. Following the Dec. 18 issue, the next publication date will be Friday, Jan. 8.

The ad deadline for the Jan. 8 issue will be Monday, Dec. 21.

As always, ads are due at 2 p.m., either by e-mail to universe@ jpl.nasa.gov or on ad cards, available at the ERC and *Universe* office, Building 186-118. ❑

Upcoming ad deadlines

Issue date	*Deadline*
Nov. 25	Nov. 16
Dec. 18	Dec. 2
Jan. 8	Dec. 21

A few words about *Universe* advertising

• *Universe* is not responsible for the quality of merchandise sold or claims made through its ads.

• Ads are for the exclusive use of JPL and Caltech employees, contractors and retirees, and their immediate families.

• Please provide your full name, as well as your home phone number and work extension. If applicable, indicate Caltech employee, retiree, etc.

• Only home phone numbers and e-mail addresses are to be used for items for sale or rent and in the Wanted and Free sections; work extensions may be be published for lost-and-found items or carpool/vanpool information only.

• Ads are accepted only on *Universe* ad cards or via e-mail . Cards are available from our office in Building 186-118 (adjacent to von Kármán Auditorium) or at the ERC. Or, if you prefer, we will mail ad cards to any JPL office or facility. Send e-mail ads to universe@ jpl.nasa.gov.

• No faxes, handwritten ads or photocopies of ad cards are accepted, with the exception of submissions for the "Letters" section. Also, ads are not taken over the telephone.

• There are still many old ad cards floating around with the wrong deadline on them. Unless otherwise noted (as in the article above, for example), the actual deadline is the Monday following publication, at 2 p.m., for the next issue. For example, the ad deadline for the Nov. 25 *Universe* is Monday, Nov. 16.

• We ask that readers not submit ads for "work sought," such as employment for child care, housekeeping, etc.

• Also not acceptable are ads for private businesses, franchises, dealerships, distributorships, etc., and products sold through those means.

• Ads for weapons, ammunition, etc. are not accepted.

• Real estate ads (for rent and sale) must be signed on the back of ad cards (non-discrimination clause). E-mail ads will be returned to advertisers with this clause included for an "electronic" signature.

• Those placing housing and vehicle ads should be listed as an owner on the ownership documents.

• Prices listed on rental ads are shown per month unless otherwise specified.

• Telephone numbers on ads are in the 818 area code unless otherwise specified.

Thank you very much for your compliance and understanding. ❑

ISO

Continued from page 6

of the Laboratory's product delivery system in meeting those quality objectives that can be found listed on the Quality Policy posters.

Basic audit etiquette suggests giving clear, factual answers to the auditor. Be professional, courteous and direct the auditor to your supervisor if you do not know the answer to any question. Be confident. No one knows your job better than you do. Don't offer additional information.

The ISO 9001 web site at http://iso is a valuable resource for preparing for the pre-registration audit. For example, take the quiz in the ISO training section, which contains typical questions an auditor might ask. Surf the site for answers to questions on ISO 9001, the JPL product delivery system, and other helpful information in preparation for the audit.

As part of he NASA strategic plan, Administrator Daniel Goldin has asked that all NASA centers be ISO-certified by September 1999. This pre-assessment audit is an important step along the road to certification. ❑

FOR SALE

AFGHANS, hand-crocheted, men's and women's, many colors, great gifts, $25/ea. 249-2596.

BARSTOOLS (2), like new, hardly used, moving-out sale, $290/pair/obo. 626/446-6456.

BEDROOM SET, oak, large dresser, dressing table with mirror, headboard, end table, TV stand, vg cond., $249/obo for all. 909/592-2279.

BIKE, Fuji 12-speed, medium size, good cond., aluminum wheels, Suntour shifters, $90 firm. 626/794-0886, Ted.

COFFEE TABLE, 24" x 60", walnut-colored wood, center cabinet, good cond., $50/obo. 626/307-0920.

COMPUTER, Intel 286 8/12MHZ PC w/80MB HD, 2MB RAM, 15" color-enhanced VGA, 5 1/4" FD, computer stand, 1200 baud Hayes smart modem, keyboard, monitor, CPU cover; all in exc. cond., $200/obo. 626/446-6456.

COMPUTER, Power Book 280C with 320HD, 12 MB RAM, 28.8 modem with docking station with 1 GB HD, a/c adapter, SCSI connection and leather case, etc., $600/obo. 832-5556.

COMPUTER, Power Computing 120MHz 601 (like PowerMac 7100), 48MB RAM, 500MB HD, Mac OS 7.5.5, incl. bundled software, $500/obo. 626/568-9890, Alan, after 6 p.m.

COMPUTER ACCESSORY, for Macintosh, Microsoft Sidewinder 3D Pro joystick, good condition, hardly used, $50. 626/795-6530, evenings.

COMPUTER SYSTEM with software, 486 pc, 66 MHz, fax modem; 12-in. color monitor; HP Deskjet 520 printer; works well; $250. 790-4984.

COMPUTER TABLE SET; white Formica assembled table with slide-out keyboard shelf, hardy metal construction, 3 joined sections produce a modern-style table 84" W x 24" D x 29" H; matching printer table on 4 wheels, 22" W x 16" D x 18" H, has paper tray protruding below front; $125 total. 213/654-0387.

COMPUTER UPGRADE CARD, AdvanSys UltraSCSI-3 PCI accelerator, offers maximum transfer speed of 20MB/sec., external and internal connectors, PowerMac and PC compatible, $75. 626/795-6530, evenings.

DESK, 33" x 59", $35/obo; OFFICE CHAIR, $25/obo; TYPEWRITER, IBM electric, $25/obo. 249-2596.

DESK, for office, 30" x 60", 2-drawer on left, 3-drawer on rt., w/cloth executive chair, good cond., $125/obo. 626/307-0920.

DINING ROOM TABLE: exquisite 6' x 4', beveled leaded glass table, glass "V" shaped gold & brass pedestals, with 4 high-backed black chrome & brocade chairs, perfect condition, all for $399/obo. 249-4561.

DRYER, gas, Kenmore, vg cond., $125/obo. 626/798-1546.

EXERCISE EQUIPMENT, step, with video, $10. 248-2807.

EXERCISE MACHINE, NordicTrack Achiever w/Fitwatch, exc. cond., $350. 805/255-5645.

FREEZER, Sears upright, 18 cu. ft., $75, Valencia. 805/287-4446.

FURNITURE: merging two households, all items in good condition; dining room table and chairs, roll top desk, computer desk, grandfather clock, bar and stools, microwave, 4 cu. ft. freezer, television console, upright vacuum cleaner, more. 791-1266.

GENERATOR, Redi-Line electric, 1600W, for boat, van, RV, etc., $400/obo. 249-2596.

GLASSES, beautiful Lenox casual, 10 juice, 13 water, mint condition, $2.50/ea.; JEANS, ladies', Lee, 2 prs. size 8L, 1 pr Cross Color with matching belt, excellent cond., $10; PANTS, men's corduroy, 1 DKNY and 1 ixiz, 36 x 30, excellent cond., $7/ea. 626/445-4690.

HOCKEY TICKETS, individual games for L.A. Kings; Colonnade on blue line; 2 aisle seats with Forum parking, $60 for all ($87 face value). 626/331-9998.

LOVE SEATS (2), off-white w/touch of lt. blue and 2 pillows to match, $150/ea. or optional; DINING ROOM SET, traditional, wood, with 6 cream-color chairs, seats up to 8, $300 firm. 626/296-3159.

MONITOR, color SGVA, 13" NEC, .28 dpi, pwr. cord, $50/obo. 248-7331.

MOVIES, DVD, unopened in cases, $18; sell or trade for used titles. 626/795-4928, x206.

ORGAN, Technics SX-EX50M, U & L manual each 44 keys, pedal 13 keys, 1-touch play, play sequencer, voice setting computer tone selector, techni-chord, tempo set, Autoplay chord, too many features to list, like new, $1,850/obo. 626/446-6456.

PERSIAN RUGS, assorted, different sizes and kinds, $100 to $1,690 each. 626/446-6456.

PING PONG table, exc. cond., 1½ yrs. old, $85. 562/695-5197.

PRINTER, Epson LQ200 dot matrix, exc. cond., extra ribbon and cover, $50/obo. 248-7331.

PRINTERS, Epson FX-80 dot matrix, like new, $49/obo; Epson

Continued on page 8

LQ-510 dot matrix like new, $99/obo. 626/446-6456.
RECORDING STUDIO, Foster 8-track, low hours, 12-channel, 8-bus console, power amp & effects included, $1,250. 626/791-2700.
SKIS, Autier w/Marker II titanium bindings, 194cm, exc. cond., $75; SKI BOOTS, Lange 55, M sz. 12, exc. cond., $75. 626/793-3561.
SPORTS COINS, '88 Topps, 36 unopened baseball packs, Ryan, Seaver, Bench, McGwire, Bonds; $20/box; '87 unopened packs, McGwire rookie possible, grocery packs, $10 for $45 cards. 626/914-6083.
SPORTS EQUIPMENT: rower, like new, $50/obo; ski simulator, like new, $50/obo. 626/446-6456.
STEREO EQUIPMENT: Yamaha receiver, 100w/ch, built-in 5-band equalizer, remote, fantastic sound, exc. cond, $139; Onkyo Dolby prologic surround sound decoder with center/rear channel amps, remote, attach to any receiver to upgrade to Dolby prologic for home theater, $129; Yamaha pre-amp, Dolby surround sound decoder, many a/v inputs, univ. remote, exc. cond., $99. 909/592-2279.
TOOLS, precision hand, gauges, new & used; micrometers, etc.; $10/ea./obo. 249-2596.
VIDEO GAME, Super-Nintendo set: System, 2 controllers, 7 games, exc. cond, $120/obo. 909/592-2279.
VIDEO GAMES, Nintendo 64; Turok Dinosaur, Pilot Wings, Star Fox, Gex Enter the Gecko, Super Mario, Star Wars; $30/ea. 626/355-5457.
WEB TV Plus, w/wireless keyboard, 1 KB hard drive and smart card port, hardly used, exc. cond., great Christmas gift; $250 + tax new, sell $150. 805/724-2408.

VEHICLES / ACCESSORIES

'91 ACURA Legend LS, white w/blue leather interior, mint cond., loaded, new tires, 74k mi., $12,800. 626/358-8648.
'85 BUICK Regal Limited, vg cond., clean in & out, $2,700/obo. 714/523-8479.
'92 CADILLAC Sedan Deville, burgundy w/tan leather interior, tinted windows, all power, am/fm/cass., new tires, trans., well maintained throughout ownership; runs & looks great, $9,500/obo. 626/794-4352.
'95 CHEVROLET Corvette coupe, red, chrome rims, auto trans., am/fm/CD/ cass., tan leather, 38K mi., ext. warranty, immac., $23,900. 790-6738.
'90 CHEVROLET Lumina APV 7-passenger mini-van, loaded, only 54,600 miles, new brakes/ tires/battery, auto trans., ps/w,dl, a/c, cruise control, cassette, tilt, anti-theft device, exc. condition, $7,099. 909/594-3935.
'93 CHRYSLER Concorde, exc. cond., loaded, alarm sys., $11,500. 949/766-0223.
'92 CHRYSLER LeBaron, 4 door, auto trans., tilt wheel, pwr, doors, pwr. windows, cruise control, deluxe interior, 63,300 mi. 957-7554, Bob.
'78 DATSUN 280Z, exc. cond., interior restored, new injectors & Seabring exhaust, 64,000 orig. mi., $2,700/obo. 626/791-2700.
'72 DATSUN 240Z, rare model, auto trans., vintage top 1 owner, original paint, vg cond., interior restored, dual Webber carbs, Dynomak exhaust, rebuilt from ground up, a true classic; book $9,500, sell $4,500/obo. 626/791-2700.
'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, new battery, very clean, well maintained, 138K mi., orig owner, $2,600. 626/332-2682.
'97 FORD Mustang, V6, white, auto, pw/door locks/seat, a/c, 75,000 mi. mechanical breakdown insurance, exc. cond., 35,700 mi. 626/335-9426.
'84 FORD Bronco II, 4x4, ps, pb, a/c, new brakes & hd radiator, 5-spd. stick, am/fm/cass., gd. cond., $3,500. 714/529-1718.
'65 FORD Thunderbird daily driver, runs well, new front end, recently tuned up, some work needed, very restorable, $1,800. 626/446-8733.
'88 GMC 1-ton extended cab, loaded, pwr. doors, pwr. windows, tilt wheel, camper pkg., towing pkg., shell, carpet kit, trans. & eng. oil coolers, 2 new & 2 nearly new tires, only 62,500 miles, 7.4-liter engine, $10,500. 957-7554, Bob.
'98 HONDA Civic DX hatchback, red, brand new, 2,500 mi.; air, alarm, dual airbags; 6-yr. ext. warranty, take over payments, $15,000. 626/304-0877.
'92 HONDA Accord shop manual and bra, $55/both. 626/798-1607.
'85 HONDA Shadow 700cc, V-Twin, shaft drive, automatic valve adjustment, 6 speed (w/overdrive), water cooled; excellent tires, low maintenance, reliable, good condition, red and black; includes street fairing and Tourmaster saddlebags; $1,800. 626/794-0886, Ted.
'88 ISUZU Trooper II, 4WD, A/C, stereo/cass, one owner, recent refurb. on brakes, tires, engine, $5,000. 249-6910.
'97 MAZDA Protégé, dark blue w/tan interior, 43,000 mi., dealer-maintained, good cond., $10,500. 626/294-0426.
'96 MAZDA Protégé, 4-dr., burgundy, 5-spd., dual airbags, a/c, 25K mi., orig. owner, exc. cond., $9,500. 626/564-8986.
'89 MERCEDES 300SE, 93K, taupe (bronze), excellent condition, stock plus 6-CD changer, $15,995. 891-6836, Steve.
'93 MERCURY Cougar, air, ps, pb, leather/walnut interior, exc. cond., $5,400. 249-5337.
MOPED, Murray (Sears), 50cc, runs well, $125. 790-4984.
'80 NISSAN 4X pickup truck, new engine & tires, $1,800. 213/255-7932.
SAILBOAT, 13' Alcourt catamaran w/trailer, reduced, must sell, $400. 626/294-0426.
SAILBOAT, 13' Zuma, as new, cartoppable, $1,400. 626/294-0426.
'98 TAHOE trailer by Thor, 24', queen-sz. bed, sofabed, dinette-bed, microwv., awning, air, stereo, all amenities, used 3x, $11,500. 805/533-4255.
'95 TOYOTA Celica convertible, loaded, service records, low mileage, white w/black interior, custom sheepskin seat covers, CD, alarm, exc. cond. 805/252-9313.
'90 TOYOTA Corolla, exc. cond., 96K mi., all dealer service, auto, new tires/brakes, am/fm/cass., a/c. 714/535-2994, Paul.
'87 TOYOTA Supra turbo, 5 sp., targa top, loaded, great cond., $4,000/obo. 626/794-6142.
'80 TOYOTA Corolla wagon, white, 4-dr, 5-spd manual, 167K orig. owner miles, a/c, am/fm, maint. manuals, good cond., $1,200/obo. 626/359-3486.
'97 VW Passat GLX, V6, leather interior, white, 4-dr., loaded, sec. syst. + LoJack, 6-CD stereo, cruise control, air, ext. warr., 4 new tires w/replacement insurance, just serviced. 323/258-4464.
'88 VW Cabriolet, Karman ed., black w/white top, 4 hd lights, perfect cond., automatic, a/c, takeoff stereo, $4,100. 626/792-5132.

WANTED

APARTMENT OR HOUSE in Pasadena, 3 bd., close to Caltech if possible. 626/791-7044.
CARPOOLER, Brea/Fullerton/Yorba Linda area, 7:00-4:00 flexible, non-smoking. Ext. 4-6418 or 714/529-1718, eve., Art.
COMPUTER, Notebook PC, 66MHz or better, with at least 16 MB+ RAM and 800 MB+ HD; any brand O.K.; e-mail with price to vimalmd@hotmail.com.
ENCYCLOPEDIA, solar powered, suitable for kids aged 6-12. 626/797-6982.
GOLF CLUBS, used, cheap. 626/256-1138.
HOST FAMILIES for Caltech International Students for Thanksgiving Day; 626/395-6330, Victoria Saha or e-mail victoria@cco.caltech.edu.
ROOMMATE to share furnished 3-bd., 3-ba. Pasadena apt. with Caltech post-doc, move in immed., $400 + 1/3 util. 626/351-9641.
ROOMMATE, deluxe apt., fully furn., 1 block/ Caltech, master bd., ba., spacious, sunny, new a/c, carpeted, laundry, patio, stove, oven, microwave, refrig., dishwasher, utensils, sofa, phone, TV, computer, Xerox, fax, $495. 626/449-8266, Vicky.
ROWING MACHINE. 626/797-6982.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
TENNIS PARTNER. 626/796-6759, Achim.
VOLLEYBALL PLAYERS, coed, all levels of play, Tuesday nights 8-10 at Eagle Rock High School, $4/night. 956-1744, Barbara.

FREE

BARBELL with weights. 249-2596.
CATS, sm. female silver tabby, fixed, 1 year old; male, beautiful w/tuxedo markings, not fixed, 1 year old. 951-6779.
LATHE, metal, 36" gap bed. 626/798-2430.
PUPPIES, 3/4 cocker spaniel, 1/4 dachshund, the best of both breeds, adorable, 8 weeks old, 2 tans and 2 blacks, all boys, need dog-loving home. 626/812-9107, evenings.

FOR RENT

DUPLEX, upper 2 bd., 1 ba., 2 patios, sm. dog OK, all lights of planets and stars; stove, refrig. new cptg, paint; $100 deposit. 352-5608.
LA CRESCENTA condo, 2 bd., 2 ba., washer/dryer, 10 min./JPL, great school, $980. 890-5655 or 626/286-2880.
HOLLYWOOD KNOLLS area, 1-bd. apt. in 7-unit bldg. (adj. to Universal, Griffith Pk., Lake Hollyw'd and Toluca Lake/Burbank); pleasant hillside community w/close fwy. access; outside 1st floor entr., newly remodeled, hardwd. oak flrs., new refrig., dishwshr, a/c-heat pump, solar-heated water incl., laundry rm. downstairs, covered pking; non-smkr., $650. 626/798-3235.
N. SAN GABRIEL townhouse, 20 min./JPL, 3 bd. + den, 2½ ba., LR w/fp, cent. a/c, 2-car garage w/auto. opener, water/trash/gard. incl., no pets, $1,200. 626/821-2007.
N. SAN GABRIEL, with Temple City schools; elegant, 3 bd. + den/4th bd., 2.5 ba., fireplace, master suite, small charming garden, like new, no pets, 9050-E Arcadia Ave., $1,495. 626/939-3853.
PASADENA apt., 2 bd., 2 ba., cent. air, small patio, laundry facil., $775 + util. 626/351-9641.
PASADENA guest house, spacious 1 bd., exc. neighborhood, washer, dryer, refrig., stove & utilities, $750. 626/793-7937.
PASADENA townhouse-style apt., near PCC, 2 bd., 1½ ba., refrigerator, built-in range & oven, cent. a/c, carpets, drapes, disposal, laundry, covered parking, $725. 790-7062.
PASADENA house, 3-bd., 2 ba, patio, big yard, detatched 2-car garage, 10 min. to JPL, walking distance to library, park, grocery and entertainment, quiet and friendly dead-end street, next to Hastings, $1,100. 790-9275.

REAL ESTATE

2-bd., 2-ba. house, very nice, lg. liv. rm., sep. dining rm., ceiling fans, fireplc., lg. tree, shaded, backyd., needs some TLC, pleasant diverse neighborhood, 20 min./JPL, no fwy. travel. 626/798-1546.
BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
PASADENA home, walk to JPL (2 mi.), 2 + 1, fireplc., dining area, updated kitch., all appliances + washer/dryer, exterior freshly painted, lg. patio, gazebo, sprinklers front/back. 626/821-1249, Sandy Radey.
PASADENA, good neighborhood; corner lot; beautifully restored 1933 Spanish; 2 bd., 2 ba., dining rm., living rm., den, screened back porch, detached 2-car garage; courtyard; walled gardens front and back; fireplace; hwd. floors; French doors & windows; bolted; 1,760 sq. ft. (house); $299,000. 323/258-8518.

VACATION RENTALS

BIG BEAR, 7 mi. from slopes; full kitchen, f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night minimum; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR cabin, walk to village, quiet area, 2 bd., slps 8, compl. furn., F/P, TV/VCP, $75/nt. 249-8515.
BIG BEAR CITY, near airport, 2-bd., 1-ba. cabin, nicely furnished, sleeps 8; fireplace, TV, full kitchen, microwave; $100 refundable cleaning deposit; $75/nite weekdays, $250 weekend (2 nites). 909/982-2986.
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/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhome, indoor/outdoor spa, near skiing, beautiful stone fireplace, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/night for 4. 248-8853.
CORNWALL, ENGLAND, August 1999 total solar eclipse; prime location campsite on the path of totality; includes lecture series by Caltech, JPL and UK astronomers; http://www.ctg-windows.co.uk/ eclipse.html. 626/356-2998.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 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, microwave, 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.
LA JOLLA, ocean vw., steps to gorgeous beach, 1 bd., slps. 4, fully eqp'd. kitch., linens, hot tub; Thanksgiv. wk., Nov. 23-27. 626/844-4670, Sandie or Mike.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitchen, TV/VCR, covered parking; walk to Canyon Lodge; JPL discount. 249-8088.
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 condo in Chamonix at lifts 7, 8, 16, 17; walk to warming hut, 2 bd., 2 full ba., sleeps 6, fully eqpd. elec. kitch., microwv. & extras, fireplace/wood, color TV, VCR, FM stereo, o/d Jacz., sauna; game, rec. & laundry rms., conv. to shops, lifts; spec. midweek rates. 249-8524.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft; sleeps 6-8; fully equipped 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.
OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.
PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.
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.

Universe

Editor
Mark Whalen

Photos
JPL Photo Lab

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To change an address, contact your section's administrative assistant, who can make the change through the HRS database. For JPL retirees and others, call Xerox Business Services at (626) 844-4102.

Jet Propulsion Laboratory

Universe

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JPL-teamed Discovery proposals selected for study

If approved, missions would probe Jupiter's interior, smash projectile into comet

JPL proposals to analyze Jupiter's interior through measurements of the planet's gravitational and magnetic fields—and to fire a copper projectile into a comet to study its ice and rock—have been selected among five proposals to go forward for detailed study as candidates for the next missions in NASA's Discovery Program of lower-cost, highly focused scientific spacecraft.

The proposed Jupiter orbiter, known as Interior Structure and Internal Dynamical Evolution of Jupiter, or Inside Jupiter, would fly to within approximately 1,000 kilometers (600 miles) of the surface of the planet.

Deep Impact would be a flyby mission designed to fire an 1,100-pound (500 kilogram) copper projectile into the comet P/Tempel 1, excavating a large crater more than 65 feet (20 meters) deep, in order to expose its pristine interior ice and rock.

JPL's Dr. Edward Smith, who also serves as NASA project scientist for the Ulysses mission to the Sun, would be principal investigator for Inside Jupiter. Smith said the proposed mission would launch aboard a Delta II rocket in February 2004, fly by Earth in January 2006 and arrive at Jupiter in April 2008. The mission would conclude in August 2009.

Total cost of the proposed mission is $227.3 million. The spacecraft would be designed and built by Ball Aerospace & Technologies Corp. of Boulder, Colo.

"The spacecraft's trajectory would bring it to an orbit around Jupiter in a very high inclination," Smith said, "and part of the orbit would bring the spacecraft very close to the surface of Jupiter—to within about 1,000 kilometers of the visible atmosphere."

"We wouldn't be flying directly over the poles, but would be getting the high latitudes of Jupiter, which makes it ideal for mapping of gravity and magnetic fields," he added.

Additional investigations for the mission would be radio occultation experiments to learn about the structure of Jupiter's atmosphere. An energetic particle spectrometer will assist in studying magnetic fields, "and help us characterize the environment," Smith said.

JPL's Earth and Space Sciences Division generated the proposal. Besides Smith, other JPL personnel involved in the project include Dr. Tom Spilker, proposal manager and co-investigator; Dr. Neil Murphy, co-investigator, energetic particle experiment; Dr. John Anderson, co-investigator, gravitational fields measurement.

Inside Jupiter's science team also includes the following co-investigators: Dr. Andrew Ingersoll, Caltech; Dr. David Hinson, Stanford University; Prof. William Hubbard, University of Arizona; Dr. Barry Mauk, Johns Hopkins University; Prof. David Stevenson, Caltech; and Prof. G. Leonard Tyler, Stanford.

Imaging and atmospheric data gained by the Galileo spacecraft "will be of particular interest to us," Smith said. "Scientifically, we'll do some of the same things as Galileo, and we're depending on key personnel from that mission to help make Inside Jupiter a success. There have been gravity measurements of Jupiter done by Galileo but they never went any closer than about four Jupiter radii (290,000 kilometers or 175,000 miles). We will make all of our measurements probably within two Jupiter radii (about 143,000 kilometers or 89,000 miles), and as close as 1,000 kilometers.

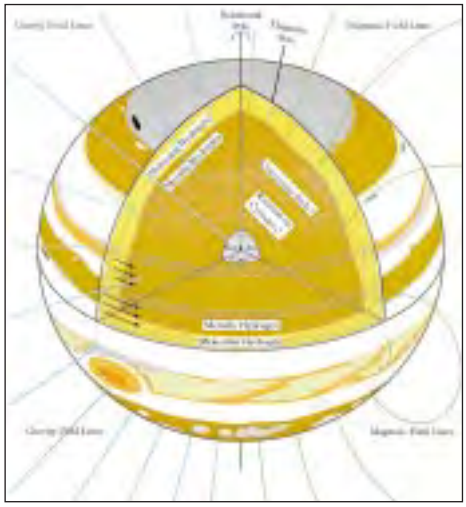
"We will not emphasize the Galilean satellites," Smith noted. "We will be directing all our attention to what's below the spacecraft, and particularly when we're close to Jupiter."

The Deep Impact mission proposal manager is Dr. Cliff Anderson of JPL. The project's principal investigator is Dr. Michael A'Hearn of the Department of Astronomy, University of Maryland, College Park. Total cost is to be $203.8 million.

Proposed for launch in January 2004, an Earth gravity-assist flyby in January 2005 and arrival at P/Temple 1 in July 2005, the Deep Impact spacecraft would precede by about five months the arrival of JPL's proposed Deep Space 4 Champollion project, which would land on the comet.

The project would be the first investigation to determine P/Temple 1's ice depth and the structure of the outer layers of its nucleus, and "would study the relationship between the measurements made by the lander mission and the pristine material that we seek in comets," Anderson added.

Measurements made from the spacecraft would include:



Inside Jupiter would measure the planet's gravitational and magnetic fields and use the information to infer the structure and dynamics of its interior.

• Broadband images of the surface made from a camera on the impactor as it approaches, with ever-increasing spatial resolution; ultimately, images of the impact site would be acquired with a resolution of less than a meter;

• White-light and medium-band images of the crater excavation process and of the resultant crater;

• Near-infrared spectral images of the outflowing hot debris, surface of the nucleus and crater and outgassing to the coma before, during and after the event.

Anderson said two imagers onboard the spacecraft would "make events readily observable from Earth, and an intensive campaign of observations at nearly all wavelengths from both ground-based and Earth-orbital facilities is planned."

"The Deep Impact proposal got approved for the second step in the Discovery process on the basis of the outstanding science return expected and an exceptional team of scientists," Anderson said.

Two JPL scientists are named for the science team. Kenneth Klaasen of Section 385 is the interface to the mission operations system and will coordinate all aspects of scientific mission planning and flight operations, and Dr. Donald Yeomans, manager of the Near-Earth

See Discovery, page 4

Special Events Calendar

Ongoing

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

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

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call 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.

Wednesday, November 25

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. Call Mary Sue O'Brien at ext. 4-5090

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. Call Joyce Wolf at ext. 4-7361.

Tuesday, December 1

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

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

Wednesday, December 2

Associated Retirees of JPL/Caltech—Meeting at 10 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

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

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

Thursday, December 3

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

Friday, December 4

Caltech Women's Club Holiday Party—To be held at the Athenaeum, reception starts at 6 p.m., with dinner at 7 p.m. Dancing until midnight. Tickets: $30 for Caltech Women's Club members and significant others, $32 for nonmembers. Phone reservations to Vilia Zmuidzinas at (626) 395-3343. Deadline is Nov. 27.

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

"Lost Worlds of the Bible"—This travel film covers historical sites contemporary to biblical references in Lebanon, Israel, Syria and Jordan. To be held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $9 and $7. For information, call (626) 395-4652.

NASA Commercialization Center—Julie Holland, director of the center at Cal Poly Pomona, will present information and answer questions at noon in Building 180-801. Call Dr. Tom Lloyd at ext. 4-3821.

Fri., Dec. 4–Sat., Dec. 5

Holiday Concert—Songs of the season will be performed by women's, men's and mixed voices, along with harp and brass, during this free concert at 8 p.m. in Caltech's Dabney Lounge. For more information, call (626) 395-4652.

Saturday, December 5

ERC Holiday Party—Entertainment from Jim Gamble's marionettes in "T'was the Night Bearfore Christmas," gifts and visits from Santa and Mrs. Claus highlight the event, to be held at Lanterman Auditorium in La Cañada from 10 to 11:30 a.m. Tickets are available at the ERC for $3 per person.

Sunday, December 6

Chamber Music—The Takács Quartet will perform Haydn, Bartók and Dvorak in this 3:30 p.m. concert in Caltech's Beckman Auditorium. Tickets are $25, $21, $17 and $13. For information, call (626) 395-4652.

Tuesday, December 8

JPL Scuba Club—Meeting at noon in Building 168-427.

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

TDA Open House—Tax-deferred annuity representatives from Fidelity, Prudential and TIAA/CREF will be available from 9 a.m. to noon and 1 to 3 p.m. in Building 291-202 to answer questions regarding 403-B pre-tax deferred annuity plans.

Wednesday, December 9

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. Call Mary Sue O'Brien at ext. 4-5090

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. For location and further information, call Joyce Wolf at ext. 4-7361.

SESPD Lecture Series—Dr. Les Deutsch of the Advanced Flight Systems Program Office will discuss the Deep Space Systems Technology Program at 11 a.m. in von Kármán Auditorium.

Thursday, December 10

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

Friday, December 11

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

Tuesday, December 15

Investment Advice—Fidelity Investments representative. Alyssa Valladao will be available for individual appointments. To make an appointment, call Patrice Houlemard at ext. 4-2549.

Wednesday, December 16

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

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

Russian Language Workshop—Meets from 7 to 9 p.m. on the Caltech campus. Some knowledge or previous study of the language is essential. Call Joyce Wolf at ext. 4-7361.

Thursday, December 17

JPL Atari Club—Meeting at noon in Building 238-544.

Von Kármán Lecture Series—Galileo Project Manager Jim Erickson will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

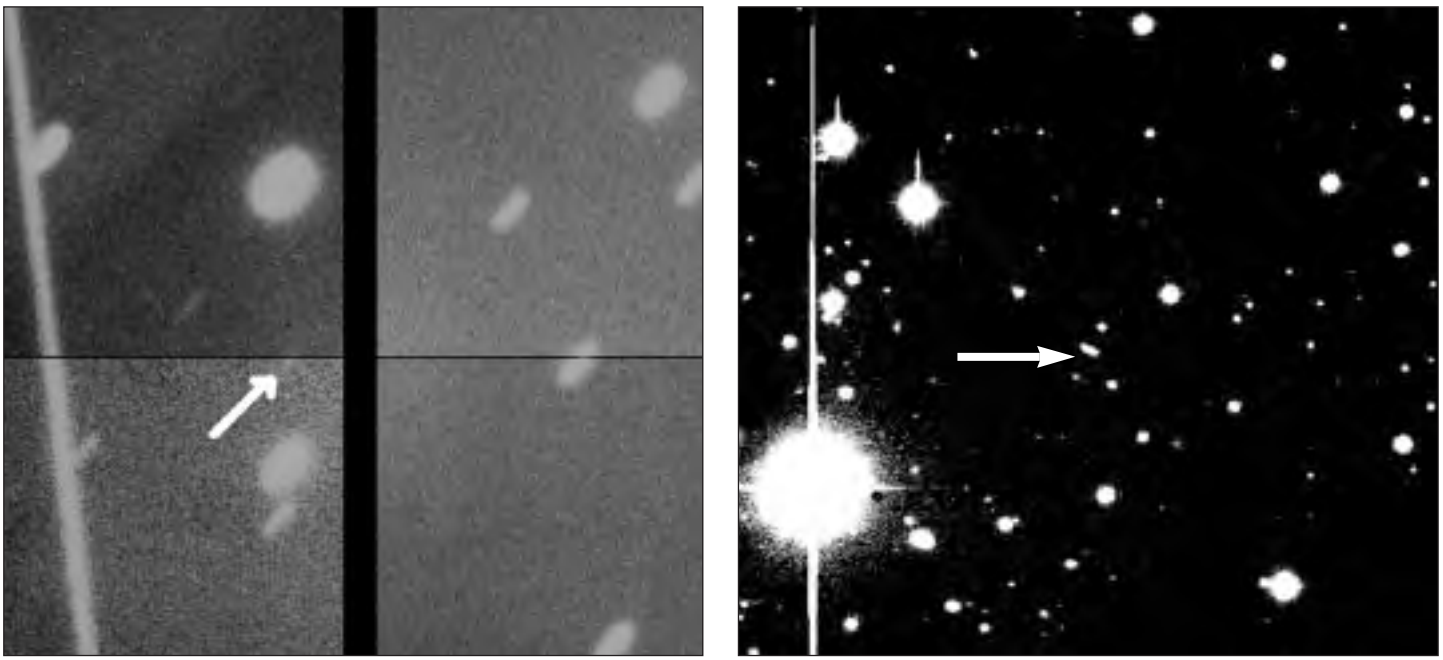
Friday, December 18

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

Von Kármán Lecture Series—Galileo Project Manager Jim Erickson will speak at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Award For Excellence Nominations—Due today from JPL personnel in technical organizations (3X, 4X, 5X, 7X, 8X, and 9X) to the Reward & Recognition Administrator. For more information, visit the R&R home page at http://eis/sec614/reward/excel.htm or call the R&R program office at ext. 4-3825. Note: Nominations will be accepted from business/administrative organizations (1X, 19X, 2X, and 6X) Jan. 4–22, 1999.

Telescope captures DS1's target asteroid, spacecraft in flight



JPL astronomers Stuart Shaklan and Dr. Steve Pravdo on Oct. 2 used the Stellar Planet Survey instrument on the 5-meter (200-inch) Palomar telescope to make astrometric observations of 1992 KD, left, Deep Space 1's scheduled flyby target on July 28, 1999. The image shows 1992 KD surrounded by elongated stars, elongated because astronomers were tracking on the motion of the asteroid. David Rabinowitz and Andrea Boattini reduced the astrometric data consisting of three images. At right, Deep Space 1 as captured by JPL astronomers Drs. Bonnie Buratti, Paul Weissman, Michael Hicks and Alain Doressoundiram using the same telescope on Nov. 16, when the spacecraft was 3.7 million kilometers (2.3 million miles) from Earth. Jon Giorgini assisted with telescope-pointing predictions using JPL's Horizons online ephemeris system, an Internet-accessible computer program Giorgini developed that computes positions of objects in the solar system as seen from any location on Earth. These predictions were based on orbit determination performed by the Deep Space 1 navigation team.

Voyager 2 OK after blackout

The Voyager 2 spacecraft, now on the outer fringes of the solar system, was returned to normal flight operations Saturday, Nov. 14, after a 66-hour communications blackout which began on Thursday, Nov. 12.

Ground controllers at the Deep Space Network station near Madrid, Spain, lost Voyager 2's signal on Wednesday night at about 11:57 p.m. Pacific Standard Time. At the time, the spacecraft was in the process of shutting down power to its scan platform which contains science instruments, including the ultraviolet spectrometer. Preliminary analysis indicated that the commands were properly sent to the spacecraft.

Turning off the scan platform is part of a power conservation plan to keep Voyager 2 operating until at least the year 2020. There are still five experiments operating on Voyager 2: the cosmic ray instrument, low-energy charged particle instrument, plasma science instrument, plasma wave instrument and the magnetometer.

As the spacecraft's onboard plutonium power source decays, it is necessary to periodically reduce the spacecraft electrical power usage in order to maintain an adequate power margin.

About 720 commands were sent Nov. 12 to turn on the spacecraft's X-band transmitter; however, communication with the spacecraft was not immediately reestablished. Subsequent analysis of the probable failure modes suggested the spacecraft's onboard S-band exciter, a small oscillator used to generate the spacecraft's carrier frequencies, could have been shut off. About 360 commands were sent the evening of Nov. 13 to turn the spacecraft's S-band exciter back on.

The flight team reacquired the spacecraft's signal the evening of Nov. 14 at approximately 6:18 p.m. Pacific Standard Time. Telemetry had been switched to a data rate of 40 bits per second from the standard operating rate of 160 bits per second. Spacecraft systems were functioning normally, although some hardware components were slightly warmer than expected. The flight team reported that the backup X-band transmitter was on at the time of signal reacquisition.

Subsequent analysis of the spacecraft computer memory showed that the scan platform power-down sequence had executed exactly as planned The team will continue to analyze data to determine the cause of signal loss.

Voyager 2 is departing the solar system at 48 degrees to the south of the ecliptic plane at a speed of 15.9 kilometers per second (35,000 mph). Round-trip light time from Earth to Voyager 2 is currently about 16 hours. The spacecraft is now 8.4 billion kilometers (5.2

See Voyager, page 6

La Niña, El Niño coexist in Pacific, TOPEX shows

By MARY HARDIN

The latest measurements of sea surface height made by JPL's TOPEX/Poseidon satellite show the tropical Pacific Ocean with a stalled La Niña condition coexisting with the remnants of last year's El Niño event.

"The forecasted intensification of this La Niña for fall 1998 and into winter 1999 has yet to live up to its billing," said Dr. Bill Patzert, a research oceanographer at JPL. "The size and heat content of this cold pool of water has remained remarkably stable for the past five months since El Niño began to dissipate in mid-June."

The image shows sea-surface height on Nov. 8, 1998, relative to normal ocean conditions. Sea surface height is an indicator of the heat content of the ocean. Remnants of the high sea level, warmer El Niño waters still linger to the north of the equator—while the area of low sea level, or cold water that is sometimes referred to as La Niña, remains in the center of the Pacific. Oceanographers believe that the

See TOPEX, page 6

Discovery

Continued from page 1

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.

Other team members are Dr. Michael Belton, National Optical Astronomy Observatories; Alan Delamere, Ball Aerospace & Technologies; Jochen Kissel, Max Planck Institute; Lucy McFadden, University of Maryland; Karen Meech, University of Hawaii; H. Jay Melosh, University of Arizona; Peter Schultz, Brown University; Jessica Sunshine, Science Applications International Corporation; and Joseph Veverka, Cornell University.

In addition to Inside Jupiter and Deep Impact, the mission proposals selected by NASA for further study would send spacecraft to orbit Mercury, return samples of the two small moons of Mars to Earth and investigate the middle atmosphere of Venus.

The five missions were among 26 proposals submitted to NASA. "The degree of innovation in these proposals climbs higher each time we solicit ideas," said Dr. Ed Weiler, associate administrator for space science at NASA Headquarters. "Deciding which one or two of these exciting finalists will be fully developed will be a very difficult choice—any one of them promises to return unique insights into our solar system. Meanwhile, the solar wind instrument will fill in some critical gaps in our understanding of the history of water on Mars."

Following detailed mission concept studies, which are due for submission by March 31, 1999, NASA intends to select one or two of the mission proposals in June 1999 for full development as the seventh and possibly eighth Discovery Program flights.

The selected proposals were judged to have the best science value among 30 total proposals submitted to NASA in response to an Announcement of Opportunity issued last March. Each will now receive $375,000 to conduct a four-month implementation feasibility study focused on cost, management and technical plans, including small business involvement and educational outreach. Initial mission cost estimates will not be allowed to grow by more than 20 percent in the detailed final proposals.

The other selected Discovery proposals are:

• Aladdin, a mission to gather samples of the Martian moons Phobos and Deimos by firing projectiles into the moons' surface and gathering the ejecta during slow flybys. It would then return the samples to Earth for detailed study. Aladdin would be led by Dr. Carle Pieters of Brown University in Providence, R.I. Co-investigators include JPL's Dr. Donald Yeomans and Dr. Charles Yoder.

• The Mercury Surface, Space Environment, Geochemistry and Ranging mission, or Messenger, an orbiter spacecraft carrying seven instruments to globally image and study the closest planet to the Sun. Messenger would be led by Dr. Sean Solomon of the Carnegie Institution, Washington, D.C.

• The Venus Sounder for Planetary Exploration, or Vesper, an orbiter with four instruments to measure the composition and dynamic circulation of the middle atmosphere of Venus and its similarities to processes in Earth's atmosphere. Vesper would be led by Dr. Gordon Chin of NASA's Goddard Space Flight Center, Greenbelt, Md. JPL co-investigators are Drs. Mark Allen, David Crisp and Victoria Meadows.

In a unique step for the Discovery Program, NASA has also decided to fund a co-investigator to provide part of an instrument to study the interaction between the solar wind and the atmosphere of Mars. It is scheduled to fly aboard the European Space Agency's Mars Express spacecraft in 2003. NASA plans to consider such investigations, categorized as "Missions of Opportunity," in all future Discovery and Explorer program Announcements of Opportunity.

The solar wind science hardware to be built as part of the selected Mission of Opportunity is intended for an instrument called the Analyzer of Space Plasmas and Energetic Atoms, or ASPERA-3. The principal investigator for this instrument is Dr. R. Lundin of the Swedish Institute of Space Physics. The co-investigator being funded by NASA is Dr. David Winningham of the Southwest Research Institute, San Antonio, Texas.

The investigations proposed in response to this AO were required to address the goals and objectives of the Office of Space Science's Solar System Exploration theme, or the search for extrasolar planetary systems element of the Astronomical Search for Origins theme. 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 next launch of a Discovery mission is scheduled for Feb. 6, 1999, when the Stardust mission will be sent on its way to gather a sample of comet dust and return it to Earth in January 2006. The first Discovery mission, the Near Earth Asteroid Rendezvous (NEAR) spacecraft, is due to arrive at its target asteroid, 433 Eros, on Jan. 10, 1999, for at least a year of close-up observations from an orbit around the Manhattan-sized body. ❑

Weiler replaces Huntress at HQ

NASA Administrator Daniel Goldin has named Dr. Edward Weiler as associate administrator for NASA's Office of Space Science.

Weiler has served as acting associate administrator since Sept. 28, following the departure of Dr. Wesley Huntress Jr.

"In his short time as acting associate administrator, Ed Weiler has demonstrated both the management skills and scientific leadership that this position demands, and I am delighted he has accepted the offer on a more permanent basis," Goldin said.

In this capacity, Weiler will be responsible for providing overall executive leadership of NASA's Space Science Enterprise.

This enterprise aims to achieve a comprehensive understanding of the origins and evolution of the solar system and the universe, including connections between the Sun and the Earth, the beginnings of life and the question of whether life exists elsewhere beyond Earth. It also is charged with communicating this knowledge to the public.

Weiler was appointed as science director of the Astronomical Search for Origins and Planetary Systems theme within the Office of Space Science in March 1996. He will continue to serve as the program scientist for the Hubble Space Telescope, a position he has held since 1979, until a replacement for that position is selected.

Weiler joined NASA in 1978 as a staff scientist. Prior to that, Weiler was a member of the Princeton University research staff and was based at NASA's Goddard Space Flight Center, Greenbelt, Md., as the director of science operations of the Orbiting Astronomical Observatory-3 (COPERNICUS). ❑

New Millennium says thanks

PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

On behalf of the New Millennium Program, Deep Space 1 Project Manager David Lehman, left, presents a certificate of appreciation to Dr. John Stubstad of the Ballistic Missile Defense Organization, a member of the Deep Space 1 flight team, for exceptional achievement in overseeing the development and delivery of the Scarlet solar array. This advanced technology will significantly enable future NASA missions' ability to generate scientific knowledge.

Archives, Safety hold open houses

Safety lab part of new Bldg. 200 facility

JPL's Safety Operations Section celebrated the opening of its new facility in Building 200 with a Nov. 5 open house.

Laboratory Director Dr. Edward Stone, Associate Director Kirk Dawson and Business Operations Director Daryal Gant cut a ribbon to dedicate the opening of new offices that will house JPL's first industrial hygiene laboratory, as well as the industrial hygiene and workers' compensation groups.

The new laboratory includes a number of instruments used by the Safety Operations Section in monitoring potential exposures to employees concerning chemical, noise, radiation, air quality and emergency response issues. Section personnel will use the laboratory to analyze sample data.

The facility also includes a "regulatory repository," which contains numerous technical references, including health and safety program documentation, Standard Operating Procedures for JPL employees and California Occupational Safety and Health Administration regulations.

"Senior management has provided Safety Operations Section the facility and tools needed to support all JPL employees in the areas of safety and health, launching the section into the new millennium as a world class health and safety organization," said Pamela Brown, section supervisor. ❑

Above, Business Operations Director Daryal Gant, (left) Lab Director Dr. Edward Stone and Associate Director Kirk Dawson dedicate the Safety Operations Section's new facility. At right, senior industrial hygienist Julie Jackson shows Stone some of the instruments in the new laboratory.

Ed Fernandez, left, president of Sherikon Inc., and Willis Chapman, Division 64 manager, cut ribbon to dedicate newly remodeled JPL Archives facility. At right is Phil Knowlton, Sherikon director of strategic planning.

Sherikon Space Systems to manage Archives

JPL has awarded a contract for records management and archives services to Sherikon Space Systems Inc., of Cape Canaveral, Fla.

The contract, which became effective Sept. 21, requires Sherikon Space Systems to provide the personnel, facilities and equipment necessary to manage and operate the JPL Archives; provide records management support, including storage, retrieval and disposal services for noncurrent institutional records, as well as storage and retrieval services for the JPL Technical Library, Engineering Document Services, and Graphic Services; and fill secondary distribution requests for JPL documents and publications.

"This contract is an expansion of the previous contract for records storage and retrieval services, because it adds the archival and secondary distribution services not re-quired of the former contractor," according to the contract technical manager and JPL chief archivist Dr. Michael Hooks. "We intend to develop a strong partnership with Sherikon Space Systems to ensure that the needs of our JPL and NASA customers are met."

On Nov. 13, Sherikon Space Systems held a formal opening of their newly remodeled JPL Archives and Records Management Facility at 145 N. Altadena Drive in Pasadena (the former JPL Building 512). Willis Chapman, manager of the Logistics and Technical Information Division, and Ed Fernandez, Sherikon's president and chief executive officer, cut a ribbon commemorating the opening, and employees gave tours of the facility afterward.

For archival and records management services, Hooks said, JPL employees should contact Sherikon Space Systems at (626) 449-1593 or e-mail jplarchives@sherikon.com . ❑

ISO auditors report on certification pre-assessment

By MARK WHALEN

Following a week of auditing activities conducted as a pre-assessment of JPL's readiness for ISO 9001 certification, representatives of third-party registrar Det Norske Veritas (DNV) debriefed JPL personnel on their findings Nov. 20.

The three DNV auditors conducted numerous interviews with JPL employees during the week, part of the process to prepare the Laboratory for ISO certification next March. Additionally, they met with JPL internal assessors on Thursday to share their personal experiences as auditors and answer questions from the internal assessors.

DNV left a rough draft of its findings with JPL's ISO management representative, Chief Engineer John Casani.

According to DNV lead auditor Tom Dadson, a full pre-assessment report would take approximately two to three weeks to complete.

"In summary," Dadson said, "all three auditors have agreed that the one major area the most imposing for us was JPL's documentation system," calling it complex and frustrating to get into.

Dadson wondered whether some documented procedures were necessary and asked whether some of them could be combined. "Many are not documented yet and the difficulty is trying to get to what you're looking for," he said.

"Whatever you can do to standardize it and simplify it, do it.

"It's not something management does for you," Dadson added. "It's going to take the efforts of all technicians, engineers and everybody else."

The auditor also noted that employees are not always aware of the fact that JPL has a corrective action procedure, where problems can be reported and elevated upwards for resolution.

He described a series of both major and minor findings that need to be corrected for JPL's certification. Those categorized as "major" findings were those that represented "lapses in the system—we

See ISO, page 7

News Briefs

JPL's Infrared Focal Plane Array Technology Group in Section 346 has been awarded NASA's Effective Partnerships Prize and a cash award of $10,000 for its paper describing the Laboratory's research and development of quantum well infrared photodetectors (QWIPs).

The award was accepted by group supervisor **Dr. Sarath Gunapala** during a formal ceremony at the American Institute of Aeronautics and Astronautics' Defense & Civil Space Conference in Huntsville, Ala., on Oct. 29.

Supported by interagency funding, the group's work at JPL's Center for Space Microelectronics Technol-ogy has produced a series of highly sensitive infrared detector arrays for NASA commercial, medical and defense applications, including Earth observations systems, astronomy, weather monitoring, thermal mapping, missile tracking and night vision aids.

A joint honor of NASA's Office of Space Science and the AIAA, the prize was awarded following a peer review by practicing technologists and technology managers from NASA and other agencies of the U.S. government. Criteria for evaluating the papers in the NASA-wide competition included technical excellence of the contribution, short- and long-term benefits for Earth and Space Science at NASA, degree of synergism among the programs in the collaboration, and proposed utilization of the cash award, such as effective partnering among agencies, education or public outreach. ❑

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

Section 313: Parag Vaze, John Wirth.

Section 387: Henry Conley, Timothy McCann.

Section 391: Frank Marfai, Tanisha Smith, Robert Warzynski.

Section 601: Neil Bautista, Eva Bazzarre, Jeffrey Behar, Pamela Brown, Mary Gilmore, Jeannine Harmon, John Houseman, Julie Jackson, Ruth LeBlanc.

Section 621: Martha Molodow-itch.

Section 622: Kathy Sovereign.

Section 660: Patricia Reed.

Section 661: Luba Berman, Robert Nofer, Hassan P Shankar, Carl Simon, Myrna Snitowsky.

Section 662: Rodolfo Devera, Robert Ewing, Douglas Hall, Carl Hallstrom, Sam Jacoby, Arturo Lemoncito, Armando Marquez, Nathaniel Ronquillo, Bruce Woodward.

Section 664: Ernest Breig, David Griffith, Alden Jenkins, Scott Susoeff. ❑

On Dec. 1, JPL will celebrate its 40th anniversary as a NASA installation. To note the day, and have some fun, the Public Affairs Office is planning to stage a parody of the TV show "Jeopardy," to be called "JPLardy," in von Kármán Auditorium from noon to 1 p.m.

For those who would like to be part of this event, help is needed in two separate and distinct areas:

• Answers and their appropriate questions, a la "Jeopardy," dealing with different categories of JPL history (e.g., spacecraft, planets, findings, personnel, facilities, events, etc.);

• Contestants. A round of nine questions will be held, with the top point-gatherer taking on two fresh contestants in another round, and so on for one hour.

Personnel can participate in the first or the second area, but not both. And if a lot of contestant-applicants sign up, a random drawing will be conducted for participants to play in one hour.

If interested, e-mail to Public Services Office Manager **Kim Lievense**. ❑

To have some fun and at the same time show off JPLers' creative abilities, Section 352 will on Dec. 18 host a balloon car contest in front of Building 180 from noon to 1 p.m.

Contest organizer **Paul MacNeal** said the competition is open to JPL employees, contractors and their immediate families. Those planning on having a family member attend the contest need to make arrangements with the Security Office in advance; call Myron Hitch at ext. 4-7610.

MacNeal defined a balloon car as any vehicle that travels on the course using one or two officially supplied balloons for power. A maximum of two balloons can be used on the car, but a total of four balloons will be provided to help with preliminary testing of the car. The officially provided balloons are to be the only source of energy for the car.

Participants are not to work on their entry during working hours.

Balloons can be picked up in person and entries submitted at Building 301-325Q. MacNeal said the deadline for both is Dec. 15.

A grand prize trophy will be presented to the designer of the car that stays on the course and finishes the farthest distance from the starting point. In addition, certificates will be awarded for various categories.

For more information, call MacNeal at ext. 4-7824. ❑

Auditions for Caltech's production of Shakespeare's Richard III will be held Friday, Dec. 4 from 7 to 10 p.m. and Saturday and Sunday, Dec. 5 and 6 from 1:30 to 5:30 p.m. in the campus' Ramo Auditorium.

The show will be performed Feb. 12–28, 1999.

For more information, call **Craig Peterson** at ext. 3-2481 ❑

Voyager

Continued from page 3

billion miles) from Earth, or more than 56 times farther from the Sun than Earth is.

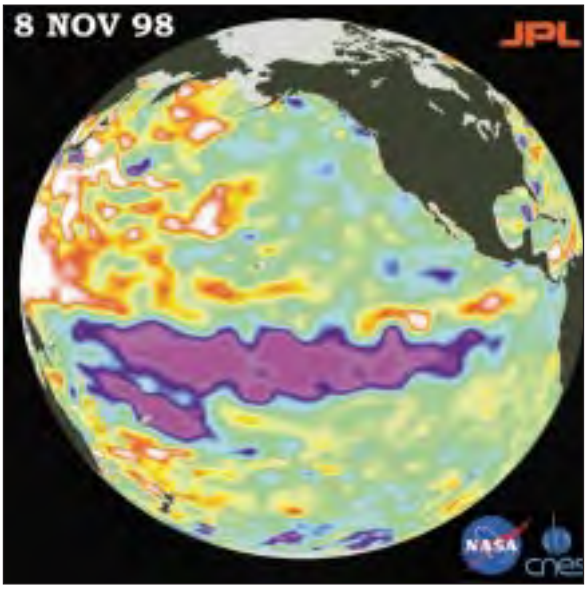
Its twin, Voyager 1, the most distant human-made object in space, is healthy and operating normally. Voyager 1 is leaving Earth's neighborhood at 35 degrees to the north of the ecliptic plane at a speed of about 17.3 kilometers per second (38,752 miles per hour). Voyager 1 is currently 10.8 billion kilometers (6.7 billion miles) from Earth. ❑

TOPEX

Continued from page 3

coexistence of these two contrasting conditions indicates that the ocean and the climate system have not recovered from the record-breaking warming that has occurred during the past two years.

A La Niña is essentially the opposite of an El Niño condition, but during a La Niña the trade winds are stronger than normal and the cold water that normally exists along the coast of South America extends to the central equatorial Pacific. Like El Niño, a La Niña situation also changes global weather patterns and is associated with the possibility of more winter storms entering North America in the Pacific Northwest and with less precipitation anticipated for Southern California and the southwestern United States. ❑♦



This image, taken by the U.S.-French TOPEX/Poseidon satellite on Nov. 8, shows that the low sea level, or cold pool of water commonly referred to as La Niña, the large purple mass in the center of the picture, has stayed about the same for the last five months, changing very little in size and heat content. The satellite's ability to monitor the entire ocean indicates there is also a large-scale warming taking place in the western Pacific, as indicated by the white areas surrounded by red in the upper left.

ISO

Continued from page 5

(JPL) haven't implemented it, or we've forgotten all about it." "Minor" findings were compared to parking tickets, which if allowed to accumulate might lead to more serious problems.

The findings were distributed over the 20 "elements" or major parts of the ISO standard. Major findings were identified in areas that were previously identified by internal assessments conducted by JPL's internal assessor teams. However, there were some new areas and greater detail of audit in all elements from the DNV auditors.

"I can't recommend you for certification until all Category 1 (major) issues are rectified," Dadson said.

Noting the upcoming end-of-the-year holidays, he said "it will take a lot of focusing in the right direction between now and the end of March" for JPL to reach its goal of certification.

Casani told the gathering that the pre-assessment auditors "have done their job; now it's our turn. We're up to it."

ISO Implementation Team member Dr. Jerry Suitor noted that the team has already begun planning the next activities to make JPL compliant with the ISO standard. Improvements to the Develop and Maintain the Institutional Environment (DMIE) documentation system, additional documentation, documentation training, further internal assessments, and corrective action assignments to Executive Council members for resolution are some of the activities planned.

JPL employees can help the effort, Suitor added, by becoming familiar with the procedures they use in their daily work and knowing where in the DMIE documentation system they can find those procedures. ❑

Passings

Esther Baer, 75, a retired accounting clerk in the former Section 631, died of natural causes Oct. 30.

Baer worked at JPL from 1957–74. Services were held at Forest Lawn Memorial Park in the Hollywood Hills. ❑

William Payne, 73, a retired employee from Section 351, died of heart failure Nov. 3 at a Lancaster hospital.

Payne worked at JPL from 1978–89. He is survived by his wife, Yvonne; and children Madeline Clemann and Dale Payne.

Memorial services were held at Chapel of the Valley in Palmdale. Burial was at Arlington National Cemetery. ❑

For the record

Due to an editing error, an incorrect caption was placed under a photograph on page 1 of the Nov. 13 issue of *Universe*.

The caption should have described the photo showing the north polar cap of Mars surrounded by a zone of dark dunes, as imaged last summer by Mars Global Surveyor.

The image is available online at http://photojournal.jpl.nasa.gov . ❑

Next *Universe*: Dec. 18
Ad deadline: Dec. 2

JPLers' holiday giving

JPL volunteers sort and box donations from employees during the recently completed United Way food drive. In all, 39 boxes of food were collected and distributed to five local United Way agencies, which will help feed about 1,200 families with JPL donations.

FOR SALE

AIRLINE TICKET, R/T, anywhere American Airlines flies, includes free hotel stays and 1 day free rental car, $450; ENTERTAINMENT CENTER, large 3-piece lighted glass, $99; FRIDGE, huge, $59; LAPTOP, new Pentium with $1,600 12.1 active matrix screen/modem, $899; PAINTINGS modern art, orig. up to $1,000, sell $50-$100; SOFTWARE, Word 97 upgrade, $19, Adobe Photodelux or Photostudio, $15; FICUS, fake, huge, $39; FLOOR LAMPS (3), tall, black, halogen, $25. 366-6134.

ANTIQUES: child's bent wood rocker, $50; 2 carved side chairs, needlepoint seats, $400/pair; 2 velvet upholstered arm chairs, $400/pair; all exc. cond.; Little Green Machine carpet cleaner, used once, $50. 626/449-8035.

APPLIANCES: Sears Cold Spot refrigerator, white, $100; GE portable dishwasher, $150; Caloric Gas Stove, cream colored, $200; all in very good condition. 626/296-0082.

BASEBALL CARDS, '89 Upper Deck set of (1-700), $150; '90 Upper Deck miscellaneous cards, no Ken Griffey Jr., over 800 cards, $100/obo (includes some higher-priced cards); large collection of Frank Viola cards, including '70 Topps; miscellaneous cards, including some Mark McGwire, Harmon Killebrew. 790-2825, Terri.

BED FRAME, king size, never used, $15/obo. 626/568-8298.

BEDDING, almost new twin, queen and king bedspreads and comforters, $15-30 each. 626/398-4960.

BEDROOM SET, oak, large dresser, dressing table with mirror, headboard, end table, TV stand, vg cond., $199 for all. 909/592-2279.

BEDROOM SET, youth platform bed (twin), desk, hutch, bookcase headboard, tall armoire; oak; cost $4,000, good quality, $1,500. 626/447-6423.

BUNK BED, black metal, will help move, $150/obo. 626/285-7284.

CARPETS, Persian, new, handmade, silk & wool mixed, unique designs. 626/577-0022.

CLARINET, needs four pads replaced but in excellent condition, $125. 790-2825, Terri.

COMPUTER, Intel 286 PC, 80MB HD, 2MB-RAM, NEC 15" color EVGA, FD, Logitech mouse, stand, 1200bps Hayes smart modem, keyboard, CRT & CPU cover, all in exc. cond., must sell, $195/obo. 626/446-6456.

COMPUTER, Packard Bell, 486 SX-25, w/Windows 3.1, extremely compact, no monitor, $75. 626/398-4960.

COMPUTER, Power Computing 120MHz 601 (like PowerMac 7100), 48MB RAM, 500MB HD, MacOS 7.5.5, incl. bundled software, $500/obo. 626/568-9890, Alan, after 6 p.m.

COMPUTER ACCESSORY, Microsoft Sidewinder 3D Pro joystick for Macintosh, vg condition, hardly used, $50. 795-6530, eves.

COMPUTER ACCESSORY, AdvanSys PCI UltraSCSI-3 adapter, adds 1 external and 1 internal SCSI-3 narrow (50-pin) connectors to PCI PowerMac or PCI-equipped WinTel computer, provides 20MB/sec maximum data transfer rate, $75. 795-6530, eves.

DESK, wood, large L-shaped, $120. 626/449-2795, 4-7 p.m.

DIVE GEAR, wet suit (complete), plus regulator, fins, mask, all paraphernalia, exc. tanks, $50. 626/398-4960.

DRYER, Maytag, 240V, model HDE 308, 15 years, fully featured, 2 temps, 3 cycles, runs great, vg cond., $80. 626/296-8633.

EXERCISE MACHINE, NordicTrack Achiever, with Fitwatch, exc. cond., $350. 805/255-5645.

EXERCISE MACHINE, SoloFlex, great condition, $300/obo. 626/447-6423.

FIREWOOD, $2.50/bundle. 248-0853.

FLUTE & PICCOLO, Haynes, sterling silver, high quality, $1,300 & $900 (appraised higher). 727-7480, Len Lebow.

GUITAR, vintage 1966 Fender Mustang electric, bright red finish, very good condition, $550. 626/351-5485.

FOOTBALL CARDS, various brand names, unopened boxes (24 packs), major stars and rookies, $50; BASEBALL PACKS, unopened '87 Topps (48 cards/pack), possible McGwire rookie card; also Ryan, Rose, Schmidt, and Bo Jackson, Bonds, Bonilla, Will Clark and Palmiero rookie cards; $10/pack or $25 for 3 packs. 626/914-6083.

GAZEBO, CalSpas, 16' x 12', redwood, enclosed, includes 1

Continued on page 8

table w/4 chairs, 1 bar table w/4 stools, 4 redwood planters, $700. 626/444-6156, Bob or Annie.
KILIMS, Persian, two, gorgeous 26" x 36" hand-made, $59 each; 58" x 84" hand-made, $99. 626/446-6456.
LAMPS (4 units), night use, crystal ball shape, 2 are 1 ft. tall (7" dia,), 2 are 1.5 ft. tall (9" dia.), $30 for small pair, $50 for large pair, $70 for all/obo. 909/592-0780, Ana.
LAWNMOWER, excellent condition, Murray brand, $150; WEED TRIMMER, excellent condition, Makita, with spool, $175/obo. 805/288-2235.
MONITOR, 21" Viewsonic P810, $800; Matrox Millenium II with 8MB, $150; Diamond Monster 3D, $40. 213/264-8388, Patrick.
MOVING SALE, 8 a.m.-4 p.m. Fri.- Sat., Nov. 27-28, 17633 Horace St., Granada Hills, furniture, appliances, exercise equip., children's clothes and toys, lots of good stuff.
MOVING SALE, furniture and appliances, oak TV/stereo stand, Tappan microwave oven, 6 x 9 off-white rug, oak dinette with 2 built-in leaves and 4 matching chairs with cushions, white w/gold trim matching desk, dresser w/mirror and nightstand; best offers, must sell. 626/797-6453.
ORGAN, Technics SX-EX50M, electronic console, U&L k-boards ea 44 ks, pedal 13, 1-touch play, voice setting computer, technichord, tempo set, autoplay chord, lk nw, paid $7,500, must sell, sacrifice for $1,350. 626/446-6456.
PRINTERS, Epson FX-80 dot matrix, like new, $39/obo; Epson LQ-510 dot matrix, like new, $99/obo, must sell. 626/446-6456.
PUPPIES, Lab, registered, shots, claws removed, yellow & black, $400, La Verne. 909/596-7553.
REFRIGERATOR, 18 cu. ft., $100. 626/285-7316.
RUGS, Persian, pair of 44" x 62" all wool, $445; a beauty 56" x 80" wool & silk, $985; gorgeous silk miniatures by a famous artist, 32" x 45", suitable for hanging on wall, $1,085, must sell. 626/446-6456.
SKI JUMPER, women's size 6, "Thinsulate" insulated, made by Mountain Goat, never worn, still has tags, retail price $210, pale blue & white, very nice, $65. 626/798-0329.
SOFA BED, $40. 626/449-2795, after 4 p.m.
SPEAKERS, homebuilt giants featuring 15" woofers with 80 oz. magnets; complete with monster cable; $200/obo. 790-6922.
SPORTS EQUIPMENT, WestBend Rower Model 5100, like new, reduced to $49/obo; FiteOne Cross Country ski simulator, like new, reduced to $49/obo, must sell. 626/446-6456.
STAMPS, collector's, USPS "Golden Moments" 1984 US Commemorative Olympics with hardbound book, also Olympic mailing envelopes and ticket stubs with cancellations from Olympic events and official Olympic souvenir program, $30/obo. 626/798-0329.
STEREO, Aiwa AXR-005 receiver, 100W/channel surround receiver with remote, left channel doesn't work, project, $10. 550-7555, Rob.
STEREO, old, Grundig, $500; CASH REGISTER, antique, brass, $500. 562/464-0446.
STEREO EQUIPMENT: Yamaha receiver, 100W/ch., built-in 5-band equalizer, remote, fantastic sound, exc. cond., $119; Onkyo Dolby prologic surround sound decoder with center/rear channel amps, remote, attach to any receiver to upgrade to Dolby prologic for home theater, $99; Yamaha pre-amp, Dolby surround sound decoder, many a/v inputs, univ. remote, exc. cond, $79. 909/592-2279.
STOOLS (2), like new, quality wood & fabric, hardly used, moving out sale, reduced to $265 per pair/obo, must sell. 626/446-6456.
TABLE, dining room, round, mahogany, sits 8 with 2 extensions, almost new, comes with 6 matching chairs, $700/obo; matching China buffet, $1,000/obo; all for only $1,500/obo. 909/592-0780, Ana.
TV STAND, oak, on coasters w/storage below and VCR shelf, can easily accommodate up to 27", $50. 626/398-4960.
VACUUM CLEANER, Adjust Rite upright with full set of attachments, works well, $15. 626/798-0329.
VIDEO GAME, Super-Nintendo set; system, 2 controllers, 7 games, exc. cond., $99. 909/592-2279.
WATER JUG, Brita, 2-gallon unit with 4 unused filters, $18/obo. 626/568-8298.
WINE RACK, wrought iron, holds 7 bottles of wine in a circle formation, stands approx. 2.5 ft. off the ground, very nice, $20. 626/798-0329.

VEHICLES / ACCESSORIES

BMW bra, black, possibly for a 320I, $15. 626/798-0329.
'86 CADILLAC Fleetwood, 4 door, white w/landau top, leather interior, wire spoke wheels w/premium tires, a/c, 142K miles, all maintenance records, $3,225 firm. 626/355-8574.
'71 CHEVROLET Malibu, $3,500/obo. 626/285-7316.
'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, new battery, very clean, well maintained, 138K mi., orig. owner, $2,600. 626/332-2682.
'95 FORD Windstar LX, loaded, with tow package, excellent condition, 60K, bra, mag wheels, carpet kit, front and back environment controls. 213/293-3354.
'96-'99 HONDA Civic custom black seat covers, 3 months old, dash board covers and floor mats; for front and back, whole set $400. 993-0779, after 6 p.m.
'97 HONDA Accord EX coupe, metallic silver/tan, auto, 12k miles, loaded, Honda premium sound w/6-disc CD changer, power moonroof, windows/ locks/seats/etc., like new, no accident, orig. owner, $17,000/obo. 310/204-0825.
'94 HONDA Accord EX, 2-dr. coupe, blk/tan, v-tech eng., loaded, full pwr, well maintained, all original, $10,600. 626/798-7261, Todd.
'91 HONDA Civic EX, power window, power steering, auto, 45,300 miles, records available, single owner, $9,900/obo. 626/791-3194.
'87 HONDA Accord; 113 K; 2 doors; silver; regular maintenance; $2,800. 626/304-1025, Alex.
'98 ISUZU Trooper, 3.5L V6, 4 x 4, air cond., CD, power windows, power door locks, auto, salvage title, 3,000 miles, like new, mint cond., $23,000/obo. 909/599-3230.
'89 MERCEDES 300 SE , 93K miles, taupe, excellent condition, stock plus 6-CD changer, $15,995. 891-6836, Steve.
'85 MERCEDES BENZ 190 E, $5,000/obo. 805/553-9443.
'97 NISSAN Altima GXE, auto, 14,500 miles, air cond., power windows, power door locks, am/fm/stereo cassette, exc. cond., $11,954/obo. 569-2032, pager, or 909/599-3230.
'67 PORSCHE 912, 2nd rebuild of engine; good interior; no engine problems, $4,500/obo. 706-9552.
'94 SATURN SL2, 5 sp., 91k mi., am/fm, a/c, exc. cond., absolutely reliable, $6,000. 790-6922.
'89 SEADOO SP, runs great, $1,500. 626/798-4131.
'91 SUBARU Loyale wagon, 5 speed, 4WD, air, full power, white, ski rack, chains, stereo cass., 192K mi., $2,900/obo. 909/599-2598.
'89 TOYOTA pickup truck, good condition, 97K miles, $4,000. 949/766-0223.
'80 VOLVO 240DL, 4 spd., new tires, am/fm/cass., $1,100. 952-9463.
'72 VW, 1835cc motor, $850 firm. 562/464-0446.

WANTED

INSTRUMENTS needed for community music school; need piano, strings, winds, drums, etc.; all donations appreciated. 626/794-1792.
ROOM in house w/backyard, only can afford $350/month including utilities, have 1 basset hound, outdoor dog, only inside the house whenever the owner is home. 626/287-1072, Rani.
ROOMMATE to share with 3 others; 3-bd. Pasadena apt., $385 + deposit. 626/564-1078, Beth.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
VANPOOL RIDERS, #30, Santa Monica/West L.A.; read, talk, sleep, or daydream your commute away; part-time or full-time riders, 2 convenient pick-up spots. Ext. 3-1139, Duane Bindschadler.
VANPOOL RIDERS, #3, from Rancho Cucamonga/ Upland/Claremont/LaVerne area to JPL. Ext. 4-8343, Mike Taylor or 4-5831, Rhea Clearwater.
VOLLEYBALL PLAYERS, coed, all levels of play, Tuesday nights 8-10 at Eagle Rock High School, $4/night. 956-1744, Barbara.

FREE

CLEAN FILL DIRT [mostly gravel like], you haul, several cu yds., take as little or as much as you like, 3 blks. ESE of NY & Hill, Altadena. 791-3103.

LOST & FOUND

Lost: JPL WINDBREAKER, special shade of tan with a touch of green; Lost on Nov. 12 in 167 Cafeteria about 10 a.m. Suzanne, ext. 3-0537.

FOR RENT

ALTADENA house to share, overlooks East Lot, walk to JPL, wood floors, fireplace, dogs OK, female pref., avail. Dec. 1, $500. 989-1930 or 626/798-6302, Michele.
ARCADIA, cozy, furnished room; includes kitchen privileges, washer, dryer, swimming pool; no smoking, $350. 626/448-8809, Shary.
EAGLE ROCK hilltop house, gorgeous, 3 bd., 2 ba., all modern, easy access to JPL/Caltech, $1,300. 213/254-5350.
LA CRESCENTA condo, 2 bd., 2 ba., washer/dryer, 10 min./JPL, great school, 2-car parking, $980. 890-5655.
MONTROSE 2-story townhouse, 2 mi. to JPL, spacious 2 bd. + 2 1/2 ba., quiet gated community, cathed. ceiling, subterr. parking, fireplace, a/c, refrig., beautiful cond., great area, walk to shops and restaurants, $1,400. 626/577-7922.
PASADENA, 2 bd., 1 ba., hardwood floors, new tile bath & kitchen floors, fireplace, separate living and dining rooms, h/ac, new stove, w/o hookups, large yard, patio, garage; no smokers; 1 block north of San Marino, Santa Anita Ave., $1,500. 248-1433.
SIERRA MADRE apt., 2 bd., 1.5 ba., quiet 6-unit building, balcony, view, hot water included, $790. 626/355-7318.
SOUTH PASADENA, furn. studio apt. on 1 level, 1718 Huntington Dr. betw. Milan/Marengo; laundry facilities on premises, parking space; non-smoker; no pets; $565, utilities pd.; available 12/14. 626/792-9053, Marilyn.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.
TEHACHAPI area, new custom house, 2,100 square feet, 3 bd., 2 ba., 2-car garage, 2,800 square-foot Dutch barn, panoramic mtn. views on 2.5 acres, $155,000. 626/794-5858.

VACATION RENTALS

BIG BEAR, 7 mi. from slopes; full kitchen, f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night minimum; 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/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhome, indoor/outdoor spa, near skiing, beautiful stone fireplace, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/night for 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., swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 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, microwave, 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 in Chamonix at lifts 7, 8, 16, 17; walk to Canyon Lodge, 2 bd., 2 full ba., sleeps 6, fully eqpd. elec. kitch., microwv. & extras, fireplace/wood, color TV, VCR, FM stereo, o/d Jacz., sauna; game, rec. & laundry rms., conv. to shops, walk to lifts; spec. midweek rates. 249-8524.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitchen, TV/VCR, covered parking; walk to Canyon Lodge; JPL discount. 249-8088.
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.
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. kitchen w/microwv, beaut. furn, close to golf, beaches, 17 Mile Drive, Aquarium, Cannery Row, JPL discnt. 626/441-3265.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.
PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach; tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; $995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/wk. low seas., + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

NOTICE TO ADVERTISERS

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

Universe

Editor
Mark Whalen

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JPL Photo Lab

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

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

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