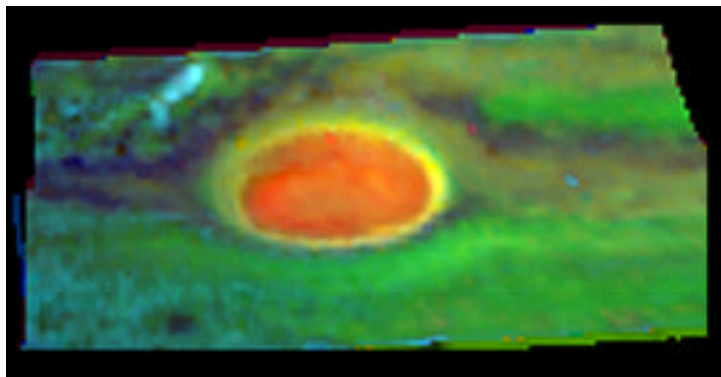


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## Galileo findings highlight planetary conference

By Martha Heil and Guy Webster



**E**xciting discoveries from JPL's Galileo spacecraft, as well as new findings on other planets, asteroids and comets, highlighted this week's meeting of the American Astronomical Society's Division of Planetary Sciences, held in Pasadena.

Galileo has detected an unusually pure cloud of young, fresh ammonia ice on Jupiter—the first ever seen—though the planet is known to contain ammonia gas.

In addition, scientists presented findings from Jupiter's moon Io. New Galileo pictures include the highest-resolution view yet of the volcanically active satellite, showing a bumpy plain that has dark and light patches interspersed like dark rocks reappearing through a shrinking layer of springtime snow. Elsewhere on Io, plains appear fully blanketed by the snow-like material.

Galileo's near infrared mapping spectrometer instrument has found extremely high temperatures inside Io's volcanoes, which are more abundant than previously believed and contain surprising substances. The spectrometer detects heat from lava and shows the location of different materials on Io's surface.

Other notable presentations at the JPL-sponsored conference included a "recipe" for the necessary ingredients to create the gaseous planet Neptune and observations of "white oval" storms at Jupiter (see story below).

The ammonia cloud, first discovered during Galileo's first orbit of Jupiter, may be in the cross-current of opposing paths of uncommonly strong wind, which pulls up ammonia gas from below. Scientists have named the spot the Turbulent Wake Anomaly because it lies downstream from Jupiter's Great Red Spot, a 300-year old storm two times as Earth.

Seeing pure ammonia clouds is surprisingly rare, said JPL research scientist Dr. Kevin Baines, who discovered the spot in infrared images and spectra taken by Galileo's near infrared mapping spectrometer. These clouds are normally covered up within a few

hours of their formation by unknown substances that attach themselves to the ammonia ice particles, he said, noting that "It is only because we got a clear shot of a fast-growing cloud in an unusually turbulent region that we were able to see the ammonia ice crystals before their surfaces were altered."

Planetary scientists have known that Jupiter contains lots of ammonia gas, because the gas absorbs certain wavelengths of light. Scientists would then expect that the low temperatures in Jupiter's outer atmosphere would cause the ammonia gas to condense into ice. Until now, localized ammonia ice clouds have never been seen, despite the cold temperatures and the abundance of ammonia.

Closer examinations by Galileo's spectrometer in May 1999 and May 2000 revealed that the spot was a heavy concentration of ammonia ice particles. The cloud may be as much as 15 kilometers (more than 9 miles) thick.

This spot will be further scrutinized by both Galileo and Cassini later this year in planned joint observations of Jupiter. Baines and his colleagues are eager to look for other materials that may be dredged up to high altitudes by the strong Jovian currents. "These rare materials must have been transported upward from far below the clouds," Baines said.

Galileo took the images of Io during a flyby that passed within 199 kilometers (124 miles) of Io in February. The snow-like material is not frozen water like Earth's snow, but a sulfur-rich material that looks like white snow, said Dr. Alfred McEwen, a University of Arizona planetary scientist.

"We see this volatile material everywhere on Io where we've had a close-up look," McEwen said. It includes sulfur dioxide, and probably other sulfur-rich substances, he said. On Earth, sulfur dioxide is a gas. On Io, it can be either a solid or a gas at the surface, or a subsurface liquid.

"It looks like this volatile material is sublimating or eroding away by some means, yet it's still there," McEwen said. "We'd like to know where it's coming from, how the surface layer is being resupplied."

JPL senior research scientist Dr. Glenn Orton presented Neptune data from the European Space Agency's Infrared Space Observatory's long wavelength spectrometer, which measures how elements reflect or absorb long wavelengths of light, and from the short wavelength spectrometer, which does the same for short wavelengths of light.

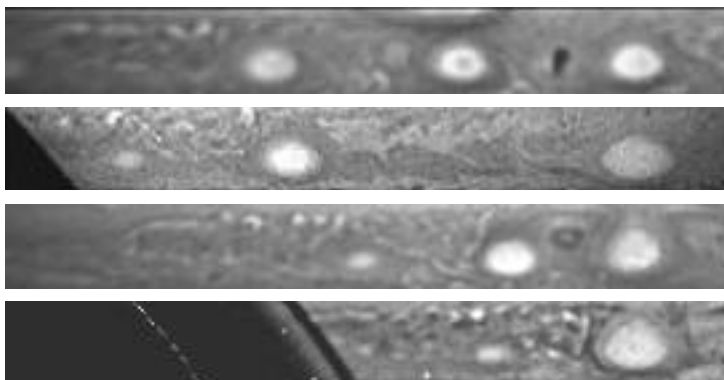
Neptune seems to be generating some of its own heat, Orton said. Data from the two spectrometers imply that Neptune is radiating heat at about 60 Kelvins (-351 degrees Fahrenheit). Scientists would expect Neptune to be only about 46.6 Kelvins (-375 degrees F), if its only source of heat were sunlight. According to Orton, it can then be deduced that Neptune must have an internal heat source.

Abstracts on these and other JPL presentations at the conference are available online at <http://www.aas.org/publications/baas/v32n3/dps2000/SL.htm>.

*The first discrete ammonia ice cloud positively identified on Jupiter is shown in the above image taken by the Galileo spacecraft. Ammonia ice (light blue) is shown in clouds to the northwest (upper left) of the Great Red Spot (large red spot in middle of figure).*

## Hubble images Jupiter 'white oval' activity

By Guy Webster



*These four images of clouds in a portion of Jupiter's southern hemisphere show steps in the consolidation of three "white oval" storms into one over a three-year span of time. They were obtained on four dates, from Sept. 18, 1997, to Sept. 2, 2000.*

For the first time, scientists have been able to watch the process of two of Jupiter's giant "white oval" storms, each about half the size of Earth, colliding and merging to form an even bigger storm.

"Usually when we've seen two of them approaching each other, they bounce back away from

each other," said Dr. Glenn Orton, a JPL senior research scientist and member of a team of Spanish, French and American astronomers that used the Hubble Space Telescope and ground-based telescopes to study the ovals this year. Dr. Agustin Sanchez-Lavega, an astronomer at Universidad del Pais Vasco, Bilbao, Spain, reported the team's observations Oct. 26 at the meeting of the American Astronomical Society's Division of Planetary Sciences in Pasadena.

An image of the storms before and after merging is available at <http://www.jpl.nasa.gov/pictures/jovianstorm>.

The researchers speculate that a similar merger took place centuries ago and may have built Jupiter's famous Great Red Spot, a storm that is twice as wide as the Earth and has persisted in Jupiter's southern hemisphere for more than 300 years.

Seeing the collision of two

storms will help scientists understand more about the dynamics of Jupiter's atmosphere. One question has been how deeply the roots of a storm at Jupiter's cloud tops extend into lower layers. In this year's merger, the upper layer seemed to move differently than underlying clouds.

Three white oval storms, in a band of Jupiter's atmosphere farther south than the Great Red Spot, became active about 60 years ago. In the following decades until 1998, they sometimes approached each other but never collided. In early 1998, two of the ovals were approaching each other as Jupiter went out of sight from Earth, behind the Sun. When the planet came back into view, the two had become one.

"We weren't able to see how they came together that time," Orton said.

Last year, the oval resulting from the 1998 combination

approached the remaining one of the original three ovals. Each was a swirling high-pressure vortex, upwelling at the center and spinning winds counterclockwise to about 470 kilometers per hour (290 mph). One was about 9,000 kilometers (about 5,600 miles) across, the other slightly smaller.

A third, darker oval, swirling clockwise instead of counterclockwise, formed temporarily between the two white ovals. That type of interceding system may be what usually keeps white ovals from colliding, the team proposed. But in this case, the middle storm appears to have been pushed even farther south and torn apart as all three passed near the Great Red Spot last December.

The disappearance of the opposite-swirling storm from between them cleared the way for the two white ovals to meet.

## News Briefs



Dr. Michael Turmon

### Turmon wins early career award

JPL engineer DR. MICHAEL TURMON, 35, who developed revolutionary new methods for tracking bright spots as they move across the Sun, this week received the Presidential Early Career Award in a Washington, DC ceremony.

The award, established in 1996, is the highest honor given by the United States government to scientists and engineers as they begin their careers.

Turmon, a senior member of JPL's Data Understanding Systems Group in the Exploration Systems Autonomy Section, earned the award for his computational work in solar physics. He created a program that recognizes patterns in the motions of bright solar spots, and translates them into user-friendly graphics. The program recognizes certain patterns in the different kinds of data that physicists acquire with many types of detection systems. It will be used on the Picard satellite, which is scheduled to launch in 2003, and now runs on the Solar and Heliospheric Observatory's Michelson Doppler Imager instrument. Turmon and his co-investigators have been processing data with the software since 1996.

### United Way campaign coming up

A kickoff celebration for the Laboratory's 2000-01 United Way campaign, "Let's Share Because We Care," will take place Tuesday, Oct. 31 on the mall, in conjunction with the annual ERC Halloween Fashion Show.

The event features displays by various community service agencies supported by United Way. Last year, United Way of Greater L.A. raised \$63 million and JPL's United Way campaign raised \$429,000.

In conjunction with the campaign, JPL's annual food drive is underway through Nov. 10. Last year, JPL employees and contractors donated enough food to help feed more than 1,000 families.

Suggested items for food donations include canned stew, pork and beans, soup, chili and dried foods such as cereal, coffee, flour and sugar.

Food donations may be put into barrels at the following locations:

Building 79; Building 114-104, ERC; Building 180, lobby and second floor; Building 183, by elevator; Cafeteria 190; Building 198; Building 230; Building 301, second floor; Building 302; Building 303 lobby; Trailer 1720.

A barrel will also be set up at the kickoff celebration for those attendees who wish to donate food at that time.

Eurest Dining Services will provide a

\$5 lunch special, of which 50 cents per meal will be donated to United Way.

On Oct. 31, representatives within each JPL organization will begin contacting employees for campaign participation. The top JPL campaigners in each organization will be honored at an awards ceremony.

A downloadable contribution form can be accessed from the JPL United Way web site at <http://hr/unitedway>.

For more information, go online to <http://hr/unitedway> or contact Nellie Vidaca at ext. 4-1612.

### Jupiter Millennium Flyby site is up

The Jupiter Millennium Flyby site maintained by JPL gives visitors a travel guide of the Cassini and Galileo spacecraft near Jupiter from October through March. It will provide regular updates of new information and pictures gathered by the spacecraft and by related Jupiter research.

The site is at <http://www.jpl.nasa.gov/jupiterflyby>.

Cassini will pass near Jupiter in December to gain the gravitational assist it needs for reaching its main objective, Saturn, more than three years later. Its closest approach to Jupiter will be about 10 million kilometers (6 million miles) away, on Dec. 30. It began returning Jupiter pictures and data last week.

Galileo, which has been orbiting Jupiter since late 1995, is currently in a distant portion of an elongated orbit and will be returning close to Jupiter in December. A coordinated plan of studies aims to use the opportunity of having two different vantage points to gain new information about Jupiter, its moons, and its surrounding environment.

The site will offer several animations from various points of view. It also has educational material for classroom use.

### Art competition still open

JPL staff are encouraged to submit their artwork for the Director's Annual Art Competition. Winners will have the opportunity to display their art in the Director's Office in Building 180-904.

An independent judging panel from the local art community will review submitted entries and make preliminary selections. Finalists will then bring in actual artwork for the final selection by the jury panel.

Entries are due Friday, Oct. 27. Complete details and submission forms are available in the Director's Office. For more information, call DONNA CAMPBELL at ext. 4-3406.

the mass, cost and on-board resource needs of future spacecraft.

The Cross-Enterprise Technology Development Program is a primary NASA vehicle for identifying and developing revolutionary space technologies to enable future missions and stimulate new concepts for missions not yet conceived.

The list of selected proposals is available on the Internet at <http://www.aerospace.nasa.gov/programs/xenterprise>.

The JPL researchers and their selected proposals are as follows:

Ratnakumar Bugga (Section 346): Micro-Power Source with Integrated Solid State Micro-Batteries and Charge Electronics.

Dr. Dariush Divsalar (Section 331): Power and Bandwidth Efficient Coded Modulation.

Dr. Serge Dubovitsky (Section 346): MSTAR: A High Precision Laser Range Sensor.

Dr. Polly Estabrook (Section 331): Sensor Webs for In-Situ Science.

Pantazis Mouroulis (Section 385): High-Performance Diffraction Gratings for Advanced Miniature Spectrometers.

James Polk (Section 353): Advanced Ion Optics for High Power, High Isp Ion Thrusters.

## Special Events Calendar

### Ongoing Support Groups

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

Codependents Anonymous—Meeting at noon 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 the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

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

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

### Friday, October 27

JPL 2000 Talk—Dr. Diane Evans, Alfred Zieger and Dr. Loren Lemmerman will discuss Earth science and future missions and technologies at 11 a.m. in von Kármán Auditorium.

### Saturday, October 28

FolkMusic—Singer/songwriter Adie Grey and guitarist Dave MacKenzie will perform at 8 p.m. in Caltech's Winnett Lounge. Tickets are \$12 for adults, \$4 for children under 12. For information, call (626) 395-4652.

### Monday, October 30

Caltech Ballroom Dance Club—The final session in a five-week class on beginning west coast swing will be held from 7:30 to 9 p.m. in Winnett Lounge. Taught by a professional instructor; no partner is required. Series cost is \$30. See [www.its.caltech.edu/~ballroom](http://www.its.caltech.edu/~ballroom) or call Don at (626) 791-3103.

### Tuesday, October 31

ween  
tion  
—All participants in full costume will receive a \$5 ERC lift certificate. Festive begin at and will be hosted by KNBC weatherman Fritz Coleman. Included will be an announcement of the winners of the ERC's pumpkin carving contest, in six categories. This event will be held in conjunction with the United Way kickoff celebration.

Social Security—A representative will be on Lab from 9 to 11 a.m. in the Building 167 Cafeteria.

### Wednesday, November 1

AFS Quick Start Session for Windows NT—Jeff Sachs of Section 366 will provide an overview of the AFS distributed file system to manage computer files, including setting up group space, accessing data, publishing web pages, and more. At noon in the Building 167 conference room. Information about Mac AFS access can be obtained by calling Sachs at ext. 4-6238.

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

Caltech Ballroom Dance Club—The last session in a five-week class on

Argentine tango will be held from 7:30 to 9 p.m. in Winnett Lounge. Cost for the amateur-taught course is \$1. See [www.its.caltech.edu/~ballroom](http://www.its.caltech.edu/~ballroom) or call Don at (626) 791-3103.

"Keck: The Early Childhood of a Scientific Giant"—Caltech astronomy professor Dr. Judith Cohen will give this free lecture at 8 p.m. in Beckman Auditorium. For information, call (626) 395-4652.

### Thursday, November 2

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

### Friday, November 3

"Year 2000 Annual Briefing for Administrative Professionals: Overcoming Overload, Strategies for Staying on Top"—The Director's Advisory Council for Women will present a seminar taped from an earlier broadcast featuring Pulitzer prize-winning journalist Dave Barry, who will provide a humorous, insightful perspective on how to manage life in an era when balancing life and work can be akin to managing chaos. Held from 11:30 a.m. to 1:30 p.m. in von Kármán Auditorium.

Vanities—Heather Tom, Stacey Keanan and Emily Kay star in this off-Broadway, bittersweet comedy about the growth of friendship between three women coming of age in the '60s and '70s. Contains mature themes. Held at 8 p.m. in Caltech's Beckman Auditorium, tickets are \$29, \$25 and \$21. For information, call (626) 395-4652.

### Fri., Nov. 3–Sun., Nov. 5

Hedda Gabler—Theatre Arts at Caltech will present the Ibsen play at Dabney Lounge at 8 p.m. on Friday and Saturday, 2 p.m. on Sunday. Tickets are \$15. For information, call (626) 395-4652.

### Tuesday, November 7

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

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

### Wednesday, November 8

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

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.

"Mouldy Manor"—This comedy/mystery/drama will be presented by the JPL Drama Club in von Kármán Auditorium, noon to 1 p.m.

### Friday, November 10

Travel Film—*Marco Polo's China Today* will be presented at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. For information, call (626) 395-4652.

### Fri., Nov. 10–Sun., Nov. 12

Hedda Gabler—Theatre Arts at Caltech will present the Ibsen play at Dabney Lounge at 8 p.m. on Friday and Saturday, 2 p.m. on Sunday. Tickets are \$15. For information, call (626) 395-4652.

## Lab proposals selected for technology development

Six JPL proposals were among 111 proposals NASA has selected as part of its Cross-Enterprise Technology Development Program. The agency will spend more than \$120 million seeking high-payoff technologies to revolutionize future spaceflight systems.

Over the next one to three years, principal investigators in 30 states, chosen from a field of more than 1,200 applicants, will explore promising new ideas that could lead to the agency's achieving many of its long-range goals in space science, Earth science and human exploration of space. Forty-nine percent of the selected proposals are from universities.

The broad range of studies, to be conducted by universities, industry, and private and government laboratories, will address 10 general technology areas. For example, new sensors will be developed for the gathering of previously unavailable science data from remote sources. The automation of spacecraft functions will be studied to enable complex new missions with greatly reduced human intervention. New component technologies including advanced materials, microdevices and support systems will be developed that can significantly reduce



# ODYSSEY DRAWS CLOSER

*Risk reduction a key component of the 2001 Mars orbiter, whose launch is just five months away*

*By Mark Whalen*



Richard Hasegawa / JPL photos

*Flight Systems Manager Roger Gibbs points out a feature on a model of the 2001 Mars Odyssey spacecraft.*

Preparations for JPL's next Mars mission, the 2001 Mars Odyssey orbiter, continue to move forward toward the spacecraft's launch next April.

Project Manager George Pace and other team members updated JPL staff on the status of the mission last week in von Kármán Auditorium.

So far, acoustics and thermal vacuum tests have been concluded, and instruments have been integrated. Flight units will be ready for integration by late November, and a number of minor items remain to be finalized. If all goes as planned, the Odyssey spacecraft will be shipped in early January to Kennedy Space Center for launch integration.

With its three-instrument science package, Odyssey will attempt to find out what Mars is made of, detect water and shallow buried ice and study the radiation environment.

In many ways, 2001 Odyssey is a follow-on to Mars Climate Orbiter, which was lost last year before reaching Mars orbit. In the wake of the losses of Mars Climate Orbiter and Mars Polar Lander, 2001 Mars Odyssey has undergone a series of actions to reduce risks. Pace noted that an independent "red team" review board provided invaluable help to the Odyssey team in reducing mission risk.

"Working with the red team was kind of like burnishing metal," Pace said. "It doesn't feel too good when it's happening, but when you're finished you get a nice, polished product."

Actions the project has taken to reduce risks include:

- Independent verification on mission-critical parameters.
- Use of both English and metric units. "When we've had internal handoffs between systems and subsystems, we've documented which units were being used, so that everyone's aware of it," Pace said.
- Performing "fault trees" for all mission phases before launch, rather than after launch. "We've discovered what we can do to mitigate risk, such as additional testing and analysis. It's the strongest thing that's come out of this review process," Pace said.
- Adding check valves in the propulsion system, which will allow for earlier pressurization, providing telemetry visibility for Mars orbit insertion.
- Performing oxidizer burn depletion tests to verify a valid state of operation for the engine. More tests are planned to build confidence in the system.
- Augmentation of both the development and operations staffing at JPL and at partner Lockheed Martin. As part of this effort, a risk-reduction team is testing the flight software to essentially "break" it, find its limits and build confidence in it.
- Formalization of operations training, with a full-time test and training engineer.

"We packed a lot of science into a modest orbiter," noted 2001 Odyssey Flight Systems Manager Roger Gibbs. "We had the benefit of seeing how Mars Climate Orbiter was developed and ultimately performed. As a result, we have been able to include more science—as a fraction of power, mass or other demands on the flight system—than any other spacecraft has done."

Since the loss of Mars Climate Orbiter, he said, "We have operated in a 'must work at all costs' mode. I will not allow a schedule or cost

argument to prevent us from doing anything to increase reliability. That's been a paradigm change. We're doing more design reviews, tests and requalifications, and as a result, we have a significantly more reliable spacecraft."

Project Scientist Dr. Steve Saunders noted that Odyssey will benefit from the experience of a number of staff who also worked on Magellan, the Venus mapping mission that introduced the aerobraking technique to stabilize a spacecraft's orbit. Saunders also acknowledged "the huge role that Mars Global Surveyor is continuing to play in getting us ready and allowing us to pose the kind of questions we're going to be addressing with Odyssey."

Mars Global Surveyor's thermal emission spectrometer has resolution of about 3 to 4 kilometers, and at that resolution, Saunders said, "we're able to see basic, crustal rock types. But we need to look at it at a much higher resolution, which is what we'll do with the thermal emission imaging system (THEMIS) on Odyssey."

THEMIS, developed by Arizona State University, will combine infrared and visible imagery to correlate MGS data, but down to a much finer scale. The instrument will provide 100-meter resolution in the infrared, 30 times that of Global Surveyor's thermal emission imaging system.

The Mars Radiation Environment Experiment (MARIE), being built by NASA's Johnson Space Center, will study the radiation environment near Mars. It was originally designed to work in tandem with a similar instrument on the surface of Mars (when the mission plan also included a lander) to analyze a tissue-equivalent dose of radiation a human might experience. "We will still have MARIE in orbit to look at problems we might experience on the way to and in Mars orbit," Saunders said.

The gamma ray spectrometer, provided by the University of Arizona, will map the elemental abundance of the surface of the planet. "We will be able to see and map the distribution of hydrogen on Mars on a regional basis," Saunders said. "So if there's a pattern in the northern hemisphere where ice may be stable on the surface at a particular latitude, we'll be able to see that pattern very nicely. Certainly we will be able to see polar ice very well."

Mission Manager Dave Spencer noted that because of the spacecraft's outbound trajectory in a highly southern declination, a tracking station in Santiago, Chile, has been added to fill in the gaps in telemetry when the Deep Space Network's Canberra, Australia, outpost can't see Odyssey the first week or so following launch.

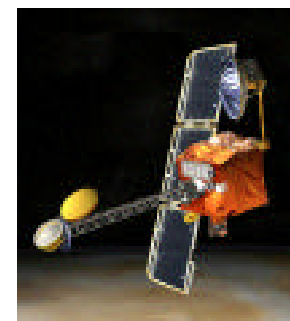
Launch is scheduled for April 7, with a 21-day window and two launch opportunities each day.

Four trajectory correction maneuvers are planned during the cruise phase, the first one eight days after launch. The timeline calls for a cruise of about 200 days. Upon Mars orbit insertion, aerobraking will take 1 1/2 to 3 months to the desired 400-kilometer (about 250 miles) circular mapping orbit. There will be about a two-week period from the end of aerobraking to the beginning of the science mission.

Through its UHF radio, Odyssey will also serve as a relay station for Europe's Mars Express and Beagle landers, and later for NASA's twin 2003 rovers now under development at JPL.

**"We've discovered what we can do to mitigate risk, such as additional testing and analysis. It's the strongest thing that's come out of this review process."**

— George Pace, 2001 Mars Odyssey project manager (above left)



## Passings

**DONALD LYNN**, 68, former deputy manager of the Voyager Project's Flight Science Office, died Oct. 14 at Granada Hills Community Hospital following a cerebral hemorrhage.



Donald Lynn

Lynn shared responsibility for the organization, management an operational direction of all science activities on the Voyager mission to the outer planets. Prior to this assignment, he served as supervisor of the Space Image Processing Group, which included supporting the Mariner 10 and Viking missions, as well as planning activities for Voyager and Galileo.

His interests led Lynn to participate in a project to develop and apply digital image processing techniques to the Shroud of Turin, which some believe was worn by Jesus Christ at the time of his death.

Lynn worked at JPL from 1971-81 and continued to work as a consultant to the Laboratory for years after his retirement. He is survived by his wife, Patricia; sons Tim, Michael and Patrick; and daughters Elizabeth and Jennifer.

Memorial services were held Oct. 17 in Granada Hills.

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Universe online

<http://universe.jpl.nasa.gov>

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### Notice to Advertisers

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

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

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

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

## Letters

My family and I would like to thank our friends at JPL for their expressions of sympathy in the passing of my mother. Also, thank you to the staff at ERC for the beautiful plant.

Thomas F. Lynch

My family and I would like to thank our friends at JPL for their condolences on the passing of my mother. We also thank ERC for the beautiful plant sent to our home.

Sien Wu and family

On behalf of my family, I would like to thank the friends of my brother, Gary Wanczuk, for their kindness at the time of his passing. The plants and personal expressions were deeply appreciated at a difficult time.

Gail Wanczuk Barton

My family and I would like to thank our friends at JPL and ERC for their kind expressions of sympathy on the recent passing of my mother. We greatly appreciate your support at this most difficult time.

Jennifer Wu and family

My family and I would like to thank the employees of JPL for their expressions of sympathy at the passing of my father. We would also like to thank the ERC for the beautiful plant, a living memory of my dad.

Richard Halverstadt

## Classifieds

### For Sale

AIR CONDITIONER, window, White-Westinghouse, 9950 BTU, perfect condition, 3 months old, in original box with manuals & 5-yr. warranty, \$250. 842-6445.

BASEBALL CARDS, Post cereal, 1992-94, 30-card sets plus checklists, \$12 each or all three for \$30; also 1995 Tombstone Pizza set for \$20. 626/332-2682, Steve.

BEDROOM FURNITURE: dresser w/mirror and 2 matching nightstands; dresser is 70" wide by 30" high with 9 drawers; nightstands are 26" wide by 23" high with 2 drawers; all for \$265/obo. 626/914-7853.

BIKES: Royce Union BMX, excellent cond., front & rear Oryg. brakes, frnt. rear pegs, lifetime warranty, 6 mo. old, \$100; Huff City 15-speed, \$25. 626/

797-3202, Ryan.

CD JEWEL CASES, 50 ea., \$10; DIET TAPES, Jenny Craig, set of 14, \$50; PWR. CONT. CTR., 5 pwr switches + 1 master sw., 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; SPRINKLER VALVE ADAPTERS, Lawn Genie automatic, model 756LG 3/4, new, \$10 each; ORGAN, Yamaha 415 electr. console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. \$7,500, sacrifice for \$3,000. 790-3899. CLAY POTS, round, large (2-ft and 3-ft diameter), \$50 each 2" obo, \$60 each 3" obo. 626/398-3480.

CRIB, 2 drawers under bed, 3-drawer chest, includes mattress, very good condition, \$250. 957-3130.

DIAMOND RING, Marquis cut (.33) with 6 small diamonds (.18): total CTW .51; \$1,900 value, sell \$500. 362-3358.

DOG, Beagle puppy, male tri-color, last of the litter, 10 weeks old, will send photos if interested, \$250/obo. 661/722-6067, Debi, or e-mail dhouer@as.net.

EXERCISE MACHINE, Healthwalker, vg condition, \$50/obo. 626/447-4734.

FILE CABINET, 5 drwr, lock, \$60/obo. 909/593-4046, [vivdavies@starquest.net](mailto:vivdavies@starquest.net).

FURNITURE, kitchen, country style (oak and hunter green), mint condition, table seats 7, matching 4 chairs and bench breakfast oak base with hunter green cabinets and hutch microwave cart opens into a small table for 4 cabinet below, bench opens to store shoes; complete set: \$900. 909/621-3921.

FURNITURE, oak: computer desk, 2-piece L-shape w/butcher block top, keyboard drawer, 5 drawers (2 for files, 1 w/lock); file cabinet, vertical, 4 drawers (1 w/lock); shelf unit w/8 shelves 50w x 60h x 12d; all in very good condition; all for \$500/obo. 626/791-6101.

HOCKEY TICKETS, Kings, season ticket holder selling individual games, 2 tickets, lower level. 626/331-9998.

MICROSCOPE, Bausch & Lomb, professional size with 3-turret objective and understage lamp; 10x objective provides 35, 100 and 430X; coarse and fine focusing; for advanced student; good condition, \$75. 909/624-6970.

MICROWAVE, Quasar, 600 W, 0.85 cu. ft., works great, \$60/obo. 626/254-1550.

MISC.: Portable AM/FM (Craig) cassette, great for dorm or RV, \$20; cell phone, Motorola Dynasty, \$30; exterior motion detector, \$10; folding craft/sewing table, \$30; Western Oil (pottery in grass), \$30. 362-3358.

MONITOR, color NEC, 13-in., works fine, \$60/obo. 626/254-1550.

OVEN, convection by Décor, self cleaning, electric, white, wall mount. \$150/obo. 626/584-9632.

PET ITEMS: New canary/finch "house" style white cage (very good size), \$25; new dog pillows, \$10; cat scratching posts, \$10; dog sweaters, \$7-10; assorted used finch/canary cages at reasonable prices. 626/798-6248.

PIANO, player, 1920s, Henderson w/ Gulbranson player, older restoration, \$1,200/obo. 626/797-8562.

REFRIGERATOR, 14 cu. ft., 7 yrs. old, white, good condition, runs like new, \$100. 626/351-0182, Mike.

SEWING MACHINE, Singer portable, model 15-91, in case; used little older model; excellent instruction book plus box of attachments, \$75. 909/624-6970.

SKATES, Microblade by Rollerblade, youth size 1 & 2 (two boot sizes for the skates), black, hardly used, \$70. 952-8455.

SOFA & LOVESEAT, Lazy-Boy reclining, excellent condition, purchased in February, upholstered in beautiful black chenille fabric, very comfortable, must sell, \$1,000/both pieces/obo. 805/584-3701.

TABLE dinette, square glass top 5' x 5' w/metal feet and 4 matching chairs, \$800/obo; BAR STOOLS, 4 matching, metal frame, all in excellent condition, \$400/obo. 626/398-3480.

TELEVISION, Panasonic 25" diagonal, wooden cabinet, remote control, 8 yrs. old, \$150/obo. 626/398-3480.

TREADMILL, \$385. 909/593-4046, [vivdavies@starquest.net](mailto:vivdavies@starquest.net).

### Vehicles / Accessories

'93 ACURA Integra RS, black, 5-spd manual, air cond., full power, stereo CD/cassette, alarm, rear spoiler, original owner, 106K mi., excellent condition, \$7,800 (reduced). 790-1419.

'91 CHEVY S10 pickup, V6, 140K, good condition, 5-speed manual trans., radio/cassette player with CD changer, custom rims, red w/tan interior, \$2,500. 323/259-8604, Traci.

'98 DODGE Durango SLT+, 4X4, must see to appreciate, loaded, full power, 1 owner, 22k mi., \$24,500. 661/803-2885, Jeff.

'95 DODGE Neon Highline, 4-dr. sedan, 67,800 miles, 5 spd., white w/gray interior, air cond., cruise, power locks, CD/stereo upgrade, tire upgrade, original owner, VGC, \$4,950/obo. 626/355-4376.

'84 DODGE D-50 pickup truck, excellent cond., auto trans., 2.6 liter eng., bedliner, shell, new battery and carburetor, very clean, well maintained, all service recs, 139K mi., orig owner, \$2,500/obo. 626/332-2682, Steve.

'97 FORD Expedition 4x4, blk., pwr. everything, CD, custom rims, loaded, 48K miles, \$27,500/obo. 626/798-5603, Todd.

'91 FORD Tempo, 75,000 miles, blue, runs and looks great, \$3,200/obo. 790-3854.

'89 FORD Tempo GL, new paint, new tires, new brakes, runs well, original owner, \$2,300/obo. 626/966-2904, Eva.

'88 FORD conversion van, 80K mi., TV, ice box, new a/c, very good cond., \$4,800/obo. 310/313-2101.

'90 HONDA Accord EX, beige 4-door sedan, 5 spd., moonroof, 94,000 miles, full power, 1 owner, great cond.; wholesale Kelley Blue Book \$4,625, retail \$7,375; sell for \$5,500. 249-0573, Vicki.

'94 JEEP Grand Cherokee Laredo, 105k mi., well maintained, top of the line, very good condition, new muffler and bumper, many extras, \$10,500. 626/441-0150, Danny.

'90 MERCEDES BENZ 420SEL, 50,000 mi., mint condition, light blue, \$18,000. 249-8616, Bruce MacNeal.

'82 MERCEDES BENZ 380SL, auto, black w/ tan interior, lo mileage on engine still under warranty & transmission, sunroof & AM/FM cassette radio, \$4,200/obo. 626/794-3550.

'93 MERCURY Villager LS minivan, 2 AC, CD changer, roof rack, vg cond., 107k mi., \$6,800/obo. 909/902-1025.

'96 MITSUBISHI Eclipse GSX turbo, 86K mi, 5-spd. stick, exc. cond., black exterior/gray leather interior, auto moonroof, cruise control, a/c, CD player/cass./AM-FM Infinity system, pwr. steering/windows/locks, keyless entry alarm, set of 4 brand new 16" tires, alloy wheels, anti-lock brks, dual airbags, leather-covered steering wheel, \$11,000. 213/949-1099.

'99 SATURN 3-door coupe (SC2), blue, 5 speed, sunroof, cd player, premium wheels, prepaid factory service, 24k fwy miles, really fun car, excellent condition, \$15,000. 310/364-0125.

'94 SATURN SL2, 4dr., automatic, red/gray, 89K, a/c, am/fm/cass., cruise control, electric window & door locks, all svc. records, well maintained, \$5,000/obo. 626/447-4734.

'91 SUBARU Legacy Turbo Sedan, AWD, auto, sport suspension, CD, sunroof, ABS, silver, 158K, runs great, \$4,000. 500-0488.

### Wanted

PASADENA JAYCEES seeks members to have fun, meet people and do great things for the community: general membership meeting first Wed. of every month at 7 p.m. at Villa Gardens, 842 W. Villa St. 626/792-5146.

ROCKS: rounded "arroyo stones", softball size and larger; any amount, we will haul. 626/398-4262, Martin.

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

TENNIS PLAYER, practice in Pasadena area, weeknights, 4.5-5.0 level. 626/836-4960, Jason.

### Lost & Found

Found: EARRINGpart, silver & "crystal" ball dangle; found outside 303 cafeteria on Oct. 17. Ext. 4-3581.

### Free

CATS: 2 rescued kittens, both are litter trained, one Calico female, one male, gray and white. 760/242-3689 or 626/287-9433.

COUCH, off-white, fair condition, perfect for kids to jump on, very comfy, U pick up. 248-6062.

DOG: 9-year-old Golden Lab, spayed, house broken, loves people, very gentle, needs caring owner. 249-1017.

DOG: female Golden Retriever mix, rescued, was living on a leash; 1 year old, very sweet, well mannered, mellow personality, 1st set of shots, healthy, cat friendly, likes other dogs; needs a permanent home. 626/287-9433.

TREE: one Monterey Pine in tub, 7 1/2 ft tall. 626/355-3201, Monty.

### For Rent

ALTADENA, lg. furn. rm., cable TV, priv. ba., also share lg. hilltop house, pool, patios, panor. view with ret. JPL engr.; all amen. e.g. kitchen w. d/w, laundry rm., c/a/h; priv. prkg. spot, 11 min. JPL, smokg. OK, owner smokes cig., \$480 incl. all util., + dep. 626/794-1050, after 5 p.m., Harry.

LA CANADA house, spacious 4 bd., 3 ba.; 5 min. to JPL; study, family room, formal living room, back yard with fruit trees; close to shuttle and blue ribbon schools; \$3,000. 626/744-3243, evenings.

LA CRESCENTA guest house, 1 bd., 1 ba., prkng., patio, Indry, a/c, refrig., priv. entry, no pets, no smoking, credit check, \$650 util. incl. 957-2173.

LA CRESCENTA guest house, woodsy secluded area, kitchen, ba., lg. rm. w/modular closet. 957-1949.

MONTRORSE apt., 1 bd., 10 min./JPL, avail. Nov. 1, \$650. 626/445-0884.

PASADENA apt. to share w/Caltech post-doc, 3 bd., 3 ba., laundry, fully furn., avail. Nov. 1, \$495 + 1/3 util. 626/351-9641.

PASADENA, part of a beautiful home, nice setting, private entrance, one room, kitchenette, full bath, ideal for person w/quiet lifestyle, \$550. 626/798-4056.

PASADENA, 1 bd., 3/4 ba., charming 1907 bungalow, share house with JPL engineer, laundry, central A/C, quiet neighborhood, off-street parking, all privileges, 10 min./JPL, \$600 incl. util. 626/296-8315.

SAN GABRIEL VILLAGE, beautiful home, 3 bd., 2 ba., excellent cond., separate dining or fam. room, fireplace, patio, double garage, lg. fenced rear yard, gardener paid, 610 Abbot Ave., 20 min. from JPL, \$1,400. 626/792-3732.

SUNLAND, Shadow Hills horse ranch, 3 bd., 2 ba., 2 level on mt. side, horse corral, end of road, quiet, avail. 11/1, \$1,395. 626/584-6526, Fred.

SYLMAR townhouse, exc. cond., 2 bd., 1-1/2 ba., f/p., central air, stove, d/w, disposal, washer/dryer hookup, sec. alarm/gates, 2-car enclsr., 2 priv. patios, pool, Jacz., \$875. 248-4637.

### Real Estate

BURBANK, 2 bd., 1 ba., formal dining rm., vg cond., central heat/air, fireplace, 2-car garage, covered patio, timer sprinklers, \$227,500. 790-4379, eve.

PASADENA, executive condo next to Caltech, totally remodeled 2 bd. + 1 3/4 ba., 1,200 sq. ft., newly refinished hardwood floors in din. rm, newer appliances, carpet & paint, large balcony just redone, overlooking beautiful trees; top floor unit in park-like setting, walk to Caltech & S. Lake Ave: nice pool and spa; \$219K. 626/585-9048.

PRESCOTT, Arizona, 1/2-acre lot in Timber Ridge subdivision, one of area's finest, in the Ponderosa Pines, located at end of a cul-de-sac, has underground utilities, indoor and outdoor pools and tennis courts; lot ref. #MLS-357840, \$65,000. 626/798-2440, eves.: 888/540-7355, Tim Parker, Prescott Pines Realty.

SO. PASADENA condo, 2 bd., 2 full ba. with large patio, fireplace in living room, new carpet in bedrooms, recently painted, Pergo flooring throughout living, dining, and kitchen, about 985 sq. ft, unit security system, community pool/spa, and gym; very nice complex: move-in condition, 20 minutes to JPL, \$134,000. 323/259-8604, Howard.

SYLMAR, 2 houses + bonus in 1 lot; front: 2 bd., 1 ba., a/c units, front yd.; back: 2 bd., 1 ba. + 1 in-law bd. set up with 1 ba., cent. a/c/h, backyd. trees; each house has detached 2-car garage w/newer doors, lg. drive-way, new modern windows/copper plumbing/roof; 15638-40 Lakspur St., reduced price \$259,900. 340-5000, George Guetzolan, Century 21; 949/829-9430 owner.

### Vacation Rentals

BIG BEAR cabin, quiet area near town, good walking, hiking, 2 bd., sleeps 8, completely furn., \$75/nt. 249-8515.

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

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

CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-8853.

HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing and beautiful, swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.

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

LAKE ARROWHEAD house, 4 bd., 2 1/2 ba., sleeps 10; quiet, secluded, relaxing woodsy area of Cedar cng; close to the best hamburgers/malts on mountain; JPLers get 2 for 1 + cleaning fee: <http://www.mountaincountryrealty.com/rentals/shikawa.html> or [http://www.highcountryrents.com/cedar\\_run.html](http://www.highcountryrents.com/cedar_run.html) for pictures/rates. 626/403-0446.

LAKE TAHOE, North Shore, 2 bd., 2.5 ba., sleeps 6, private beach, great location, all amenities, hiking, golfing, fishing, 2 miles to casinos; thru Nov. 8 - \$85/day or \$475/week + cleaning fee, 3-night minimum; call for holiday info. 626/355-3886, Rosemary or Ed.

LAKE TAHOE, West shore @ Homewood, close to northern ski areas: Squaw, Alpine Meadows, Homewood, etc.; 3 bd. + loft, 2 ba., slps. 8, linens provided, full kitch. & laundry, TV/VCR, wood stove; 2 day min., JPL disc., \$75 cleaning fee. 626/585-0321, Bob or Nicole.

MAMMOTH, Chamonix condo at lifts 7, 8, 16, 17, walk to warming hut; 2 bd., 2 full ba., slps. 6, fully equip'd elec. kitch. w/mcrow. & extras; f/p & wood, color TV, VCR, cable, FM stereo, pool & sun area, old Jacuzzi, sauna, game, rec. & laundry rms., play & BBQ areas, convenient to lifts, shops, events, daily/special midweek rates. 249-8524.

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

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

PACIFIC GROVE hse, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kit w/microw., beaut. furn, close to golf, bches, 17 Mile Dr., Aquarium, Cannery Row, JPL discont. 626/441-3265.

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

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