

# Deep Impact is bound for comet

By DC Agle



Deep Impact launches from Cape Canaveral on Jan. 12.

THE JPL-MANAGED DEEP IMPACT SPACECRAFT BEGAN ITS 431-MILLION kilometer (268-million mile) journey to comet Tempel 1 on Wednesday, Jan. 12, at 10:47 Pacific time.

Deep Impact is comprised of two parts, a “flyby” spacecraft and a smaller “impactor.” The impactor will be released into the comet’s path for a planned collision on July 4. The crater produced by the impactor is expected to be up to the size of a football stadium and two to 14 stories deep. Ice and dust debris will be ejected from the crater, revealing the material beneath. The flyby spacecraft will observe the effects of the collision. NASA’s Hubble, Spitzer and Chandra space telescopes, and other telescopes on Earth, will also observe the collision.

Deep Impact’s flyby spacecraft measures 3.3 meters (10.8 feet) long and weighs in at 601 kilograms (1,325 pounds) at launch. After releasing a 1 meter by 1 meter (3- by 3-foot) projectile to crash onto the comet’s surface, the flyby spacecraft will reveal the secrets of the comet’s interior by collecting pictures and data of how the crater forms, measuring the crater’s depth and diameter as well as the composition of the interior of the crater and any material thrown out, and determining the changes in natural outgassing produced by the impact.

The spacecraft’s impactor will collide with comet Tempel 1 when the comet is near its perihelion, or the closest point to the Sun in its orbit. The impactor will strike it at a relative velocity of 10.2 kilometers per second (22,800 mph).

Comets are time capsules that hold clues about the formation and evolution of the solar system. They are composed of ice, gas and dust, primitive debris from the solar system’s distant and coldest regions that formed 4.5 billion years ago.

The geologic record of the planets shows that, about 3.9 billion years ago, a period of heavy cometary and asteroidal bombardment tapered off. The earliest evidence of life on Earth dates from just after the end of this heavy bombardment. Comets are also at least partially responsible for the replenishment of Earth’s ocean after the vaporization of an early ocean during the late heavy bombardment. While Earth has long been regarded as the “water planet,” it and the other terrestrial planets (Mercury, Venus and Mars) are actually poor in the percentage of water and in carbon-based molecules they contain when compared to objects that reside in the outer solar system at Jupiter’s orbit or beyond.

Comets are about 50 percent water by weight and about 10 to 20 percent carbon by weight. It has long been suspected that what little carbon and water there is on Earth was delivered here by objects such as comets that came from a more water-rich part of the solar system.

Deep Impact is the eighth mission in NASA’s Discovery Program, which sponsors frequent, cost-capped solar system exploration missions with highly focused scientific goals. Created in 1992, the Discovery Program competitively selects proposals submitted by teams led by scientists, supported by organizations that manage the project, as well as partners that build and fly the spacecraft. Deep Impact was built for NASA by Ball Aerospace and Technologies Corp., Boulder, Colo.

For more information, visit <http://deepimpact.jpl.nasa.gov>.

# Jason, Topex data show new details of tsunami

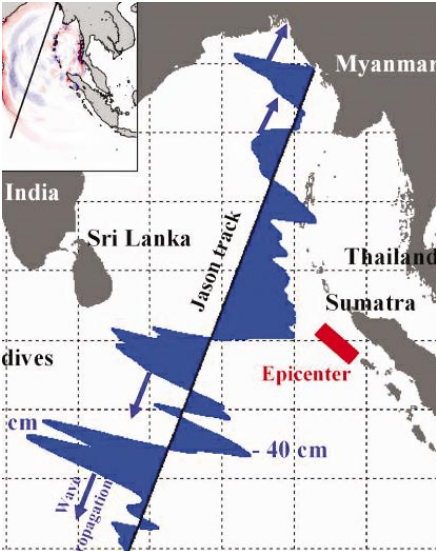
By Alan Buis

FOR THE FIRST TIME, ORBITING SATELLITES HAVE OBSERVED AND measured a major tsunami event in open ocean, the Indian Ocean tsunami that resulted from the magnitude 9 earthquake southwest of Sumatra on Dec. 26. The measurements are of tremendous value to researchers worldwide and will aid our understanding of these events.

U.S. and French teams working in parallel with altimetry data from the joint NASA/French Space Agency Jason and Topex/Poseidon oceanography satellites—both managed by JPL—have independently confirmed the satellites’ measurements of the height of the tsunami waves as they radiated from the earthquake’s epicenter. The satellites flew over the Bay of Bengal about 150 kilometers (93 miles) apart approximately two hours after the quake.

“These two satellites make only about 13 Earth revolutions daily, with each orbit passing over the Earth approximately 3,000 kilometers (1,864 miles) away from its last,” said JPL’s Dr. Philip Callahan, who has been searching for tsunami signals in satellite radar altimeter data since Topex/Poseidon’s launch in 1992. “There is a very low probability of capturing observations in any given location within two hours of an event like this. The fact that Jason captured the tsunami’s signals is serendipitous, but is nevertheless a major boon for oceanographers,” he said.

“The observations made by Jason and Topex/Poseidon are unique and of tremendous value for testing and improving tsunami computer models and developing future tsunami early warning systems,” said JPL’s Dr. Lee-Lueng Fu, the Jason and Topex/Poseidon project scientist. “The satellite altimeter data currently take a minimum of five hours to process, so they cannot provide early warning of such events,” Fu said. Callahan received the Jason data the morning of Dec. 27.



Displayed in blue is the sea-surface height measured by Jason two hours after the initial magnitude 9 quake hit the region (shown in red) on Dec. 26.

# Huygens on its way to Titan

By Carolina Martinez



Cassini team members celebrate the Huygens separation. From left are Julie L. Webster, Dave Allestad, Mona Witkowski, Paula Morgan and Allan Lee.

THE HUYGENS PROBE SUCCESSFULLY DETACHED FROM THE CASSINI orbiter Dec. 24 to begin a three-week journey to Saturn’s moon Titan. All systems performed as expected and there were no problems reported with the Cassini spacecraft.

The Huygens probe, built and managed by the European Space Agency, was bolted to Cassini and had been riding along during the nearly seven-year journey to Saturn largely in a “sleep” mode. Huygens will be the first human-made object to explore on-site the unique environment of

Titan, whose chemistry is assumed to be very similar to that of early Earth before life formed. Huygens will tell us whether this assumption is correct.

“We wish to congratulate our European partners as their journey begins and wish them well on their descent to Titan,” said Cassini Program Manager Bob Mitchell. “We are very excited to see the probe off and to

have accomplished this part of our job. Now we’re ready to finish our part—receiving and relaying the Huygens data back to Earth.”

“This was an amicable separation after seven years of living together,” said Dr. David Southwood, director of science program for the European Space Agency. “Our thanks to our partners at NASA for the lift. Each spacecraft will now continue on its own but we expect they’ll keep in touch to complete this amazing mission. Now all our hopes and expectations are focused on getting the first in situ data from a new world we’ve been dreaming of exploring for decades.”

The Huygens probe will remain dormant until the onboard timer wakes it up just before the probe reaches Titan’s upper atmosphere on Jan. 14. Then it will begin a dramatic plunge through Titan’s murky atmosphere, tasting its chemical makeup and composition as it descends to touch down on its surface. The data gathered during this 2-1/2 hour descent will be transmitted from the probe to the Cassini orbiter. Afterward, Cassini will point its antenna to Earth and relay the data through the Deep Space Network to JPL and on to the European Space Agency’s Space Operations Center in Darmstadt, Germany. From this control center, ESA engineers will be tracking the probe and scientists will be standing by to process the data from the probe’s six instruments.

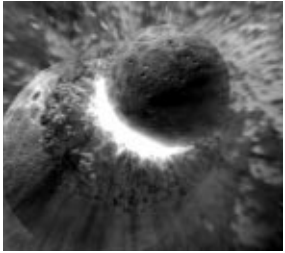
Seven days after separating from Huygens, Cassini successfully flew by Saturn’s moon Iapetus at a distance of 123,400 kilometers (76,700 miles) on Friday, Dec. 31.

Iapetus is a world of sharp contrasts. The leading hemisphere is as dark as a freshly-tarred street, and the white, trailing hemisphere resembles freshly-fallen snow.

The Dec. 31 flyby was the first close encounter of Iapetus during the four-year Cassini tour. The second and final close flyby of Iapetus is scheduled for 2007.



News Briefs



This artist's concept illustrates how a massive collision of objects perhaps as large as the planet Pluto smashed together to create the dust ring around the nearby star Vega.

Spitzer sees collision aftermath

Astronomers say a dusty disc swirling around the nearby star Vega is bigger than earlier thought. It was probably caused by collisions of objects, perhaps as big as the planet Pluto, up to 2,000 kilometers (about 1,200 miles) in diameter.

The JPL-managed Spitzer Space Telescope has seen the dusty aftermath of this “run-in.” Astronomers think embryonic planets smashed together, shattered into pieces and repeatedly crashed into other fragments to create ever-finer debris. Vega’s light heats the debris, and Spitzer’s infrared telescope detects the radiation.

Vega, located 25 light-years away in the constellation Lyra, is the fifth brightest star in the night sky. It is 60 times brighter than our sun. Observations of Vega in 1984, with the Infrared Astronomical Satellite, provided the first evidence for dust particles around a typical star. Because of Vega’s proximity and because its pole faces Earth, it provides a great opportunity for detailed study of the dust cloud around it.

“Vega’s debris disc is another piece of evidence demonstrating the evolution of planetary systems is a pretty chaotic process,” said the lead author of the study, DR. KATE SU of the University of Arizona. The findings were presented Jan. 10 at a meeting of the American Astronomical Society in San Diego.

SRTM topographic map completed

Culminating more than four years of processing data, NASA and the National Geospatial-Intelligence Agency have completed Earth’s most extensive global topographic map.

The data, extensive enough to fill the U.S. Library of Congress, were gathered during JPL’s Shuttle Radar Topography Mission, which flew in February 2000 on the Space Shuttle Endeavour.

The digital elevation maps encompass 80 percent of Earth’s landmass. They reveal for the first time large, detailed swaths of Earth’s topography previously obscured by persistent cloudiness.

“This is among the most significant science missions the shuttle has ever performed, and it’s probably the most significant mapping mission of any single type ever,” said Project Scientist DR. MICHAEL KOBRICK of JPL.

The final data release covers Australia and New Zealand in unprecedented uniform detail. It also covers more than 1,000 islands comprising much of Polynesia and Melanesia in the South Pacific, as well as islands in the South Indian and Atlantic oceans.

“Many of these islands have never had their topography mapped,” Kobrick said. “Their low topography makes them vulnerable to tidal effects, storm surges and long-term sea level rise. Knowing exactly where rising waters will go is vital to mitigating the effects of future disasters such as the Indian Ocean tsunami.”

Apply now for summer program

Applications are now available for NASA’s 2005 Summer High School Apprentice Research Program (SHARP).

The program’s goal is to increase the participation and success rates of students who are traditionally under-represented in science, technology, engineering, math and geography.

Log on to <http://nasasharp.com> for information. The application deadline for the eight-week program is Feb. 14. Applicants must be U.S. citizens at least 16 years old and have completed 10th grade. Also, they must commit to participate on a full-time basis Monday through Friday for the duration of the program.

The program operates from about mid-June to mid-August. Students will have the opportunity to conduct meaningful research, interact with students from different racial and ethnic backgrounds, and participate in a variety of enrichment activities that develop oral, written, computer and leadership skills.

For more information, call university liaison WENDIE DONAHUE in the Education Office at ext. 3-5386.

Badging equipment to be upgraded

The Office of Protective Services will soon begin the process of upgrading its photo ID badging equipment. This upgrade is in compliance with NASA requirements for the future NASA Smart Card. The equipment upgrade installation will take place Jan. 19–21.

During the installation, the Office of Protective Services will not be able to issue any photo ID badges. Temporary badges will be issued as needed until photo ID badging resumes on Monday, Jan. 24.

When installation of the new equipment has been completed, NASA civil servants will be issued a new NASA photo ID.

New Weight Watchers series

JPL and contractor employees are invited to join the successful Weight Watchers at Work series.

The cost for the 20-week series is \$219 (based on a \$10.95 charge for each meeting) paid by check, cash or one of the following credit cards: Visa, MasterCard, Discover or American Express.

JPL and contractor employees are welcome to join the series at any time. Those who join after the first week are required to pay \$11 for each remaining meeting. The total for all remaining meetings is due at enrollment.

For more information, call LAURIE LINCOLN, ext. 4-1612.

Blood drive in February

The next JPL/Red Cross blood drive will be held in von Kármán Auditorium on Tuesday, Feb. 15, from 10 a.m. to 4 p.m. and Wednesday, Feb. 16, from 7 a.m. to 1 p.m.

Register to donate at [www.givelife.org/index.cfm?hcl=JPL](http://www.givelife.org/index.cfm?hcl=JPL), using work address and work phone only. Once you select your appointment, you will receive an automatic confirmation e-mail. For further assistance, call the Red Cross at (213) 400-0140.

Advance signup sheets will also be available at JPL Occupational Health Services, Building 310-202, prior to the blood drive.

Special Events Calendar

Ongoing Support Groups

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

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

Codependents Anonymous—Meets at noon every Wednesday.

Lambda (Gay, Lesbian, Bisexual and Transgender Networking Group)—Meeting at noon on Friday, Jan. 21 in Building 111-117. Note: The group will return to its normal schedule in February, when it meets the first Friday and third Thursday of the month at noon in Building 111-117. For more information, call Randy Herrera, ext. 3-0664.

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

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

Tuesday, January 18

Caltech’s Frank Capra Film Series—The screening of *Chinatown* at 8 p.m. in Beckman Auditorium will be followed by a panel discussion with scientists, historians, film scholars and filmmakers. Free admission. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Wednesday, January 19

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

Thursday, January 20

“Search for Extraterrestrial Intelligence: Pulling Signals Out of Cosmic Noise”—Jill Tarter, director of the Center for SETI Research, will speak at 11:30 a.m. in von Kármán Auditorium.

Thu.–Fri., January 20–21

Von Kármán Lecture Series—Principal Scientist Ichiro Fukumori will present “Oceans: Today’s View From Space With Supercomputers” at 7 p.m. Thursday in von Kármán Auditorium and Friday in Pasadena City College’s Vosloh Forum, 1570 E. Colorado Blvd. Thursday’s lecture will be webcast at [www.jpl.nasa.gov/events/lectures/jan05.cfm](http://www.jpl.nasa.gov/events/lectures/jan05.cfm). Call Public Services at ext. 4-0112.

Friday, January 21

Caltech Folk Music Society—Singer/instrumentalist John McCutcheon will appear at 8 p.m. in Ramo Auditorium. Tickets are \$15 for adults, \$5 for children under 12. For more information, call (626) 395-4652 or visit [www.folkmusic.caltech.edu](http://www.folkmusic.caltech.edu).

Martin Luther King Celebration—The annual event will be held from 11 a.m. to 12:30 p.m. in von Kármán Auditorium. Keynote speaker will be Dr. Genevieve Shepherd, principal of Tom Bradley Environmental Science and Humanities Charter Magnet School. Refreshments will be served.

Saturday, January 22

Caltech Jazz Bands—Drummer Gregg Bissonette will appear with the bands in their 8 p.m. performance in Beckman Auditorium. Free admission. Call (626) 395-4652 or visit <http://events.caltech.edu/index.html>.

Monday, January 24

“Choosing Your TIAA/CREF Income Options”—This workshop, to be held from 10 to 11:30 a.m. in the 180-101 conference room, is designed for employees one year or less from retirement.

Wednesday, January 26

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

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

“The Shuttle Fleet, Columbia, and Present and Future Space Access”—Paul Dimotakis, professor of aeronautics and professor of applied physics at Caltech, will deliver this free lecture at 8 p.m. in Beckman Auditorium. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

University of Phoenix Open House—Professional Development will host from 11:30 a.m. to 1:30 p.m. in the 180-101 conference room. Come learn about the wide assortment of degree programs available online or in a classroom environment that include doctoral, MBA and bachelor’s programs; corporate online training; certificate programs and single courses available for school or university credits. For more information, call Professional Development at ext. 4-3750 or visit <http://hr/et>.

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

Thursday, January 27

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

Caltech Ballroom Dance Club—The term party will be held in Avery Dining Hall starting at 8:30 p.m. Free admission.

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

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

JPL Stories—Dr. Yoseph Bar-Cohen, group leader, Non-Destructive Evaluation and Advanced Actuators, will present “Biomimetics—Technologies That Mimic Nature” at 4 p.m. in the Library, Building 111-104. Biomimetics offers a great potential for exciting NASA missions and some examples are already being pursued, including the development of legged robots. One area that will receive special attention is the emerging field of artificial muscles. If you have questions about the JPL Story series or wish to participate, call Teresa Bailey, ext. 4-9233.

“Unveiling the Mysteries of Conducting: Who Is Looking?”—Jorge Mester, conductor of the Pasadena Symphony, will give this Voices of Vision talk at 8 p.m. in Caltech’s Ramo Auditorium. Free admission. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Saturday, January 29

Dancesport—The second annual Caltech competition will be held from 9 to 10 a.m. in Brown Gymnasium. Couples from as far as New Mexico and Arizona will be competing in various styles of ballroom dances, from waltz and rumba to swing and tango, followed by a professional showcase. The competition is open to both collegiate and non-collegiate amateur competitors. For more information, visit [www.its.caltech.edu/~ballroom/comp](http://www.its.caltech.edu/~ballroom/comp).

Lazer Vaudeville—This program that combines the high-tech effects of lasers and blacklights with the traditional arts of juggling, comedy and acrobatics will be held at 2 p.m. in Caltech’s Beckman Auditorium. Tickets are \$12; high school age and younger, \$7. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Voyager: 10,000 days and counting



Over the last several decades, dozens of missions have come and gone at JPL. But all the while, the intrepid twin Voyager spacecraft, launched about two weeks apart in the summer of 1977 and now heading out of the solar system, continue making history.

Both spacecraft are still going strong and are returning valuable science data. On Jan. 5, the Voyager team noted a milestone with a nice round number: 10,000 days since Voyager 2’s launch. On Jan. 21, Voyager 1 will also pass 10,000 days.

Voyager veteran Regina Wong of the Data Management and Science Team has worked on the mission off and on several times since before the launches. She laughed when recalling that six or seven years ago, a summer hire who was born just four months before Voyager 2’s launch joined the mission team for awhile.

Tim Hogle, Voyager systems engineer and mission controller, noted that each Voyager’s cosmic ray detector, magnetometer, plasma wave detector, low-energy charged particle detector, and plasma and planetary radio astronomy instruments all still operational. Also, Voyager 1’s ultraviolet spectrometer is still working. He expects both spacecraft to send back valuable data until the year 2020—and perhaps longer.

Project Manager Ed Massey said the mission currently employs the equivalent of about 10 full-time people. Staffing may have reached 300 at one time, he said, during the height of its famed “Grand Tour” of the planets through 1989. During the journey, the Voyagers flew by Jupiter, Saturn, Uranus and Neptune and are now near the edge of the heliosphere, the area dominated by the sun’s influence.





# NEW BUSINESS, FINANCE CHIEF ONBOARD

By Mark Whalen

JPL recently welcomed Dale Johnson as its new chief financial officer and director for business operations.

After holding a number of increasingly responsible business-management positions for more than 20 years with Lockheed Martin, Johnson joined the Lab in November. He discusses his outlook for the near future.

**You had worked at Lockheed Martin for quite a while. What attracted you to JPL?**

I found this opportunity at JPL to be an excellent fit with my experience and interests. Being a Federally Funded Research and Development Center and with its close association with the Caltech campus, JPL has earned an outstanding reputation and I'm really looking forward to being part of this team.

**How will your experience in private industry best benefit JPL? As a government contractor, how do JPL's financial challenges compare to the corporate world?**

My experience has allowed me to be involved in a number of financial areas, such as budgets, pricing, contracts and financial planning. I've also been fortunate to have a pretty solid background on the management and administrative side, including information technology, facilities and security.

NASA is placing particular emphasis on strengthening certain areas, including cost control and cost estimating. Given my background, these are areas I'm very comfortable with. JPL is already a strong institution in these areas, and in the future we can look for enhancements to improve our service even more. It's an area of opportunity.

**What are your organization's areas of responsibility? How is the office set up, and whom do you consider your customers?**

The support activity we provide is a complementary partnership with the technical and engineering directorates at JPL. As part of that, we bring all the business, administrative, financial, security, facilities, acquisition and information technology the Lab needs to ensure the success of the flight projects.

We have a rich, successful background in these processes. It takes all participants to make the Lab successful, including the business management elements. I've been impressed by the professionalism and the caliber of the individuals who are part of the business teams. The management

"What we'll see in the future is a focus on the people, processes and tools to do our jobs."

team has done a great job in contributing to JPL's technological leadership. The successful conversion to Oracle is just one excellent example of the Lab's willingness to move forward, not just in the engineering, computing and system excellence areas, but also in the financial areas as well. There's a lot to be proud of.

**What are the biggest challenges for you personally and for your organization? Have you been able yet to establish short term and long-term goals?**

I still have a lot to learn and understand about JPL. I can say that the organization itself is very well organized. I have been able to grasp and understand most of the issues here fairly quickly and easily, based on the structure that's been set up. As a result, as I look at some of the issues that face us in the near term, there are some definite focus areas related to NASA concerns that we will need to address. Specifically, our near-term goals are to continue improving cost management capabilities, enhance effective business and acquisition processes and capabilities, further emphasize and deploy earned value project management, streamline and consolidate business systems, and develop a pricing capability. Overall, I think the organization is well positioned to respond favorably—in fact, be a leader in these areas—on behalf of NASA as well as the other centers.

**Part of your job is chairing JPL's Business Management Council. What is that group all about?**

The council includes members of the 2X organizations, as well as the business representatives that support all the other

directorates. We meet twice a month and focus on the needs of the Lab and how the business and administrative areas respond to those needs. Right now, we're heavily engaged in evaluating burden budget performance, as well as moving forward toward better utilizing the council as a means to improve project business performance across JPL.

**Can you look forward and project where JPL business operations will be in the next few years?**

What we'll see in the future is a focus on the people, processes and tools to do our jobs. From a people standpoint, we are aggressively moving forward in setting up improved training to achieve our goals. We are endeavoring to mirror the flight management practices training program that Tom Gavin has put together by providing a very similar training program for business management personnel and other selected representatives.

With respect to the processes, we've already initiated several areas in terms of strengthening process-based management practices, cost estimating and cost management, among other areas. I can definitely foresee a future where there will

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be specific areas in which we can gain stronger links to the flight projects.

From a tools standpoint, we will have a complementary suite of systems that can be used across the Lab that will have some consistencies in capabilities for system users. We will be looking for ways to combine and narrow down our current set of business tools to provide the most robust, user-friendly capability available.

**Have you received any feedback or advice that has been particularly helpful to you to this point?**

I've found Dr. Elachi to be an excellent communicator. His exuberance in working with all levels of employees is unique. He encourages all the Executive Council members to be proactive; to meet with and have vibrant discussions with the directorates we support in order to get a good understanding of their needs and requirements. We need to continue to engage in conversations with staff and have a close affiliation with them. That to me is a key ingredient to making the Lab successful.

**What are your first impressions of JPL? What have you observed about the Lab and its people that's stuck with you?**

In the short time I've been here, I found what represents the best of JPL. In just my second week at the Lab, we had the vanpool accident, a terrible tragedy. What I found remarkable was the family orientation and the desire of the entire Laboratory to respond and help members of the affected families. You can say you have a close-knit family, but often that's only reflected in people's specific actions. I can attest that JPL really demonstrated a sincere and honest concern regarding those involved. Everybody came together in a positive, proactive fashion. To me, that demonstrated a very unique sense of caring and commitment.

Again, I feel very fortunate to be part of the JPL team. The reputation JPL enjoys worldwide is something all of us can be very proud of. I very much look forward to a successful and rewarding career here.

2004

## in review

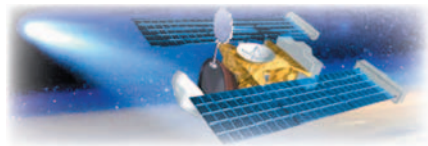
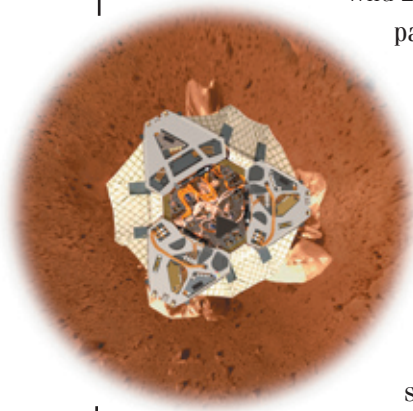
Following the busiest year in the Lab's history, 2004 certainly kept JPLers busy as well. Remember how last year began, with Stardust capturing samples of comet particles and the Mars



Exploration Rovers touching down successfully? Now, Stardust is on its way back to return samples to Earth in another year, and the rovers are still successfully traversing Mars on extended tours. Other missions and their discoveries continued apace throughout the year. Briefly, here are some of the memorable moments of 2004.

### JANUARY

Stardust began its two-year trek back to Earth after successfully navigating through the coma around comet Wild 2 on Jan. 2. The spacecraft flew within about 230 kilometers of the comet, catching particle samples and taking detailed pictures of Wild 2's pockmarked surface. ... Spirit, the first of twin Mars Exploration Rovers launched by JPL in 2003, became the first spacecraft to land on the Red Planet in six years with an airbag-assisted landing in Gusev Crater on Jan. 3. The MER team did it again with the Opportunity rover's landing in Meridiani Planum on Jan. 24. ... The cooler and drier conditions in Southern California over the last few years appear to be a direct result of a Pacific Decadal Oscillation. A study by JPL's Dr. Bill Patzert and others suggested Pacific oceanic and atmospheric measurements can be used to forecast seasonal West Coast temperatures and precipitation up to a year in advance. The pattern lasts many decades rather than just a few months like El Niño and La Niña. ...



### FEBRUARY

Aviation Week & Space Technology magazine honored team members at JPL and Ball Aerospace & Technologies Corp. with a 2003 Aerospace Laurel award for redesigning the Spitzer Space Telescope, which saved \$800 million and provided a powerful new instrument for studying the universe. ... Mike Sander was appointed manager of the new Exploration Systems and Technology Office, which will be responsible for all JPL activities and missions related to NASA's Office of Exploration Systems, except the Jupiter Icy Moons Orbiter. ... An employer preference survey by the National Society of Black Engineers, the largest student-managed engineering organization in the country, rated JPL the 44th best organization to work for in the United States. That represents an increase of 109 spots from the previous year and the biggest jump of all employers rated in the survey. ...

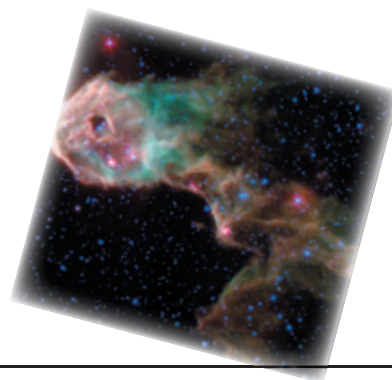
### MARCH

The European Space Agency's Rosetta spacecraft was launched March 2 for a planned rendezvous with a comet in 2014. Onboard, JPL's microwave instrument will show how comet materials change from ice to gas, and will help determine temperature changes as the comet approaches the Sun. ... Based on evidence the rover found in a rock outcrop, scientists concluded the part of Mars explored by Opportunity was soaking wet in the past. Clues from the rocks' composition, such as the presence of sulfates, and the rocks' physical appearance, such as niches where crystals grew, helped make the case for a watery history. ... Using the JPL-developed Airborne Synthetic Aperture Radar, an international team of scientists took a three-week expedition of discovery. The team surveyed sites in Central America to help unearth archaeological secrets and to preserve resources and biological and cultural diversity. They then ventured to South America's Patagonia ice fields and Antarctica to conduct topographic surveys of ice to better gauge the effect of climate change. ... A beachball-shaped "tumbleweed rover" that one day could search for evidence that water existed on other planets survived an eight-day, wind-driven trek across Antarctica. Robotics researcher Dr. Alberto Behar deployed the prototype, which is being developed at JPL. ... Spirit found hints of a water history in a rock at Gusev Crater, but it was a very different type of rock than those in which Opportunity found clues to a wet past on the opposite side of the planet. A dark volcanic rock showed bright material in interior crevices and cracks that look like minerals crystallized out of water. ... A study by the Quick Scatterometer spacecraft and its SeaWinds instrument of Southern California's legendary Santa Ana winds, which create hot, dry conditions and fire hazards, showed the winds have some positive benefits. The winds cause cold water to rise from the bottom of the ocean to the top, bringing with it many nutrients that ultimately benefit local fisheries. ... Dr. William Pickering, a central figure in the U.S. space race and JPL's director from 1954 to 1976, died March 15 at age 93. ...



### APRIL

The JPL-developed Precision Global Positioning System (GPS) Software System was inducted in the Space Technology Hall of Fame. Team members Dr. Yoaz Bar-Sever, Dr. Willy Bertiger, Dr. Michael Heflin, Dr. Kenneth Hurst, Dr. Stephen Lichten, Ronald Muellerschoen, Dr. Frank Webb, Dr. Sien-Chong Wu, Dr. Thomas Yunck and Dr. James Zumberge were honored. ... NASA approved an extended mission for the Mars Exploration Rovers as they finished their three-month prime mission, providing \$15 million for operating the rovers through September. ... The Spitzer Space







Telescope's infrared eyes revealed a fireworks-like display of massive stars, the biggest of which is estimated to be 100,000 times as bright as our own Sun. The region is buried in so much space dust that no visible light escapes it. ... A cooperative study that included JPL scientists quantified, for the first time, the relationship between Arctic ozone loss and changes in the temperature of Earth's stratosphere. The results indicate the loss of Arctic ozone due to the presence of industrial chlorine and bromine in Earth's atmosphere may well be sensitive to subtle changes in stratospheric climate. Such ozone depletion leads to increased exposure to harmful, ultraviolet solar radiation at Earth's surface. ...

MAY

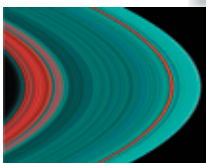
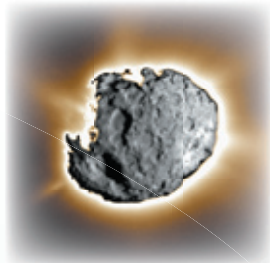
An estimated crowd of 40,000 people attended JPL's annual Open House May 15–16. ... Scientists and engineers celebrated when they saw the first pictures Opportunity sent from the rim of a stadium-sized crater that the rover reached after a six-week trek. Multiple layers of exposed bedrock line much of the inner slope of the impact crater "Endurance." Such layers and their thicknesses may reveal what the environment on Mars was like before the salty standing body of water evaporated to produce the telltale rocks that were explored in the tiny "Eagle" Crater. ... JPL's Optical Communications Telescope Laboratory was commissioned May 18



at the Lab's Table Mountain facility near Wrightwood. The research and development facility houses a 1-meter elevation/azimuth telescope capable of tracking spacecraft from 250-kilometer altitude to deep space. ... New findings from the Spitzer Space Telescope included the discovery of significant amounts of icy organic materials sprinkled throughout several dusty planet-forming discs that circle infant stars. The materials, icy dust particles coated with water, methanol and carbon dioxide, may help explain the origin of icy planetoids like comets. Scientists believe these comets may have endowed Earth with some of its water and many of its biogenic, life-enabling materials. ... JPL was awarded a partnership in a hydrogen storage research project, one of many selected by the Department of Energy to support President Bush's Hydrogen Fuel Initiative. The awards include the formation of "Centers of Excellence" at the National Renewable Energy Laboratory, Los Alamos National Laboratory and Sandia National Laboratories. JPL will be a member of Sandia's Metal Hydride Virtual Center of Excellence. The Lab's contributions will include assisting in the design of improved hydride storage vessels and developing better storage materials. ... Spitzer images detected distant objects—including several supermassive black holes—that are nearly invisible in even the deepest images from telescopes operating at other wavelengths. Seven of the objects may be part of the long-sought "missing" supermassive black holes that powered the bright cores of the earliest active galaxies. The effort required the combined power of NASA's three Great Observatories—the Hubble Space Telescope, Chandra X-ray Observatory and Spitzer. ...

JUNE

Findings from a historic encounter between the Stardust spacecraft and a comet revealed a much stranger world than previously believed. "We thought Comet Wild 2 would be like a dirty, black, fluffy snowball," said Principal Investigator Dr. Donald Brownlee. "Instead, it was mind-boggling to see the diverse landscape in the first pictures, including spires, pits and craters, which must be supported by a cohesive surface." ... Software from the Space Technology 6 Autonomous Sciencecraft Experiment captured images of Antarctica's Mount Erebus and detected volcanic activity, an observation made on its own without human interaction. The JPL-developed software controls the Earth Observing-1 spacecraft. After taking an image of Erebus, the software detected heat from the lava lake at the summit of the volcano and reprogrammed the camera to take more pictures. News of the detection was rapidly transmitted to scientists. Typically, it could take months to learn a remote volcano was active and scientists normally would need to take measurements at the volcano to detect the same type of event. ... The international Cassini-Huygens mission successfully entered orbit around Saturn on June 30. This began a four-year study of the giant planet, its majestic rings and more than 30 moons. Cassini traveled about 3.5 billion kilometers since its October 1997 launch. ...



REACHES SATURN

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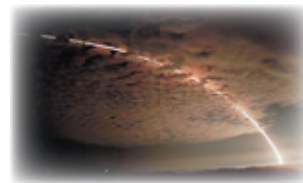
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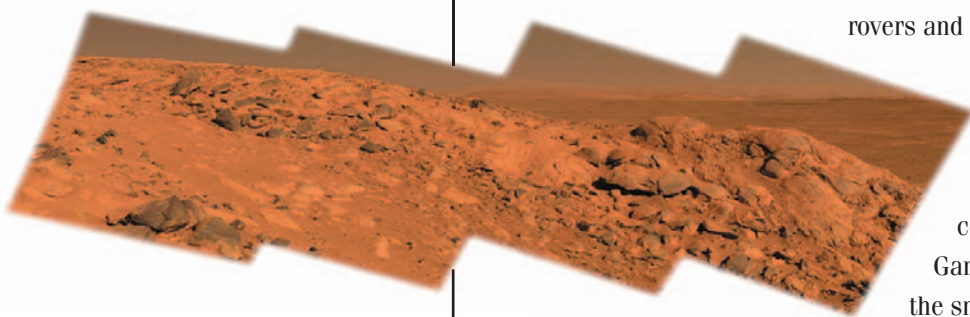
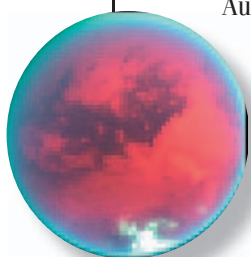
c o n t i n u e d

**JULY**

The Aura spacecraft launched July 1 from Vandenberg Air Force Base. Two of Aura's four instruments—the Microwave Limb Sounder and the Tropospheric Emission Spectrometer—were designed, built and tested at JPL, where they will be operated. Aura will help answer key scientific questions about the recovery of Earth's protective ozone layer, the processes controlling air quality and how the Earth's climate is changing. ... During a distant flyby on July 2, Cassini revealed surface details of Saturn's moon Titan and imaged a huge cloud of gas surrounding the planet-sized moon. Titan's dense atmosphere is opaque at most wavelengths, but the spacecraft captured some surface details, including a possible crater, through wavelengths in which the atmosphere is clear. ... Using a JPL-developed infrared video camera, surgeons tested thermal imaging and image processing to see if they can create useful maps of brain tumors. Doctors at USC's Keck School of Medicine are trying to see if they can sketch tumor margins by detecting temperature changes during surgery, since tumor cells emit more heat than healthy ones. The camera's precision allows it to map temperature differences of one-hundredth of a degree Celsius at a high resolution. ... NASA selected two proposals that JPL would lead for study as candidates for the next mission in the agency's New Frontiers Program. The "Juno" mission proposes to orbit Jupiter to investigate the existence of an ice-rock core, determine water and ammonia abundances in Jupiter's atmosphere, study convection and deep wind profiles in the atmosphere, investigate the origin of the Jovian magnetic field, and explore the polar magnetosphere. The other New Frontiers candidate, "Moonrise: Lunar South Pole-Aitken Basin Sample Return Mission," proposes to land on the far side of the moon and to return about 2 kilograms of lunar materials from a region of the surface believed to harbor materials from the moon's mantle. ... NASA also selected nine studies to investigate new ideas for future mission concepts within its Astronomical Search for Origins Program. A JPL-led proposal, "A Background Limited Infrared-Submillimeter Spectrograph for Spica: Revealing the Nature of the Far-Infrared Universe," would enable far-infrared spectroscopy of the galaxies that make up the far-infrared background out to distances of some of the farthest galaxies known today. ...

**AUGUST**

Cassini detected lightning and a new radiation belt at Saturn, and a glow around the planet's largest moon, Titan. ... A new image from Spitzer showed what could not be seen before—a massive doughnut-shaped ring of material that was expelled from the dying star. The composition of the ring and how it formed are mysteries scientists hope to address with further Spitzer studies. ... The team preparing JPL's Mars Reconnaissance Orbiter for launch began integrating and testing the spacecraft's versatile payload. Possible launch dates begin Aug. 10, 2005. The spacecraft will reach Mars seven months later to study the surface, subsurface and atmosphere. ... The Opportunity rover sent pictures relayed by the European Space Agency's Mars Express orbiter for the first time, demonstrating that the orbiter could serve as a communications link if needed. On Aug. 4, as Mars Express flew over Opportunity, the orbiter received data previously collected and stored by the rover. The data, including 15 images from the rover's cameras, were subsequently forwarded to the European Space Operations Center in Germany, and immediately relayed to the rover team at JPL. ... The "Science Activity Planner," developed by JPL, was selected by NASA as one of the "best of the best" software developed by the agency in 2004. It combines cutting-edge visualization with sophisticated planning and simulation capabilities to provide an intuitive interface to Mars rovers and landers. ... Scientists discovered irregular lumps beneath the surface of Jupiter's largest moon, Ganymede. These irregular masses may be rock formations, supported by the moon's icy shell for billions of years. This discovery comes nearly a year after Galileo's orchestrated demise and more than seven years after the data were collected. The findings caused scientists to rethink what the interior of Ganymede might contain. ... Cassini uncovered two moons that may be the smallest bodies around the ringed planet. The moons are approximately 3 kilometers and 4 kilometers across. The smallest previously known moons around Saturn are about 20 kilometers across. ... In examining bedrock in the "Columbia Hills," the Spirit rover found evidence that water thoroughly altered some rocks in Mars' Gusev Crater. ... NASA approved an extended mission through September 2006 for the Mars Odyssey orbiter after it completed a prime mission that discovered vast supplies of frozen water, ran a safety check for future astronauts and mapped surface textures and minerals all over Mars. The spacecraft has been examining Mars in detail since February 2002. ...

**SEPTEMBER**

Seen through the eyes of the JPL-managed Multi-angle Imaging SpectroRadiometer aboard NASA's Terra satellite, the menacing clouds of Hurricanes Frances and Ivan provided a wealth of information that can help improve hurricane forecasts. MISR images of Frances and Ivan were acquired Sept. 4 and 5, respectively, when Frances' eye sat just off the coast of eastern Florida and Ivan was heading toward the central and western Caribbean. ... Carrying a cargo of solar-wind particles, the Genesis sample return capsule entered Earth's atmosphere and the preplanned entry ellipse in the Utah Test and Training Range as predicted on Sept. 8. However, as a result of its



# “Breakthrough of the Year”

SCIENCE MAGAZINE

parachute not deploying, the capsule impacted the ground. Within the month, the Genesis team recovered and restored collector arrays and prepared them for shipment to Johnson Space Center for analysis. A major milestone was the recovery of four separate segments of Genesis’ concentrator target. Designed to measure the isotopic ratios of oxygen and nitrogen, the segments contain the samples that are the mission’s most important science goal. ... For the first time, scientists demonstrated that precise measurements of Earth’s changing gravity field can effectively monitor changes in the planet’s climate and weather. The finding comes from more than a year’s worth of data from the Gravity Recovery and Climate Experiment (Grace), a joint partnership of NASA and the German Aerospace Center. ... JPL selected Northrop Grumman Space Technology of Redondo Beach as the contractor for co-designing the proposed Prometheus Jupiter Icy Moons Orbiter spacecraft. The mission would launch in the next decade. ... NASA extended funding for the Spirit and Opportunity rovers for an additional six months of operations. ... JPL computer engineers created a system called Object Oriented Data Technology Software that will connect information from hospitals all over the world into one virtual intensive care unit. The system would link doctors with researchers willing to share their data about pediatric medicine, and might eventually allow high-tech surgeries to be performed in a remote country. ... New infrared images from Spitzer and the University of Wyoming Infrared Observatory revealed a never-before-seen globular cluster within the dusty confines of the Milky Way. Called globular clusters, these ancient bundles of stars date back to the birth of our Milky Way galaxy, about 13 billion years ago. ...

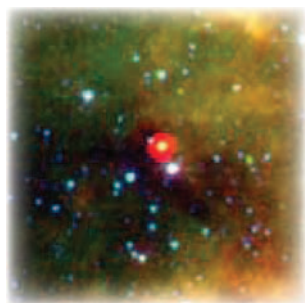


## OCTOBER

A new JPL-managed mission was approved by NASA to proceed into the preliminary design phase. The Wide-field Infrared Survey Explorer will scan the entire sky in infrared light in search of nearby cool stars, planetary construction zones and the brightest galaxies in the universe. The next in NASA’s Medium-class Explorer program of lower cost, highly focused, rapid-development scientific spacecraft, it is scheduled to launch in 2008. ... The first radar images of Saturn’s moon Titan showed a very complex geological surface that may be relatively young. Previously, Titan’s surface was hidden behind a veil of thick haze. Early analysis of images and other data captured during Cassini’s Oct. 26 close flyby of Titan revealed greater surface detail than ever before and showed that Titan has lost much of its original atmosphere over time. ... The Keck Interferometer team installed a new instrument that can make stars disappear almost completely from a telescope’s view and reveal the close-in regions where planets may have formed. The “nuller” instrument will be used to combine infrared light from both 10-meter Keck telescopes, permitting a “visibility” measurement that can measure the size of objects with exquisite precision. ...

## NOVEMBER

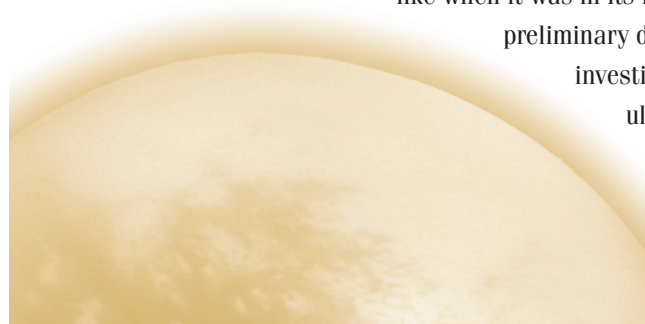
JPL was recognized on Scientific American magazine’s 2004 Scientific American 50, the publication’s prestigious annual list honoring outstanding acts of leadership in science and technology. The Lab was named Research Leader in the Aerospace category “for demonstrating the power of robots to explore the planets.” ... Two new results from Spitzer helped astronomers better understand how stars form out of thick clouds of gas and dust, and how the molecules in those clouds ultimately become planets. Two discoveries—the detection of an oddly dim object inside what was thought to be an empty cloud, and the discovery of icy planetary building blocks in a system believed to resemble our own solar system in its infancy—were presented Nov. 9 at the first Spitzer science conference, held in Pasadena. ...



## DECEMBER

Cassini completed a successful rendezvous with Saturn’s moon Titan on Dec. 13. This was the last pass before the Huygens probe was sprung loose from Cassini on Christmas Eve. ... The Aura spacecraft began providing the first daily, direct global measurements of low-level ozone and many other pollutants affecting air quality. ... Science magazine chose the Mars Exploration Rovers mission as the scientific “Breakthrough of the Year” for 2004. ... The Galaxy Evolution Explorer spotted what appeared to be massive “baby” galaxies in our corner of the universe. It also offered astronomers their first, close-up glimpse at what our galaxy probably looked

like when it was in its infancy. ... NASA selected eight proposals to conduct preliminary design studies to provide instrumentation and science investigations for the Mars Science Laboratory rover, scheduled for launch in 2009. The JPL-managed mission will explore a local region as a potential habitat for past or present life. ... The European Space Agency’s Huygens probe successfully detached from the Cassini orbiter Dec. 24 to begin a three-week journey to Titan.



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JPL and Caltech’s first Tournament of Roses Parade float helped bring in the new year on Jan. 1, 2005. Honoring Cassini, Stardust, Jason, Genesis, Galaxy Evolution Explorer, Spitzer Space Telescope, the Gravity Recovery and Climate Experiment and the twin Mars Exploration Rovers, the 50-foot “Family of Explorers” float was a hit with the judges, winning the award for “Best Use of Imagination & Innovation to Advance the Art of Float Design.”



Photo courtesy of David Seidel



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

Passings

PHYLLIS WARD RIGGLE, 79, a retired research engineer, died Aug. 21, 2004 in Carson City, Nev.

Riggle joined the Lab in 1950. She worked on such projects as the Explorer and Pioneer satellites of the late 1950s and the Viking landers that explored Mars in the late 1970s. She retired in 1981.

She is survived by her husband, Norman, along with a sister and numerous nieces and nephews.



Damon Simonelli

DAMON SIMONELLI, 45, a senior research associate and JPL visiting scientist from the National Research Council who worked in Division 32, passed away unexpectedly on Dec. 1.

His survivors include Simonelli's mother and sister.

GEORGE REEVES, 60, a programmer who worked on the data recorder for the Viking orbiter and also contributed the CRAF/Cassini mission, died Dec. 7. Reeves worked at the Lab from 1976–91. He is survived by his wife, Patty. Services were private.

WILLIAM “BILL” BACHMAN, 76, retired from the former Avionic Systems and Technology Division (34), died Dec. 13.

Bachman joined JPL in 1957. Upon his retirement in 1996 he was serving as the acting deputy manager of Division 34. During his 39 years at JPL, Bachman held numerous line management and project roles.

He is survived by his wife, Joan; daughters Kimberly, Jennifer and Mary Helen; sons Creighton and Frank; and eight grandchildren.

A memorial service was held at St. Bede's in La Cañada. Memorial donations may be made in his name to St. Francis High School, 200 Foothill Blvd., La Cañada, CA 91011.

Letters

My family and I want to sincerely thank all my friends and JPL colleagues for the many expressions of sympathy and support after the recent passing of my father. The plant received from the JPL-ERC was most thoughtful and appreciated.

John McKinney

I would like to thank my JPL co-workers and friends for the cards, thoughts, prayers and beautiful plant received after the passing of my mother. During a time like this we realize how much our friends and relatives mean to us. Your expression of sympathy will always be remembered.

Curt Eaton

My thanks to the JPL family and my colleagues for the overwhelming expressions of sympathy in response to the recent passing of my youngest son.

Jason Palmer

I would like to thank my JPL Voyager family for their expressions of sympathy extended to me and my family in the recent passing of my father. Also, thanks to JPL-ERC for the beautiful plant. Thank you very much. Sincerely,

Jefferson C. Hall Jr.

Retirees

The following JPL employees retired in January:

John Elias, 40 years, Section 2720; George Sweeney, 39 years, Section 352k; Ellis Miner, 37 years, Section 3200; David Clough, 26 years, Section 314c; Mary Parrish, 16 years, Section 5121.

Classifieds

For Sale

BABY BED, white, convertible to junior, gd. cond., \$60/obo. 626/447-5083.  
BED, twin, includes box spring, mattress & metal frame, gd. cond., \$100. 626/915-1807 or cell 626/705-7304, Mary.  
BOYS BIKE, Diamondback Octane 20,

6 speeds, 20" wheels, top cond., cost \$200, \$75/obo. 790-6851, Roger.

CAREER SUIT, woman's, red camel-hair, size 10/12, finely tailored, fully lined, fitted skirt, mid-calf, in new cond., \$50. 626/289-2795.

COMPUTER, Apple iMac G3, exc. working cond., extra memory, extra software: S/W Install, S/W Restore, Photoshop 5, Illustrator 8, Office 98, Norton Utilities, Disk Warrior, Adobe Page Mills, Williams-Sonoma Cooking, Photo Soap Images, Encyclopedia, Quicken; hardware: CD-ROM, 160 MB built in, single processor, 6GB, 333 MHz, 15" screen, green, \$240 for all/obo, serious inquiries only. 219-9993, Debbi, or earth2dgirl@earthlink.net.

COMPUTER MEMORY, 512 MB (two 256-MB cards), removed from new Mac G5 dual 2.5 GHz computer to install 8 GB memory, never used, make offer. 919/518-1142, tupman@ix.netcom.com.

DESK & BOOKCASE SET, like new, \$75. 323/722-4412, after 7 p.m.

FURNITURE: Techline, for office, white, 6 pieces, \$400; beautiful Spanish reversible hand-made rug 7' x 9', orange & hot pink on beige background, \$250; tall wood-framed mirror, \$25; mission oak server w/one drawer, 38W x 20D x 37H, \$400; 2 ceramic lamps, dusty rose, \$15 ea. 626/584-0860 (day) or 626/794-3144 (eve), Donna.

FURNITURE: complete 3-piece set includes armoire, headboard component containing mirror/shell/drawers/two attached side dressers, and dresser with mirror; white-wash finish; \$250; rocking/nursing chair and ottoman, new, solid wood, natural finish, elegant tapestry patterned cushion, \$125; chair, office/tv, lg., brown, reclining, \$45; toddler bed like new, solid-wood, natural finish, \$45. 626/794-1432.

GUITAR, Taylor 510 Dreadnought, mahogany with solid spruce top, cost \$1,150 new 8 years ago, used very little, exc. cond., \$700. 626/791-0993, Candy.

HORSE, 14-yr.-old mare, beginner/intermediate/ advanced riders, loves trails, a great backyard horse, just hop on with a halter and have fun, \$2,000/negotiable. 626/791-1581, Lauren.

JEWELRY: Ladies used ESQ Contessa Gold Tone watch, \$50; ladies New Coach metropolitan brown leather strap watch, \$50; ladies New Coach classic stainless steel watch, \$50; 14K tri-color gold diamond-cut bracelet, \$150; 14K two-sided, 18" diamond-cut necklace, \$200; estate oval garnet tennis bracelet in 14K yellow gold, \$60. 653-9037.

JUICE FOUNTAIN, Breville, powerful, stainless steel motor, great for daily juicing, bought 10/03, used 2-3 times only, original package, \$80/obo. 626/840-0955.

KARAOKE SYSTEM with on-screen lyrics, 5.5" monitor, CD player, am/fm radio, portable audio control, 2 microphone jacks, brand new, still in box, great gift, \$50 (paid \$110). 626/355-1722, Andrea Dean.

MATTRESS, Tempur-Pedic + foundation, queen, almost new, exc. cond., great for back, \$975. 352-4033, after 5 p.m.

MISC: Trek mtn. bike, 6 speed, red, 12.5" frame vg cond, \$85; boy's snowboard jacket, Billabong, red w/white trim, L, fits about 4'10", used once, \$39; suit/shirts, Nordstrom, fits boy about 5 ft.; quartz heater; kid's chemistry set, Smithsonian, slightly used; Erector set; all negotiable. 952-8455.

MISC: twin beds, Serta, \$250; Macy's love seats, camel, \$450; Relax the Back desk chair, \$80; JVC VCR, \$20; Apex DVD, \$20; electric barbeque grill, \$40; Motorola Talkabout radios, \$20; Apple Pro mouse, \$20; VST USB floppy drive, \$20. 213/810-8801.

MISC: Razor electric micro-scooter, 6 mo. old, 100W motor, great cond., \$90; treadmill, PaceMaster 870X DC motor w/manual incline control, great cond., \$85; foldaway elliptical strider with heart-rate monitor, Sharper Image #SR409, \$190 new, like new, \$95; Nordic Track Skier, black, vg cond., \$80; stationary bike, Proform 775x, magnetic resistance, \$60. 661/297-0219.

MISC: carpet, nearly new, light mauve, high quality, 2 pcs, 16 x 17, \$100, & 12 x 11 \$60; gas dryer, apt. sz., white, \$50. 626/794-1432.

MISC: PC, 1 GHz, Pentium III, 28 GB HD, 264 MB RAM, 4XCDRW, video card & converter, Win2K & MS Office 2K Pro, \$150/obo; photo printer, Canon S830, 2400 x 1200 dpi, 6 color, \$100/obo; camera, Zoom, APS, Yashica Profile 4000 IX, \$40/obo; cordless phones (3), 2.4 GHz, digital answering, hardly used, \$50/ obo; walkie talkie, Cobra Microtalk, 2-way radio, 2 units, 5-mile range, \$40/obo. 726-7701.

MISC: Xmas tree, Greatland 6+’ McIntyre pine, like real, \$25/obo; espresso maker, Krups Novo compact m#989, \$25/obo; Sunbeam deluxe mixer, 12 spd., w/turntable, beaters & bowls, \$50/obo; beanbag chair, denim exterior, \$25/ obo; ottoman/foot massager, \$75/obo. 726-7701.

MISC: pool table, 8’, \$500; tablecloths, 2 slate blue oval, 18 matching napkins and rings; mailbox, oversized, green, \$10; black mailbox, new, \$10; red wig, shoulder length, never used, \$20; portable basketball set, adjustable, needs net, \$200; fishing pole, salt-water, \$25; bunk bed mattress, gd. cond., \$10; baseball glove & conditioner, small, gd. cond., \$25; small food chopper, \$5; landscape oil painting, autumn tones, \$150; electric frying pan, \$10. 626/357-8210.

NECKLACE, new ladies Paloma Picasso Daisys pendant, platinum, round brilliant diamonds from Tiffanys, .15 carat total, G color, VS clarity; on 16" chain, paid \$1,500, sell for \$900. 653-9037.

PIANO, beautiful console, like new, lovely tone, near JPL, paid over \$2,000, sell for \$850 firm. 952-6221, Mon.-Thur.

POSTER PRINT, Monet's "The Artist's Garden at Vetheuil," size 27.5" L x 39" H, framed in glass w/black (matte finish), metal frame from Norton Simon Museum, \$50. 626/289-2795.

RUG, area, thick wool, 10' x 8', gd. cond., \$80; CRIB, wood, simple American style,

used twice but in good shape, \$20. 626/356-1933.

SKIS, downhill, Rossignol Quantum, 195 cm, Geze bindings, gd. cond., \$20; cross-country, Rossignol, 200 cm, gd. cond., \$10. 626/794-2431.

SOFA + 3 glass tables, \$75. 726-5129, Natalie.

STOVE, vintage O'Keefe and Merritt, 4-burner/oven/broiler/side warmer, similar to model 405, complete except missing spring for broiler door, gd. cond., \$475. 626/791-0686. STROLLER, Aprica, was \$350, now \$35. 626/850-4378.

TELEVISION, Panasonic 14" LCD color, extremely light, silver color, attached speakers, with remote and tilt function, sacrifice at \$495. 323/344-7163.

TOY, Busy Beads, like new, was \$59, now \$35. 626/850-4378.

TROPICAL PLANTS, plumerias, variety of colors and sizes; shell fingers. 626/444-6156, Annie & Bob DePonte.

VIDEO GAME, Nintendo 64 with games: Quest 64, Harvest Moon 64, Command & Conquer, Superman, all for \$49. 626/289-3373, Bob.

VIDEO GAME, Nintendo Game Cube with games: Lord of the Rings, Ikarugx, City Racer, Mario Party 4 & Super Mario Sunshine, all for \$99. 626/289-3373, Bob.

WASTEBASKET, white, plastic w/metal guide rail, about 1 x 2 x 3 ft. tall, installs inside kitchen cabinets to hide trash, brand new, in orig. box w/screws for installation, \$80/obo. 626/840-0955, leave msg.

Vehicles / Accessories

'05 ACURA TSX, silver, with added features, full-screen navigation system, tape and CD player, full warranty, purchased 12/7, 500-600 mi., must sell, \$30,000/obo. 626/568-3452 or 626/264-2692, Judy.

'98 CADILLAC Deville sedan, black/tan leather, loaded, Northstar eng., senior owned, only 54K mi., \$14,000. 909/989-1055 or drumhead58@hotmail.com.

'97 CHEVROLET Tahoe, gd. cond., loaded, 4-wheel drive, 105,000 mi., \$8,750. 310/327-1080 Marji.

'00 FORD Excursion, V8, black, new tires, great cond., seats 8, 69K, \$17,000/obo. 909/989-1055 or drumhead58@hotmail.com.

'94 FORD F-150 XLT extended cab pickup, 8-cyl. 380 engine, automatic, power windows/locks, a/c, forest green, \$5,000/obo. 323/595-8318.

'04 HONDA Accord EX, V6, top of the line, loaded, all leather seats, power windows/locks/seats, cruise control, moonroof, GPS navigation system, CD player, white/beige, 8K mi., like new, \$21,500. 909/599-3230 or 909/630-5176.

'98 MERCEDES BENZ CLK, dream car in great cond., 2-dr., silver w/black interior, 90K mi., Bose stereo sys., automatic everything, great cond., 1 owner, \$16,500/obo. 542-6424, Patricia.

'97 MITSUBISHI Eclipse, 2 dr., black/tan, 5 speed, sporty & gas saver, vg cond., stereo am/fm, CD, AD, sunroof, 99K mi., \$6,500/obo. 626/961-8771, David.

'00 NISSAN Maxima SE, 85K mi., extended warranty, new 17" tires, leather, sunroof, CD, power win./seats/doors, all maint. records by dealer avail., \$9,500. 795-2105.

'98 NISSAN Pathfinder, only 61K mi., all service records, 3.3L V6, 2WD automatic, power steering, ABS, SRS, gold ext., tan int., a/c, am/fm/CD, alarm, cruise control, keyless entry/power locks & windows, luggage rack, \$9,500. 626/799-1096.

RIMS (4), 17," all aluminum, with Neko 205/R50/70 high-performance tires, \$600 or very reasonable offer. 909/969-8694.

'00 SUZUKI SV650 motorcycle, sliders and tank bra, exc. cond., just changed oil & filter, never dropped or raced, clean title, some minor scratches, a fun bike for beginners and experts, \$3,500. 626/441-0150, Danny or centersun@hotmail.com.

'03 TOYOTA Celica GT-S, 6-speed, action package (special F+R bumper, side rocker panels, extreme rear wing), power tilt/slide moonroof, power all around, carbon blue, 30K mi., just serviced, very limited production (less than 100), exc. cond. in & out, very sporty, \$17,500. 352-6622 or 421-8364.

'83 TOYOTA Land Cruiser, classic FJ60 station wagon model, rugged 4WD, meticulously maintained, one owner, 178K mi., new trans., new alternator, new p/s, new catalytic, recent smog, great cond., new paint, ruggedized 6 cyl., 4-speed manual, \$8,000. 661/297-0219.

'99 VOLKSWAGEN Cabrio, mint cond., convertible, low mi., garaged, new JVC in-dash CD/ radio, new tires, 60K mi., complete maint. records, orig. owner, white ext./int., driver/ passenger airbag, a/c, rear window defroster, power steering, tilt wheel, \$10,000. 714/585-5246.

Free

DINING ROOM TABLE (sitting for 6) and chairs, sectional corner couch, all in fair cond., pickup location is very close to JPL. 626/345-0079.

Wanted

CHRISTMAS TREES, artificial, needed by a non-profit organization for fundraising event next winter, we can use any kind (5-6 ft.), decorations, tree skirts, etc. in gd. cond. 626/797-1310, leave message.

HOUSE to lease, mature, quiet couple seeks 2 bd., in the JPL area, needed by Jan. 26, exc. references. 383-2109, Elizabeth.

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

NANNY, daycare for infant twins, must enjoy

days full of playing and creative learning, must have references. 626/296-9036, Altadena.

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

For Rent

ALTADENA "sabbatical house," for visiting professionals: 3 bd., study, boundary Angeles Nat'l Forest, 3 mi./JPL (trails to Lab behind house), view, fireplace, oak floors, antiques; completely furn.: dinnerware, utensils, pots/ pans, bed linens + towels, fine soaps, necessities incl.: just bring toothbrush & clothes; TV/DVD/VHS, Dish satellite, wireless DSL, gardens, patio, parking; private, immaculate. 626/798-3235.

MONTROSE apt., 1 bd., 1 ba., view, exc. cond., a/c, off-st. pkg., laundry, trash/water/gardener pd., charming, 10 min./JPL, walking dist. to Montrose mall, \$890. 248-4637.

PASADENA, seeking roommate, unfurnished room in spacious furnished 2 bd., 2.5 ba., apartment, full private bath, central a/c, heat, washer/dryer, fully equipped kitchen, satellite TV, private/secure parking, no smoking, no pets, walking distance to Caltech, \$900 + shared utilities. 586/855-7303, Stephanie.

PASADENA, 2 bd., 1.5 ba., garage, wood and tile flooring, granite countertops, complete remodel 2004, basement, quiet neighborhood, close to Caltech, north of 210, MLS:H415727, \$528,000. 626/839-3688.

SOUTH PASADENA duplex, Spanish style, large (~1,100 sq. ft., 5 separate rooms), 1 bd., 1 ba., wood floors, formal living rm. and dining rm., garage w/washer & dryer hook ups, walk-in closets, recesses light in the kitchen, built-in bookcases, lease \$1,350 w/garage, no garage \$1,250. 323/344-7163. SUNLAND, large/nice/clean 1+1, all like new, walk-in closet, hall cabinets, air, parking, laundry, new carpet, dining area, lg. kitchen w/built-in oven/cook top, counter bar w/ stools, partly furn. incl. new refrigerator (or use yours), 6-unit bldg., quiet, \$75. 248-7610.

Real Estate

COSTA RICA vacation/retirement home, 3 bd., 2 ba., detached 2-car garage on lg. property near Santa Barbara, Heredia: wonderful view, 30 min. to San Jose airport, 1 hr. to downtown, \$100,000. 626/355-0944.

FIJI property, 1.28 acres, Koro Island, Eagles nest lot, short walk to resort, freehold land, own a piece of paradise, \$45,000. 249-4395.

FIJI property, 1.29 acres, Vita Levu, tropical jungle setting, free-hold land, small stream, 5-min. walk to coral coast, building permits underway, pad cut with landscape started, many pictures, own a piece of paradise for \$70,000. 249-4395.

Vacation Rentals

ARROWHEAD cabin, lake view, 6 max., \$140/weekends, \$350/week, others available, security/cleaning deposit required. 952-6221 Mon.-Thur., 909/337-1036 Fri.-Sun.

BIG BEAR LAKE, cozy cabin blocks from Snow Summit, sleeps 6, very private, plenty of parking, cable TV, DVD shuffleboard, see Antler Lodge at [www.getaway2bigbear.com](http://www.getaway2bigbear.com), 20% discount for JPLers. 726-1270.

BIG BEAR LAKEFRONT luxury townhome, indoor pool/spa, near skiing, beautiful master bd. suite, slps. 6. 949/786-6548.

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

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps. 4, laundry fac., low season rate \$115/nite/2, high season rate \$130/ nite/2, \$15/nite/add'l person. 949/348-8047 or jackandrandy@cox.net.

LAS VEGAS gift certificate for 3-day/2-night hotel accommodations for two at Harrah's, Sun.-Thur., excluding holidays and based on availability, good until 4/1/05, \$150. 395-6804, leave message.

MAMMOTH, Snowcrest, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitch. incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc't. 626/798-9222, 626/794-0455 or valeriee@caltech.edu.

OCEANSIDE beachfront, lovely 2 bd., 2 ba., single-level deluxe condo, fireplace, white water ocean views (end unit), luxurious gated complex on the sand, game rooms, fitness room, pools, barbecues, and Jacuzzis, 10 min. walk to the pier or harbor, sleeps 6, JPL discount, www.beachvisitors.com. 760/433-4459, owner.

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

OREGON, Brookings, Moosehead Lodge, [www.mooseheadlodgeoregon.com](http://www.mooseheadlodgeoregon.com), at the Winchuck River Estuary, fully furnished 3 bd., 2 ba., residence, 1 mi. from Cal. border, walk Pelican Bay beach with tidepools, surf and driftwood, fish Pacific Ocean/Wild Rivers along S. Oregon/N. Cal. coast, enjoy the redwoods and Siskiyou National Forest. 800/221-8175.

RESORTS, 5-star, local and worldwide incl. Hyatt and Marriot, luxurious residential-style studios w/furnished kitchenette, starting at \$60/night; 1 & 2 bds. with full kitchen & living room also avail., 3-night min. 626/794-9579 or fivestarresorts@earthlink.net.

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

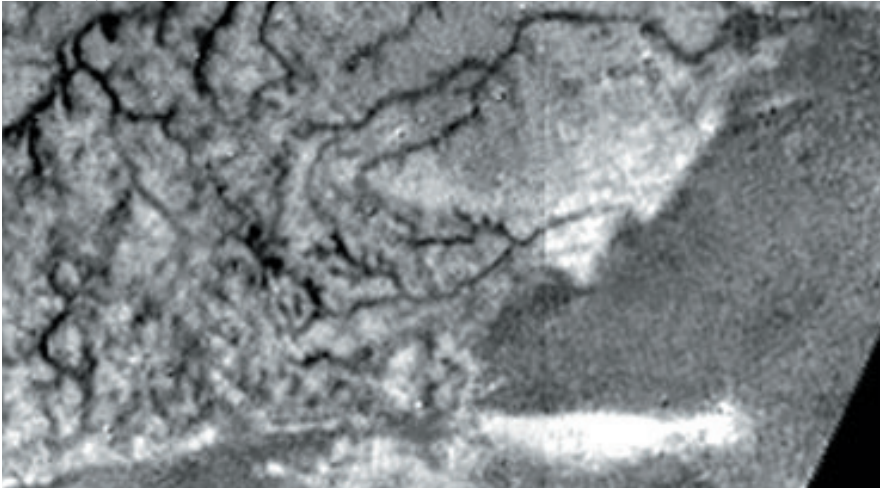


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# Huygens plunges to Titan

By Guy Webster

Mosaic shows river channel and ridge area on Titan.



ESA / NASA / JPL / University of Arizona

NASA Administrator Sean O’Keefe offered congratulations to the European Space Agency (ESA) on Huygens’ successful touchdown on Saturn’s moon Titan. “The descent through Titan’s atmosphere and down to its surface was perfect,” said O’Keefe.

The probe entered Titan’s upper atmosphere at about 2:15 a.m. Pacific time on Jan. 14 and began its two-and-a-half hour descent to the surface of the moon, sampling the chemical composition of the atmosphere throughout the trip. The probe also continued transmitting data for more than 90 minutes after reaching the surface.

Data from the probe was sent to the Cassini spacecraft for relay through NASA’s Deep Space Network to JPL and on to ESA’s Space Operations Center in Darmstadt, Germany. The ESA facility is the operations center for the Huygens probe mission. Data was received over only one of two channels designed to be redundant.

JPL Director Charles Elachi said, “We congratulate our colleagues at ESA on the splendid performance of the Huygens probe and look forward to the science results of this effort. This has been a great example of international collaboration to explore our solar system.”

Cassini-Huygens is a joint mission of NASA, ESA and the Italian Space Agency. ESA’s Huygens probe was carried to Saturn’s orbit aboard the JPL-managed Cassini spacecraft, then sent on its way to Titan on Dec. 24, 2004. Cassini continues to orbit Saturn on a four-year prime mission to study the planet, its rings, moons and magnetosphere.

Bob Mitchell, Cassini program manager at JPL, said, “Our ESA colleagues have every reason to be very proud of the excellent manner in which the Huygens probe performed and we are also proud of our support for this endeavor.”

“We now have the key to understanding what shapes Titan’s landscape,” said Dr. Martin Tomasko, principal investigator for the descent imager-spectral radiometer, adding: “Geological evidence for precipitation, erosion, mechanical abrasion and other fluvial activity says that the physical processes shaping Titan are much the same as those shaping Earth.”

Spectacular images captured by the radiometer reveal that Titan has extraordinarily Earth-like meteorology and geology. Images have shown a complex network of narrow drainage channels running from brighter highlands to lower, flatter, dark regions. These channels merge into river systems running into lakebeds featuring offshore “islands” and “shoals” remarkably similar to those on Earth.

Data provided in part by the gas chromatograph and mass spectrometer and surface science package support Tomasko’s conclusions. Huygens’ data provide strong evidence for liquids flowing on Titan. However, the fluid involved is methane, a simple organic compound that can exist as a liquid or gas at Titan’s sub-170°C temperatures, rather than water as on Earth.

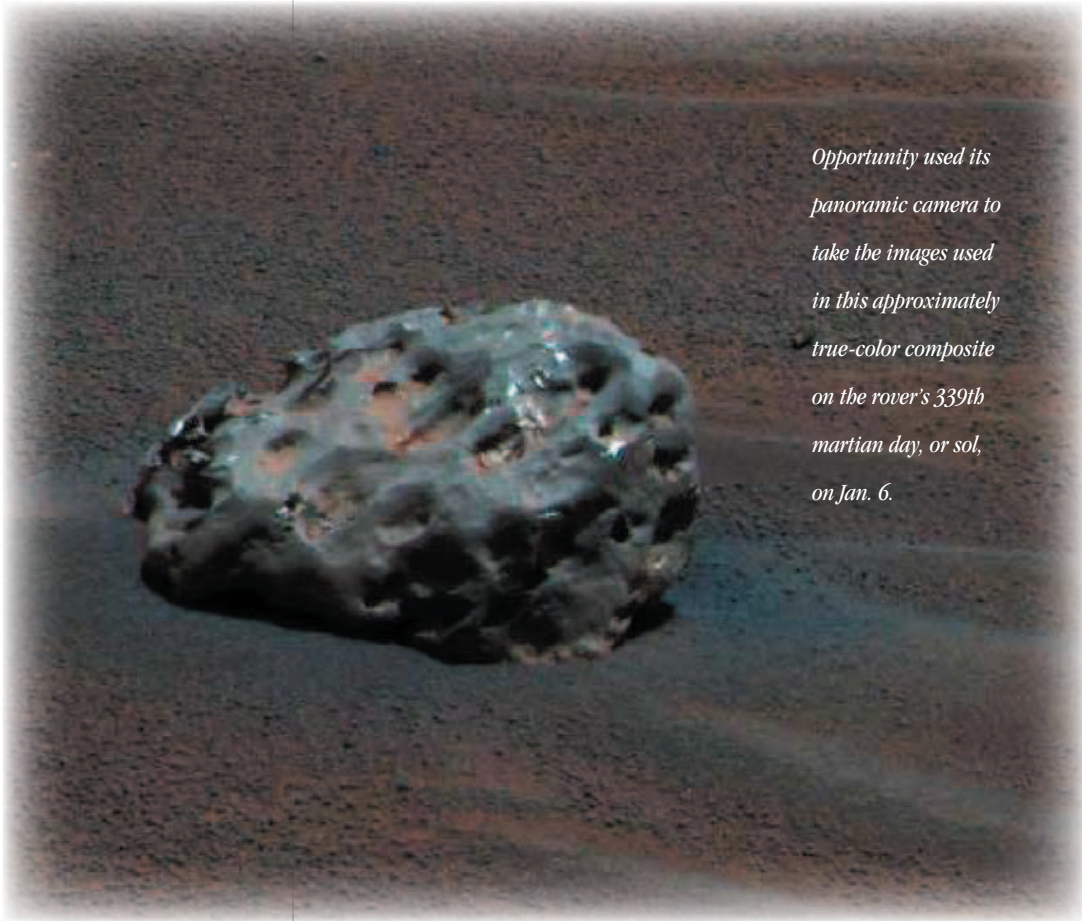
Titan’s rivers and lakes appear dry at the moment, but rain may have occurred not long ago.

Deceleration and penetration data provided by the surface science package indicate that the material beneath the surface’s crust has the consistency of loose sand, possibly the result of methane rain falling on the surface over eons, or the wicking of liquids from below towards the surface.

For more information on the Cassini-Huygens mission, visit <http://saturn.jpl.nasa.gov>.

# Opportunity finds iron meteorite

By Guy Webster



Opportunity used its panoramic camera to take the images used in this approximately true-color composite on the rover’s 339th martian day, or sol, on Jan. 6.

The Opportunity rover has found an iron meteorite on Mars, the first meteorite of any type ever identified on another planet.

The pitted, basketball-size object is mostly made of iron and nickel according to readings from spectrometers on the rover. Only a small fraction of the meteorites fallen on Earth are similarly metal-rich. Others are rockier. As an example, the meteorite that blasted the famous Meteor Crater in Arizona was similar in composition.

“This is a huge surprise, though maybe it shouldn’t have been,” said Dr. Steve Squyres of Cornell University, principal investigator for the science instruments on Opportunity and its twin, Spirit.

The meteorite, dubbed “Heat Shield Rock,” sits near debris of Opportunity’s heat shield on the surface of Meridiani Planum, a cratered flatland that has been Opportunity’s home since the robot landed on Mars one year ago.

“I never thought we would get to use our instruments on a rock from someplace other than Mars,” Squyres said. “Think about where an iron meteorite comes from: a destroyed planet or planetesimal that was big enough to differentiate into a metallic core and a rocky mantle.”

Rover-team scientists are wondering whether some rocks that Opportunity has seen atop the ground surface are rocky meteorites. “Mars should be hit by a lot more rocky meteorites than iron meteorites,” Squyres said. “We’ve been seeing lots of cobbles out on the plains, and this raises the possibility that some of them may in fact be meteorites. We may be investigating some of those in coming weeks. The key is not what we’ll learn about meteorites—we have lots of meteorites on Earth—but what the meteorites can tell us about Meridiani Planum.”

The numbers of exposed meteorites could be an indication of whether the plain is gradually eroding away or being built up.

NASA Chief Scientist Dr. Jim Garvin said, “Exploring meteorites is a vital part of NASA’s scientific agenda, and discovering whether there are storehouses of them on Mars opens new research possibilities, including further incentives for robotic and then human-based sample-return missions. Mars continues to provide unexpected science ‘gold,’ and our rovers have proven the value of mobile exploration with this latest finding.”

Initial observation of Heat Shield Rock from a distance with Opportunity’s miniature thermal emission spectrometer suggested a metallic composition and raised speculation that it was a meteorite. The rover drove close enough to use its Moessbauer and alpha particle X-ray spectrometers, confirming the meteorite identification.

Opportunity and Spirit successfully completed their primary three-month missions on Mars in April 2004. NASA has extended their missions twice because the rovers have remained in good condition to continue exploring Mars longer than anticipated. They have found geological evidence of past wet environmental conditions that might have been hospitable to life.

Opportunity has driven a total of 2.10 kilometers (1.30 miles). Minor motting from dust has appeared in images from the rover’s rear hazard-identification camera since Opportunity entered the area of its heat-shield debris, said rover Project Manager Jim Erickson of JPL. The rover team plans to begin driving Opportunity south toward a circular feature called “Vostok” this month.

Spirit has driven a total of 4.05 kilometers (2.52 miles). It has been making slow progress uphill toward a ridge on “Husband Hill” inside Gusev Crater.



News Briefs



Dr. Charles Elachi

Elachi wins Bob Hope Award

JPL Director DR. CHARLES ELACHI has been selected by the Los Angeles chapter of the National Defense Industrial Association as winner of the Bob Hope Distinguished Citizen Award.

Elachi will receive the award at a black-tie dinner on Feb. 25 at the Beverly Hilton Hotel in Beverly Hills. The dinner is designed to bring the defense and space industry on the west coast together with national, regional and local leaders from government and industry.

The honor will be given in recognition of Elachi’s career of more than 30 years at JPL, where besides serving as the Lab’s director he played the lead role in developing the field of spaceborne imaging radar from a small research area to a major field of scientific research and application.

The National Defense Industrial Association is a partnership between industry and government that facilitates growth, innovation and technological advances for all facets of the defense industrial base. Membership includes approximately 1,100 corporations and 27,000 individuals. The organization’s Los Angeles chapter consists of approximately 1,300 individual members and 44 corporate members.

Howard speaks at women’s event

JPL researcher DR. AYANNA HOWARD was a featured speaker at the California Governor’s Conference on Women, held Dec. 7 at the Long Beach Convention Center.

About 100 young women attended the event, titled “Women As Architects of Change.”

Howard joined panelists LISA LESLIE of the WNBA’s Los Angeles Sparks and NICOLE TAYLOR, the chief executive officer of College Track, in discussing “Life After High School: College and Careers.”

Howard told the gathering that her mother encouraged her to go to

college outside of California to broaden her horizons. She also encouraged the young women to study math and science and to set goals.

Kwok receives IEEE honor



Dr. Ronald Kwok

Senior Research Scientist Dr. RONALD KWOK of the Polar Remote Sensing Group has been elected Fellow of the Institute of Electrical and Electronics Engineers.

The organization recognized Kwok “for contributions to microwave remote sensing for understanding of polar ice processes.”

Kwok has worked at JPL since June 1985. He is currently working on cryospheric research tasks for NASA, the National Science Foundation and the Office of Naval Research.

Lab contributes \$461K to United Way

The JPL community contributed \$461,089 to last fall’s United Way campaign. The sum represents a 3 percent increase over the 2003 campaign’s donations.

In addition, through the United Way food drive, JPL staff donated 64 boxes of food totalling more than 1,000 pounds to four local food banks.

“Thanks to the JPL community for donating through United Way,” said NANCY KAPELL of the Employee Services and Recognition Group. She pointed to United Way of Greater Los Angeles’ “Bridging the Gap” strategy that invests in learning, empowering and caring. “Through your gifts, you are supporting programs like Success By 6, Motherhead/Fatheread, Tomorrow’s Leaders, and Saving For the American Dream,” she said. “Thanks for your contribution.”

If you would like to learn more about how your gift is making a difference in the community, log on to [www.unitedwayla.com](http://www.unitedwayla.com).

Lab event honors Dr. King

By Susan Braunheim-Kalogerakos

JPL hosted its annual celebration of the life and achievements of civil rights leader Dr. Martin Luther King Jr. on Jan. 21 in von Kármán Auditorium. This year’s theme was “Character, Commitment and Courage.”

The event—co-sponsored by the African American Resource Team and the Diversity Programs Office and organized by the MLK Steering Committee—included inspirational speakers as well as entertainment from musical group Vessels, a song by 12-year-old Teira Church accompanied by an interpretive dance by Alesia McCrary, and a special poem by 6-year-old James Wesley Bennett III.

A moment of silence was also extended in memory of the three JPL staff members who died in December’s vanpool accident.

The keynote speaker, Dr. Genevieve Shepard, principal of Tom Bradley Environmental Science and Humanities Charter Magnet School, spoke to a full house. “Martin Luther King brought hope and healing to America,” Shepard said. “We are here to commemorate his timeless values, through example, of courage and truth, of justice and compassion and of dignity, humanity and service.”

In her speech, Shepherd encouraged everyone to start making King’s dream a reality by simply “reaching out a hand to those in need.”

Wendelin Donahue, co-chair of the event along with Laura White, said, “Our goal was to simply inspire. To have the support of the Lab and the dedication of the steering committee makes the MLK celebration worthwhile every year.”

Special Events Calendar

Ongoing Support Groups

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

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

Codependents Anonymous—Meets at noon every Wednesday.

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

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

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

Friday, January 28

Student Chamber Concert—Caltech students will perform a variety of music for small ensembles and piano duets at 8 p.m. in Dabney Lounge. Admission is free and a reception will follow the concert.

Wu Man on Pipa—Wu Man, who is internationally acclaimed for her traditional repertoire and is also recognized for contemporary pipa (Chinese flute), will perform at 8 p.m. in Beckman Auditorium. Tickets are \$25, \$21 and \$17; high school age and younger, \$10. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Saturday, January 29

Lazer Vaudeville—This family program that combines the high-tech effects of lasers and blacklights with the traditional vaudeville arts of juggling, comedy and acrobatics will be held at 2 p.m. in Caltech’s Beckman Auditorium. Tickets are \$12; high school age and younger, \$7. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Sunday, January 30

Chamber Music—Les Violons du Roy, featuring works by Handel and Bach, will be offered at 3:30 p.m. in Caltech’s Beckman Auditorium. Tickets are \$29, \$25, \$21 and \$17. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Tuesday, February 1

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

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

My Darling Clementine—This 1946 film that retells the tale of the OK Corral will play at 8 p.m. in Caltech’s Beckman Auditorium. The film is part of the Frank Capra Film Series, which features films in honor of the director and Caltech alumnus whose work united popular entertainment and social consciousness. Free admission. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Wednesday, February 2

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

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

Thursday, February 3

“Getting Started”—This Fidelity workshop at noon in T1720-137 is designed for the beginning investor and will focus on the advantages of investing in

your retirement savings account, your different investment options, how to get started at any age, and investment terms and basics.

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

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

“The Importance of Workplace Trust”—



Amy Lyman, president of the Great Place to Work Institute, will discuss her organization’s “Trust Index,” a tool that helps measure how employ-

ees feel about their organization’s credibility and how well it fosters an environment of respect. To be held from 3:30 to 5 p.m. in Caltech’s Beckman Auditorium. For more information, e-mail [cma.announce@jpl.nasa.gov](mailto:cma.announce@jpl.nasa.gov) or call Dlorah Gonzales, (626) 395-8661.

Saturday, February 5

“Stand-Up Opera”—Comedienne and actress B.J. Ward will present a sendup of the opera world and all its excesses at 8 p.m. in Caltech’s Beckman Auditorium. Tickets are \$22, \$18 and \$14; high school age and younger, \$10. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Tuesday, February 8

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

TIAA/CREF Enrollment Meeting—This workshop, to be held at noon in T1720-137, is designed to assist employees newly eligible for the Caltech/JPL retirement plan with selection of investment options and the completion of their enrollment forms.

Wednesday, February 9

Art Spiegelman—The cartoonist will give a talk as part of Caltech’s Words Matter program at 8 p.m. in Beckman Auditorium. Free admission. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Astro Turf: The Private Life of Rocket Science—Author M.G. Lord will appear at 7:30 p.m. at the Huntington Library, 1151 Oxford Rd., San Marino, to discuss her book, which weaves some JPL history in with her own life story, living with a father who was absorbed by his work on the Mars Mariner project in the 1960s.

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

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

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

Thursday, February 10

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

Saturday, February 12

Afro-Brazilian Music—Ologundé will perform at 8 p.m. in Caltech’s Beckman Auditorium. Tickets are \$22, \$18 and \$14; high school age and younger, \$10. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).

Sunday, February 13

Chamber Music—The California Quartet will perform at 3:30 p.m. in Caltech’s Dabney Lounge. Free admission. For more information, call (626) 395-4652 or visit [www.events.caltech.edu](http://www.events.caltech.edu).



# Creation of 'technical authority' represents NASA culture change

BY MARK WHALEN

**In response to findings from the Columbia Accident Investigation Board (CAIB), NASA earlier this month implemented a new system of "Independent Technical Authority" to ensure that the technical decisions needed for safe and reliable operations are not compromised by cost and schedule considerations. JPL Chief Engineer Brian Muirhead discusses the implications of this new directive for the Laboratory.**

From left: Bill Kilpatrick and Walter Hussey of NASA chief engineer's office, Brian Muirhead (holding technical warrant document) and Dr. Charles Elachi.

## How did NASA come to the decision to create the independent technical authority? How will it work?

When the CAIB looked at the cause of the Columbia accident they saw a flaw in the way engineering decision-making was being done. Some engineering decisions were being made on the basis of cost and schedule that were not necessarily good engineering decisions.

The CAIB recommended, and NASA accepted, the implementation of the Independent Technical Authority with the authority over engineering decisions equal to that of the project or program management, when it comes to issues associated with safe and reliable operations, and most specifically with respect to human safety.

So the technical authority for engineering was vested in the NASA chief engineer, Rex Geveden, who in turn delegates his authority via a "warrant" process, where warrants are issued to individuals—rather than to organizations—at the NASA centers for "systems" and "disciplines." In JPL's case, Stardust, Mars Reconnaissance Orbiter and Phoenix were chosen as the first warranted systems. Eventually we're going to have all of our missions under this process. The initiative cuts across all of NASA, with warrants also issued for the space shuttle system (at JSC), the space shuttle propulsion system (at MSFC), the International Space Station system (at JSC), Global Precipitation System (at GSFC) and other areas.

So if there is a technical decision, a requirement, a waiver, the technical authority has power equal to project management in terms of approving or disapproving those engineering decisions that may impact human safety.

If the project manager and the technical authority cannot agree (which we think will be rare), then the decision will be elevated—up within the NASA center, then eventually to the Chief Engineer and program associate administrator at NASA Headquarters.

## When will this systems technical warrant take effect at JPL? How were the three JPL missions selected?

We're started now; my warrants were issued on Jan. 10 and I expect that by June or so we'll have the system fully in place and running smoothly.

These missions were picked because they represent three distinct phases of mission development/operations. Stardust is on its way back to Earth with samples of cometary material. MRO, which is scheduled for launch in August, is in system test and will soon start launch operations, the most critical phases in terms of human safety. Phoenix is in the formulation phase, with project design review a couple of months away. Here it's important to make sure the requirements are well defined and the right standards are being applied, particularly with the contractor, Lockheed Martin Astronautics.

For us, once the spacecraft leaves Earth orbit, that independent technical authority responsibility should end. However, when the mission is coming back to Earth—as is Stardust—the Independent Technical Authority ownership doesn't end until the spacecraft is safely back on Earth.

My job is to figure out how to use JPL's standards and processes, most importantly the JPL Principles and Flight Project Practices, to meet the objectives of the independent technical authority and support the excellent work done by our project teams.

I don't believe the implementation of the independent technical authority at JPL represents a significant difference in the way we already do business. It just amplifies certain elements and I think it will force a better understanding and alignment of how we apply our institutional requirements to assure safe and reliable operations.

## Is the warrant function another level of engineering oversight?

No, that's exactly what it isn't. I like to think of it as insight. Compliance with requirements is the responsibility of the project with oversight by the Office of Safety and Mission Success. The independent technical authority brings independent engineering judgment and insight to the definition of requirements and the approval of deviations when it comes to safe and reliable operations.

However, this is a culture change and something people are going to be watching, and it's got very high visibility inside and outside of NASA, including Congress. This won't be easy but we need to make sure we get it done right, for the agency and our projects.

## Where does the human safety aspect come into play at JPL?

If a mission is going to Mars, let's say, the warrant holder's responsibility ends when the spacecraft safely leaves Earth orbit. So it would involve requirements on hazardous systems, like propulsion, pyrotechnic devices, etc.—any place you where we would be placing humans

at risk during ground or flight operations. This could also include transportation or environmental testing. So for our robotic missions it's a really much smaller set of requirements than those required for mission success. On the other hand, for the human-rated systems, like shuttle, it includes just about everything.

For the class of missions that come back to Earth the scope will be much broader, including many of our subsystems—attitude control, command and data — anything that could cause a mission to lose control in some way or miss the safe landing target. The scope of the warrant holder would be significant for a Mars sample return mission.

## Will you appoint other JPL technical warrant holders besides yourself?

First of all, only the NASA chief engineer can appoint warrant holders. No redelegation is allowed. However, this job has the potential to be overwhelming, especially for a huge system like the shuttle. So there's a concept called "trusted agents," who, unlike the warrant holders, don't have to be independent of the program offices.

I plan on using the chief engineers of the directorates and the divisions, as well as the project engineers and the mission assurance managers of the projects, as "trusted agents" to execute this responsibility. I will also use a recognized group of discipline experts (e.g., propulsion, power, structures) to support the application of standards and work with Discipline Warrant Holders at other centers. It's essential to the objectives of the independent technical authority to have people close to the day-to-day operations to rely on for insight and advice.

## What is "technical conscience" about?

It is something that the NASA chief engineer is working to re-invigorate across the agency. It's the idea that every engineer at NASA—some 10,000 of us—must assume the ownership of the work we do, and to have the conscience to make visible and actively work any issues that might affect safe and reliable operations, especially when humans are at risk.

Frankly, I believe that JPLers have always exhibited a strong technical conscience. But now with the advent of the JPL Office of the Chief Engineer, the Engineering Board and warrant holders, engineers have a much more visible place to bring issues they're worried about. Everyone should know they can go to their division or directorate chief engineer, or to me, to talk about anything that concerns them with respect to engineering at JPL and NASA.

## You've only been in this job since last August. Besides the technical authority, what other issues do you face?

We've had one chief engineer before, John Casani, but this is the first time we've had an Office of the Chief Engineer. Its objective is to help sustain and enhance every aspect of engineering excellence at JPL. We have an incredible history of success on very challenging and exciting missions, and I want to do everything I can to be sure that record continues. One of the things we've done is to create the Engineering Board which is made up of the chief engineers of the directorates, the divisions, and key people from the Office of Safety and Mission Success and the Project Support Office. All future warrant holders will also be members. We now have a forum where some of JPL's best systems people get together regularly to identify, discuss and resolve technical issues. We actively review, charter Red Teams, assign actions, take positions and provide expert opinion to the projects, the ESD Director, the Associate Director and the Director. We are currently very actively engaged in MRO, Phoenix, Stardust and Deep Impact.

One of our greatest recent challenges has been understanding and making recommendations to projects about the use of field programmable gate arrays. The reliability of these devices is a problem that has cut across the entire agency as well as industry. The JPL chief engineer's office has been the focus for working this mission-critical problem and has helped JPL projects formulate a course of action that looks to have avoided a major mission risk.

We've recently supported MRO in resolving issues with their inertial measurement units and system thermal vacuum testing. And we've just agreed to charter an Avionics Advisory Board, akin to the Navigation and Entry, Descent and Landing advisory boards, for the express purpose of maintaining insight into the state-of-the-art and advising projects on the use of processors, memories, field programmable gate arrays, power converters, etc.

These are the kind of things I expect this office and the Engineering Board to be engaged in—current problems and avoiding future ones. This is the place for programs and projects and the institution to bring their most challenging technical issues and get real help.



# Service awards



For the period of October through December 2004 the following JPL recipients celebrated 25 or more years of service and were invited to attend a luncheon and ceremony in their honor on Jan. 11.

*40 years:* Yvonne Barraza, John Elias, Joachim Voeltz.

*35 years:* Richard Aragon, Kerry Erickson, Dorothe Horttor, Michael Klein, Donald Langford, Irma Lopez, Helmut Partma, Partha Shakkottai, Joel G. Smith, John Stagner, Richard Stanton.

*30 years:* Glenn Campbell, Cynthia Chinn, Judith Cohen, Hamil Cooper, James Cutts, Patrick Dillon, Dennis Matson, Helen Paley, Daina Parlee,

## Passings

**SAMUEL WEAVER**, 88, a retired machinist, died Jan. 4. He worked at the Lab for more than 35 years.

Weaver is survived by his son, Marty. Memorial services were held Jan. 23 at Church of the Brethren in Pasadena.

**WALTER “SCOTTY” SKOTNICKI**, 71, an electrical engineer in Section 334, died Jan. 8.

Skotnicki joined JPL in 1958 and had worked on such missions as Explorer 1, Voyager, Ranger and SIR-C/X-SAR. He was instrumental in the development of JPL's airborne radar program, including the CV-990-based polarimetric/along-track interferometric L- and C-band radar and Airsar.

He is survived by his wife, Justine, three sons and two grandchildren.

## Letters

My family and I want to sincerely thank my co-workers and friends for their concern and prayers at the loss of our baby girl, Ariel Analemma Ellis. Your expressions of sympathy and love during this time have been most appreciated. I am so very thankful for the “family” of friends we have at JPL. We would also like to thank Jay Sucher, the Parts Acquisition Group and Section 514 for the absolutely exquisite flower arrangement—it is the most beautiful we have ever seen.

The Kristan Ellis family

## Classifieds

### For Sale

APPLIANCES: GE self-cleaning gas water heater, 40 gal., \$150; Roper refrigerator (by Whirlpool), white, 18 cu. ft., top freezer, \$200; Maytag washer, 2-cycle, \$50; Kenmore gas dryer, 3-cycle, 4-temp, \$80; obo on prices. 626/791-8161.

BABY ITEMS: Evenflo Megasaucer, gently used bouncer, plenty of toys to entertain baby, \$30; Little Tykes Push-walker, gently used, OK for toddlers just learning how to stand or taking a few steps, folds for storage, \$10. 502-0768.

BABY ITEMS: Graco Pack 'n Play playpen, used, gd. cond., lg. square shape to accommodate baby's play time, primary colors, can be used indoors or outdoors, only been used indoors, \$15; Jenny Lind style changing table, gently used, gd. cond., top shelf for changing baby, 2 open shelves on bottom for storage, light honey color, \$40. 502-0768.

BIKE, woman's Schwinn, 4 mo. old., incl. helmet, lights and lock, \$80. 626/757-1066.

CLOTHES, infant: jacket, red/navy blue, zip-up w/hood (Old Navy), size 2T, exc. cond., \$5/obo; sweater, sky blue w/navy trim buttons, size 3T, \$1/obo; zipper shoes, Spongebob motif, size 11M, exc. cond., \$5/obo; photos on request. 626/791-6101.

COMPUTER CHASSIS, new EZ media P4ATX, 4 x 5.25 & 2 x 3.5 ext., 4 x 3.5 int., 350W supply, 2 USB 2.0 prt., fan, \$18. 395-6804, leave msg.

COUNTED CROSS STITCH SUPPLIES, four boxes of DMC floss, fabric in many colors (lugana, aida, hopscotch), beads, needles, plastic embroidery hoops, numerous pattern books, price negotiable. 626/791-7645.

DESK, salem maple, over 45 yrs. old and a family heirloom, needs TLC, 3 drawers, one needs work, slanted door to use for writing, several cubicles inside, useful for filing with two small drawers, fair/good cond., could be used for a student or as a second desk, need to sell to update home office, \$100/obo. 626/357-6155.

DRAPES, floor-length tie-back panels, light blue w/light pink, includes valance, vg cond., 2 sets, \$60; loose weave, cream with pink dots, floor length, 2 sets, \$60; all draperies cleaned and ready to hang, hardware included, photos avail. 909/596-4390.

EXERCISE EQUIPMENT: Impex Glider 3000 and Stamina Stepper 75, both foldable and with owners manual, \$25/ea. 626/355-2237.

Plan Hold “designer,” 48 1/2” x 36”, \$75; plan hold rack, stores plans/charts/maps, with roll-around wheels and 10 clip bars, gd. cond., \$100; floor lamp, 3-arm sofa arch, brass finish, \$50. 957-8346.

FURNITURE: S. Harris 3-piece tan sectional sofa w/14 pillows, down-stuffed seats and 3” foam, exc. cond., left side: 40” x 148”, right side: 40” x 132”, needs a lg. room, \$1,900 (retail \$10,700); 4-drawer metal filing cabinet, 36” W, \$75; 6-shelf cherry bookcase, 36” x 12” x 88”, \$100. 626/441-8444 or dlnels@sbcglobal.net.

FURNITURE: 40-yr-old walnut dining table w/3 leaves & 6 shield back chairs, refinished several years ago, seats need reupholstering, 43” x 64” closed, 43” x 97” open, \$400; 4-shelf walnut bookcase, 6’ x 3’ x 1’, \$75; Chinese Coromandel painted wood screen, 4 panels, 2 sides, 72” H x 64” wide, \$400/obo. 626/441-8444 or dlnels@sbcglobal.net.

GRIDDLE, Presto electric, 19”, nonstick, w/removable drip tray, brand new, used only once, \$18. 626/449-0997.

HIGH CHAIR, wood, Windsor style, 38” H, gd. cond., about 5 yrs. old, used for visiting grandchildren, photo avail., \$50/obo. 909/596-4390.

HUTCH, gorgeous wood, \$75. 626/345-1476, Stacey.

MISC: Philips 14” TV, \$50; Philips DVD, \$40; JVC VCR, \$20; Apple Pro mouse, \$10; VST USB floppy drive, \$10; Motorola Talkabout walkie-talkies, \$20. 213/810-8801.

MISC: pool table, 8’, \$400; mailbox, oversized, green, \$10; black mailbox, new, \$10; red wig, shoulder length, never used, \$20; portable basketball set, adjustable, needs net, \$200; fishing pole, saltwater, \$25; bunk bed mattress, gd. cond., \$10; baseball glove (small) & conditioner, gd. cond., \$15; small food chopper, \$5; landscape oil painting, autumn tones, \$100. 626/357-8210.

MISC.: camera, Zoom, APS, Yashica Profile 4000IX, \$40/obo; phones, cordless, 3 units, Uniden 2.4 GHz, digital answering, hardly used, \$50/obo; walkie-talkie, Cobra Microtalk 2-way radio, 2 units, 5-mile range, \$40/obo). 726-7701.

MISC.: Xmas tree (Greatland 6+ft. McIntyre pine, like real, \$10/obo); espresso maker, Krups Novo compact, m#989, \$25/obo; mixer, Sunbeam deluxe, 12 spd., w/turntable, beaters & bowls, \$50/obo; beanbag chair, denim exterior, \$25/obo; ottoman/foot massager, \$75/obo. 726-7701.

MISC: Sony 32” color TV in wood cabinet w/speakers, \$300; Jones of New York 2-pc. pantsuit, jacket fully lined, slash pockets, new with tags, size 12, dark olive, orig. \$198, sell \$50; foot massager, Brookstone, orig. \$200, sell \$40; Shiatsu neck massager, \$20; R.C. Gorman signed print, “Woman in Orange,” circa 1977, \$50. 626/398-4960.

MISC: blue oak high-back swivel desk chair, \$69; toddler bed frame, wood, looks like a red car, \$49; wireless intercom set, \$39; floor lamp, silk shade, \$19; tray tables set, blonde wood, \$19; kid's rolling duffle bag, multicolor, never used, \$10; turntable w/amp & speakers, \$10; bathroom rugs set, blue, never used, \$7. 626/798-4510.

MISC: mountain bike, Trek, boys 6-speed, red, 12.5” frame, 20” tire diameter, vg cond., \$85; boys Billabong snowboard jacket, red w/white trim, fits about 4’10” used once, \$39; large oak desk, \$295. 952-8455.

MOVING SALE: dining room table set; queen size mattress and box spring; 13” TV, see http://www.its.caltech.edu/~kmg/Sale, kmganga@yahoo.com.

MUSIC PLAYER, mini iPod, 6 months old, \$275 value for \$200. 626/795-3172.

SKI RACK, used once, \$25; SKI BOOTS, 1 pr., men's, used once, \$25, exc. cond. 626/449-6799, Bob.

SNOWBOARD, 123 cm Burton with bindings and size 5 Lamar boots, great cond., \$75. 661/254-7443.

STEREO SPEAKERS, KLH 2-way acoustic suspension, AS1746211, in walnut cases, 23” x 12” x 8 1/2”, \$50. 957-8346.

TELEVISION, Panasonic 20” flat screen “Tau”, stereo, ~2 years old, seldom used, manual + programmable remote included, model CT-20SX12D, \$135. 626/794-8737.

TROPICAL PLANTS, plumerias, variety of colors and sizes; shell gingers. 626/444-6156, Annie & Bob DePonte.

WEIGHT EQUIPMENT: incline bench, \$50, dumbbells free with the benches. 626/449-6799, Lucia.

YARD SALE, multi-family, Sat., Feb. 5, 1758 Oakwood St, Pasadena: furniture items (vintage); clothing (new/used); books; records (33s & 78s); lots of glassware & kitchen items, incl. some Franciscanware; plenty of misc., 8 am-1 pm, no early birds, please.

### Vehicles / Accessories

'98 BMW 740i, V8, 290 HP, 94K mi., white, exc. cond., loaded, beautiful ride and handling, premium sound, sunroof, 6 airbags, stability control, extended warranty for 1 more year, \$17,999/obo. 909/592-2279.

'04 CHEVROLET Monte Carlo, super-charged Super Sport, black leather interior, sunroof, on manufacturer's warranty, 20” industrial custom Giovanni wheels, 9,500 mi., \$34,000/obo. 626/407-7748, Karina Fernandez.

'96 DODGE Grand Caravan, loaded, 98K mi., power, \$4,200. 422-9396.

'94 DODGE Grand Caravan, 3.3L eng., exc. cond. inside/outside, loaded, 1 owner, quad seats, rear a/c, privacy windows, tow pkg.,

Michele Sawnor, Anita Sohus, William Stromberg, Ben Toyoshima, Joyce Wolf, Chialin Wu.

*25 years:* Olga Adame, Vijayarag Alwar, Ross Curtright, Jack Dawson, Ronald Day, Lloyd Deforrest, Joseph Dominguez, Virginia Dominguez, Gregory Hanchett, Jean Henderson, Vahraz Jamnejad, Gabor Lanyi, W. Timothy Liu, Hanh Milam, Alexander Mileant, Vartouhi Nadjarian, William Owen Jr., Veloris Pickett-McKay, Steven Pravdo, Charles Sarture, Keri Smith, Richard Springer, Audrey Steffan, William Stewart, Stephen Unwin, Nancy van Wickle, Kenneth Vines, Andre Yavrouian, Christopher Yung, Samuel Zingales/

For more information about Service Awards, visit <http://hr/esr>.

120K mi., \$3,750/obo. 626/447-1953.

'99 GMC Suburban 4 x 4, loaded, leather, 64K mi., exc. cond., extended warranty until 75K mi., \$15,500. 626/332-0130, home, or 626/922-1764, cell, Eddie.

'03 HONDA Accord LX, 4 dr., pwr. windows/locks, CD player, a/c, white color, auto, 40K mi., exc. cond., \$14,000. 909/599-3230.

'00 HONDA Civic LX, immaculate cond., auto, a/c, power steering/windows/door locks, tilt, cruise, am/fm stereo/cassette, dual front airbags, 67K mi., all service records, one owner, color: vintage plum pearl (dark maroon-brown), beige interior, see photos at ERC or call and I will e-mail, \$9,550/obo. 903-8979.

'88 HONDA Prelude Si, 2.0L, 5-spd., 168K mi., fair cond., runs great, a/c, cruise control, power windows, moonroof, 6-disk CD, \$1,300. 626/447-0214.

'92 LEXUS LS400 4 dr. sedan, exc. cond., well serviced, 130K mi., Nakamich gold package, leather, power moonroof, chocolate brown exterior, \$6,600. 236-3827.

'95 MAZDA Protégé, white, in average cond., a/c, am/fm/cassette, less than 75K mi., avail. Feb. 28, moving. kmganga@yahoo.com.

'99 MITSUBISHI Galant ES, 4 cyl., full power, sunroof, exc. new tires, \$4,200. 626/379-3503, Erik.

'97 PONTIAC Sunfire, white with black int., exc., cond., \$2,300. 626/379-3503, Erik.

TIRE/WHEEL, donut spare, T105 80D-13, used once, \$39. 626/798-4510.

'93 TOYOTA Corolla LE, 4 dr., white, automatic, loaded, moonroof, CD, great cond., 110K mi., exc. starter car, \$2,700/obo. 248-0638.

'92 TOYOTA motorhome, Dolphin Model 900, pastel blue, 16 mpg, 82M, V6 auto, cruise, awning, roof & cab a/c, microwave, like new inside, well maint'n'd, sleeps 5, innerspring mattress (not foam), rear bath, crank-up TV antenna, easy-clean linoleum floor, battery-saving fluorescent lts, all manuals incl., long-time senior owners must sell, photos at <http://tinyurl.com/ysgmw>, \$12,700. 626/798-4510.

### Free

CEILING FAN, Casablanca, with “school-house” style light, probably nds, new switch, 4-blade model is similar to “Panama” style w/antique brass finish, pick up near JPL. 790-4719.

MOUNTAIN BIKE, about 10 years old, needs new inner tubes. 626/398-5005.

PAVING, Arizona Flagstone, various size pieces up to ~30”, close to JPL, perfect for walkway or small patio, will e-mail pictures on request. 626/798-9498.

TEXTBOOKS, organic chemistry & biochemistry from the 1940s. 626/398-3649.

### Lost & Found

LOST: gold pendant w/opal and coral setting, sentimental value. Denise, ext. 4-8054.

LOST: cat, black & white neutered male, may have red & white collar, bell; lost Jan. 9, reward, <http://homepage.mac.com/akulawik/index.html>. 790-9204, Alan.

FOUND: small 18K gold ring with center stone, near Bldg. 111 on Explorer Road. Denise, ext. 4-8054.

### Wanted

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

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

TOASTMASTERS, tech entrepreneurs (and others) are establishing a Toastmasters Club at Business Tech Center, 2400 N. Lincoln, Altadena, Mondays at noon; develop your speaking, communication and leadership skills in the world's most cost-effective training organization. 626/296-6256.

### For Rent

ALTADENA “sabbatical house,” for visiting professionals: 3 bd., study, boundary Angeles Nat'l Forest, 3 mi./JPL (trails to Lab behind house), view, fireplace, oak floors, antiques; completely furn.; dinnerware, utensils, pots/pans, bed linens + towels, fine soaps, necessities incl.: just bring toothbrush & clothes: TV/DVD/VHS, Dish satellite, wireless DSL, gardens, patio, parking; private, immaculate. 626/798-3235.

ALTADENA room, all necessities furnished, laundry, sheets, towels, dishes, TV, VCR; parking and small patio enclosed, close to JPL in a very nice area, next to Christmas Tree Lane, very quiet and clean, \$500. 626/798-4821.

MONROVIA townhouse, north of Foothill off of Mountain, charming, 1,200 sq. ft., 2 bd., 2 ba., garage, in 3-unit bldg. on quiet residential cul-de-sac, close to shopping, convenient commute to Lab, balcony with great mtn. view, avail. Feb. 10, \$1,600. 687-3907 or 626/398-6899.

PASADENA, tri-level townhouse, 2 bd., 2 1/2 ba., kitchen, dining rm., living rm., fireplace, 1/2 ba. & patio-deck on main level, attached 2-car garage w/washer-dryer hookups on lower level, central heat & a/c, near PCC/Caltech; no smoking, no pets, avail.

2/01; 110 N. Meridith Ave #5; \$1,450 + \$1,800 security deposit. 626/462-1497, Mark or Tenny.

PASADENA, beautiful home in Hastings Ranch, 3 bd., 2 ba., new Corian kitchen counters & new appliances, remodeled baths, central heat and a/c, hardwood floors, fireplace, pool & covered entertainment area, refrig., washer/dryer, \$3,150 + util. & sec. dep., gardener & pool service included; avail. 3/1. 626/351-9641 or bettyrs@earthlink.net.

PASADENA, 2-story house, 4 bd., 3 ba. newly remodeled, formal living rm., formal dining rm, wood-paneled den, brand new kitchen, fireplace, hardwood floors, washer & dryer, all amenities, detached 2-car gar., detached multipurpose rm., quiet neighborhood, walking distance from Caltech, \$3,295 + util. & deposit. 626/795-4235.

PASADENA, spacious 1-bd. apt., kitchen (stove & frig. incl.), living rm., bonus rm., 1 ba., washer/dryer hookup, one-car parking, non-smoker, no pets, 5 min. from Old Town, 10 min. from JPL, \$900, deposit required. 626/372-5859.

SIERRA MADRE apt., spacious, quiet, 2 bd., 1.5 ba., walking distance to coffee shops, tennis court, swimming pool, hiking trails, 15 min. to JPL, bus 268 to JPL, parking garage, \$1,070. 626/355-7196, Doug.

### Real Estate

FIJI property, 1.28 acres, Koro Island, Eagles nest lot, short walk to resort, free-hold land, a piece of paradise for \$45,000. 249-4395.

FIJI property, 1.29 acres, Vita Levu, tropical jungle setting, free-hold land, small stream, 5 min. walk to coral coast, building permits under way, pad cut with landscape started, many pictures, own a piece of paradise for \$70,000. 249-4395.

PASADENA, 2 bd., 1.5 ba., 1 garage, wood and tile flooring, granite counter tops, complete remodel 2004, basement, quiet neighborhood, close to Caltech, north of 210, MLS:H415727, \$528,000. 626/839-3688.

WEST PALMDALE (93551), in very quiet cul-de-sac, built 1990, 4 bd., 3 ba., 2,350 sq. ft., 2 story, 3-car attached garage, 3/4-acre lot, re-stuccoed, re-painted inside/outside, 2 fireplaces, 2 a/c, alarm, long driveway, 180 degrees panoramic view of the valley, photos available on request, avail. 3/1, \$425,000. 626/791-6101, no agents, please.

### Vacation Rentals

BIG BEAR LAKEFRONT luxury townhome, 2 decks, indoor pool/spa, near skiing, beautiful master bd. suite, slps. 6. 949/786-6548.

CAMBRIA ocean front house, exceptional white water view, accom. up to 4 people, all amenities provided, Jan. & Feb. special, 3rd night free, except holidays. 702/256-1359, ereynolds2@cox.net.

CARMEL, Hyatt Highlands Inn, resort overlooks ocean, 1 bd., living rm. and fully-equip'd kitchen, wood-burning fireplace, spa tub, private balcony, binoculars, complimentary bikes, sleeps 4, July 2-9, '05, \$135/nt., standard Hyatt rate is \$500+/nt. 626/794-9579 or fivestarresorts@earthlink.net.

CAYUCOS, vintage 1880s saltbox, near beach/pier, features a 1 bd., 3/4 ba., carriage house, 2 bd., 1 ba., crow's nest, and 3 bd., 2 ba., captain's quarters, each unit has living rm./dining rm., full kitchen, private entrance & separate outdoor area, interiors furnished in Saltbox style, 2-nite min. fall, winter & spring, except holiday weekends, 1 wk. min./summer, reasonable rates, photos & rates at [thesaltbox.com](http://thesaltbox.com). 248-7499

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps. 4, laundry fac., low season rate \$115/nite/2, high season rate \$130/ nite/2, \$15/nite/add'l person. 949/348-8047 or jackandrandy@cox.net.

LAKE TAHOE, Marriott Timber Lodge in Heavenly Village, studio, queen bed, full sofa bed, sleeps 4, microwave, small refrigerator, dishes, coffee maker, 5 blocks from lake, Aug. 5-12, 2005, \$60/night, standard Marriott rate is \$200+/night. 626/794-9579 or fivestarresorts@earthlink.net.

MAMMOTH, Snowcrest, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL disc'nt. 626/798-9222, 626/794-0455 or valeriee@caltech.edu.

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

OREGON, Brookings, Moosehead Lodgeat the Winchuck River Estuary, fully furnished 3 bd., 2 ba., residence, a mi. from Cal. border, walk Pelican Bay beach w/tidepools, surf and driftwood, fish Pacific Ocean/Wild Rivers along S. Oregon/N. Cal. coast, enjoy the redwoods and Siskiyou Nat'l Forest. 800/221-8175, [www.mooseheadlodgeoregon.com](http://www.mooseheadlodgeoregon.com).

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.

UTAH, Park City, condo-tel, sleeps 4, indoor pool, spa, fitness center, kitchenette, refrig./ freezer, microwave, stovetop, oven, toaster, blender, cable TV, VCR/DVD, phone, balcony, 24-hr. desk, concierge, linens, child care service, laundry service, 10-20 min. free bus to ski resorts & Main St. historic district, JPL discount. garyglass500@charter.net.

### Editor

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