Jet Propulsion Laboratory

Universe

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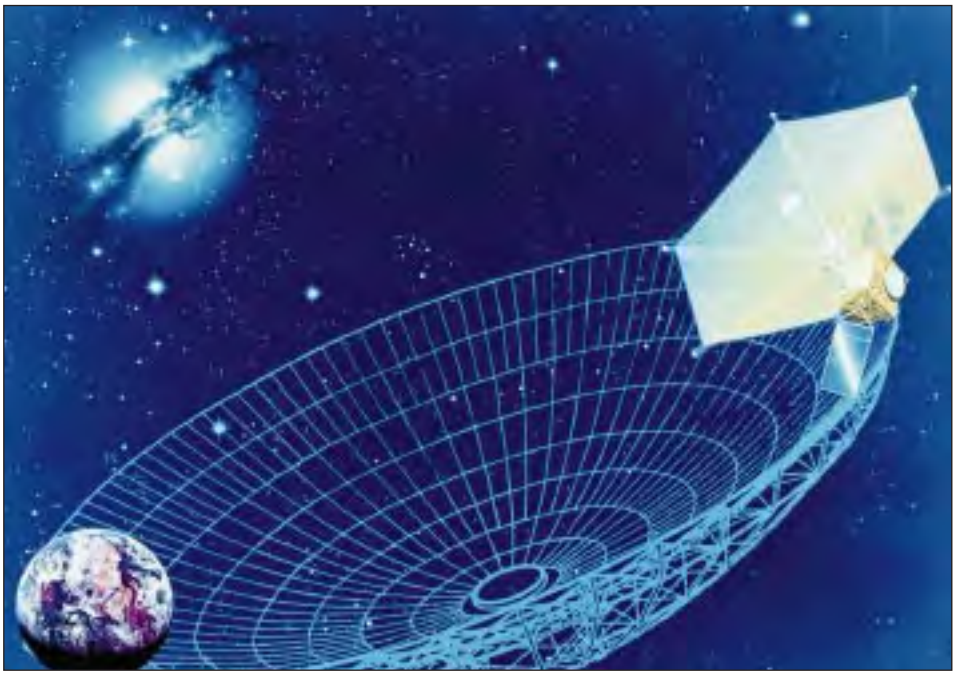

The Very Long Base Interferometry (VLBI) Space Observatory Program combines satellite- and Earth-based radio antennas to create a larger-than-Earth telescope.

VLBI images distant quasars

By JOHN G. WATSON

Images of quasars billions of light-years away are among the striking initial results of the Very Long Base Interferometry (VLBI) Space Observatory Program, a new type of astronomy mission that uses a combination of satellite- and Earth-based radio antennas to create a telescope larger than Earth.

Initial results of the radio interferometry mission, launched in February 1997 by Japan's Institute of Space and Astronautical Science (ISAS), are reported in the Sept. 18 issue of Science magazine.

JPL is part of an international consortium of organizations that support the mission, that creates the largest astronomical "instrument" ever built—a radio telescope more than two-and-a-half times the diameter of the Earth. One of the most complex space missions ever attempted, Space VLBI has given astronomers one of their sharpest views yet of the universe.

The Science article releases four new images, all depicting quasars whose emissions are estimated to have traveled billions of years to reach Earth. "These images probe some of the most distant and ancient objects in the universe, giving us a glimpse of quasars as they existed billions of years ago," said co-author Dr. Robert Preston, project scientist for the mission at JPL. "These powerful objects exist at the center of many galaxies, including our own familiar Milky Way, which has a weak version of a quasar."

Key results detailed in the article revolve around images of extremely distant objects created through a combination of raw data from the space radio telescope and an array of ground radio telescopes, along with highly sophisticated digital imaging techniques. Of special note is the value of such images in clearly resolving individual components in the observed quasars' jets, which are composed of material rushing away from quasars at nearly the speed of light. The four quasar images are available at http://www.jpl.nasa.gov/releases/98/spacevlbi. html.

Quasars are enormously bright point-like optical objects, often shining with an intensity many hundreds of times that of an entire galaxy.

See VLBI, page 6

JPL computer chip to help Ford vehicles

By JOHN G. WATSON

A new computer chip that mimics how the human mind works is making its way from the space program to American industry and may end up in millions of American cars in years to come.

Computer scientists at JPL have made advanced neural network technology breakthroughs that can solve diagnostic problems in industries from automobiles and aerospace to manufacturing and electricity production.

JPL and the Ford Motor Co. have signed a licensing agreement for use of an advanced neural network technology to diagnose misfiring under the hoods of Ford automobiles, among its many potential applications. With the advent of this new chip, vehicles should show a reduction in emission levels.

The smart fit between JPL's neural net hardware and Ford's automotive engineering algorithm expertise will enhance the industrial giant's ability to meet ever-stricter Clean Air Act requirements as they apply to continuous onboard diagnostics and control, officials said.

In addition, the chip is designed to improve fuel economy, resulting in financial savings for car owners. Ford engineers do not predict a price increase for installation of the chip because JPL designed a computationally powerful neuroprocessor that could be mass-produced in a highly cost-effective way. The technology also improves customer satisfaction by virtually eliminating distracting false alarms about misfiring that vehicle dashboards can signal with current under-the-hood diagnostic technology.

JPL and Ford scientists say the chip represents the first significant change in the way computing is done on vehicles since computers were first introduced into automobiles in the 1970s.

"Neural networks are a new discipline, and diagnostics, prognostics and control is a huge field. Ford's application is but the tip of the iceberg of this chip's potential use in American industry as a whole," said Tom Hamilton, program manager at JPL's Dual-Use Technology Office, one of JPL's many technology transfer arms. "JPL is proud to be able to make this revolutionary technology available for U.S. business."

See Ford, page 5

Special Events Calendar

Ongoing

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

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

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

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

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

Friday, October 2

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

Sunday, October 4

Chamber Music—Baritone Nmon Ford-Livene and pianist Victoria Kirsch will give a free concert at 3:30 p.m. in Caltech's Dabney Lounge.For information, call (626) 395-4652.

Tuesday, October 6

ACW Seminar—Clinical psychologist and registered nurse Dr. Bobbi Carlson will present "Assertive Communication Skills: Learning to Say No Without Feeling Guilty" at noon in the Building 167 conference room.

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

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

"System Requirements—The Faster, Better, Cheaper Way"—Develop New Products and the Center for Space Mission Architecture & Design will host a four-hour workshop given by Dr. Richard Stevens, chief technical officer and co-founder of Quality Systems Software. Stevens will address hardware and software requirement development, writing and management. At 12:30 p.m. in von Kármán Auditorium.

Wednesday, October 7

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

Chinese Language Class—Basic instruction in the language is offered starting at noon in Building 306-400. For information, e-mail to wangp@rockymt.jpl.nasa.gov .

Dr. David Baltimore Lecture—The Caltech president will discuss the life and death of cells in this free talk at 8 p.m. in the campus' Beckman Auditorium. For information, call (626) 395-4652.

Health and Safety Fair—More than 30 health care agencies will be on hand in the mall and von Kármán Auditorium to provide information and conduct health screenings, including cholesterol tests and body fat analysis. A number of vendors from JPL Safety Operations will also demonstrate their products. For more information, call Health and Safety Fair chair Susan Harper at ext. 4-3320.

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

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

Friday, October 9

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

"Spain"—This travel film will be shown at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $9 and $7. For information, call (626) 395-4652.

UCLA Football—*Last day to purchase tickets at the ERC* for the Bruins' Oct. 31 game with Stanford at the Rose Bowl. Game time is at 12:30 or 3:30 p.m. Tickets are $18.

Tuesday, October 13

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

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

Wednesday, October 14

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

Chinese Language Class—Basic instruction in the language is offered starting at noon in Building 306-400. For information, e-mail to wangp@ rockymt.jpl.nasa.gov .

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

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

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

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

SESPD Lecture Series—Mars Mobile Science Laboratory Manager Barry Goldstein will discuss the Athena Project at 11 a.m. in Building 180-101.

Thursday, October 15

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

Von Kármán Lecture Series—Stardust Project Manager Dr. Ken Atkins will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, October 16

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

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

Flu shots this month

Influenza vaccine is strongly recommended for any person who, because of age or underlying medical condition, is at increased risk for the complications of influenza. In addition, the vaccine may be administered to any person who wishes to reduce the chance of becoming infected with influenza, said Occupational Health Services Manager Dr. Donal Sweeney.

The vaccine will be available at JPL beginning Oct. 15 at Occupational Health Services, Building 263. The vaccine will be provided in a series of clinics on Thursdays and Fridays, 1:30 p.m. to 3 p.m. Appointments will not be given, and shots will be administered on a first-come, first-served basis.

Sweeney noted that flu shots have recently been found to be beneficial in healthy, working adults. A study in the New England Journal of Medicine found vaccinated individuals had 25 percent fewer upper respiratory illnesses. The study also found a $47 per person savings in healthcare and related costs. This savings is even greater when the vaccine is provided at the worksite, where consideration for work time lost for vaccination would be eliminated.

Weekly schedules, including exceptions and changes, will be advertised on JPL monitors and posted to the jpl.forum newsgroup. For descriptions of high-risk groups and other information, check Occupational Health Services' home page at http://eis/medical . ❑

Lab helps National Geographic provide maps to schools

Every school in United States set to receive gift this month

By JOHN G. WATSON

The National Geographic Society is providing a gift to America's children by sending every school in the United States a large, laminated, updated map of the world. Space program technology from JPL played a pivotal role in the creation of the satellite map images.

Each of the nation's more than 100,000 public and private schools will receive the two-sided map within the next four weeks.

One side of the 1.2- by 1.8-meter (4- by 6-foot) map shows the political world as of June 1998; the other side is a digital image of the physical world based on images collected by satellite. The latter was made possible in part through JPL's digital imaging expertise, which helped create a seamless physical world map out of more than 500 separate images. To do so, JPL drew upon its decades of unique experience in the enhancement and production of images of other worlds sent back by spacecraft from throughout the solar system.

Cartographers at National Geographic Maps relied in large part on a JPL team led by Dr. Nevin Bryant of the Laboratory's Cartographic Applications Group for guidance on working with digital data in order to create the satellite map of the world.

The partnership between the National Geographic Society and JPL was facilitated through JPL's Technology Affiliates Program, one of the Lab's several technology transfer arms. This program is specially designed to help American businesses and other institutions utilize the knowledge and skills of the space program's scientists and engineers.

JPL technology helped to create the above map of the world, which will be given to every U.S. school.

"This relationship shows how well federal research can be leveraged for the public as well as science," said Merle McKenzie, manager of JPL's Commercial Technology Transfer/ Regional Development Program.

"In the closing decade of this century, entire countries have come or gone, boundaries have shifted and place names have changed," said National Geographic Society President John Fahey.

"What better way to start the new millennium than to make sure every one of our nation's schools is on the same map?"

The National Geographic Society is the world's largest nonprofit scientific and educational organization, with 10 million members worldwide.

For information on buying the map ($39.95, order number M8I22001C), call (800) 368-2728. ❑

TOPEX image shows Pacific running both hot and cold

La Niña development still uncertain

By MARY HARDIN

The lingering El Niño in the Pacific Ocean still appears locked in a battle with a possibly waning La Niña condition, according to scientists studying new measurements of sea surface height made by the JPL-managed TOPEX/Poseidon satellite.

The new image shows that the rapid cooling that had occurred in the central tropical Pacific has slowed and the area of low sea level, or cold water that is sometimes referred to as La Niña, has slightly decreased in size and strength since August.

See TOPEX, page 6

It is still uncertain, scientists say, that this cold pool will evolve into a long-lasting La Niña situation.

The image shows sea-surface height on Sept. 12 relative to normal ocean conditions. Sea surface height is an indicator of the heat content of the ocean; the pool of cold water in the Pacific is detected by the satellite as a region of lower than normal sea level.

The tropical Pacific Ocean continues to exhibit the complicated characteristics of both a lingering El Niño, and a possibly waning La Niña situation. The coexistence of these two contrasting conditions indicates that the ocean and the climate system remain in transition. These strong patterns have remained in the climate system for many months and will continue to influence weather conditions around the world in the coming fall and winter.

A La Niña is essentially the opposite of an El Niño condition, but during a La Niña the trade winds are stronger than normal and the cold water that normally exists along the coast of South America extends to the central equatorial Pacific. Like El Niño, a La Niña situation also changes global weather patterns, and is associated with less moisture in the air resulting in less rain along the west coasts of North and South America.

The Sept. 12 image is available online at http://www.jpl.nasa.gov/ elnino . ❑

NBS goes 'live' Oct. 8

By MARK WHALEN

Thanks to the diligent work of JPL's New Business Solutions Project over the last 22 months, the Laboratory is now in receipt of a new set of automated and integrated business processes to prepare it for the new millennium.

The New Business Solutions Program has now delivered New Business Systems (NBS), an integrated set of 42 business applications to support the Laboratory. Just in time for the beginning of fiscal year 1999, IBS is set to go "live" Oct. 8, said New Business Solutions Manager Marc Montgomery.

"The foundation of the automated-tools implementation," Montgomery said, "is 10 Oracle business applications, configured by the NBS team to specifically support JPL's business processes. The system will cover every aspect of purchasing, accounting, inventory and more."

In addition, 11 new applications were cus-

See NBS. page 6

News Briefs

Mark Bennett has been named JPL's new benefits supervisor.

Previously, Bennett worked for 13 years as vice president and retirement plan administrator at Home Savings of America. In this capacity, he was responsible for managing the staff and overall operations of Home Savings' pension, 401(k) and executive benefit programs. He has also worked in the company's compensation, affirmative action and employee relations departments.

Bennett holds bachelor's and master's degrees from Loyola Mary-mount University.

Former benefits supervisor **Melinda Stell** will continue her work with the New Business Solutions (NBS) Project in anticipation of the implementation of the human resources/payroll modules in January. ❑

Izeller Cureton-Snead has been appointed the Human Resources Directorate's technology integration leader. In her new capacity, she will lead NBS' payroll, human resources and timekeeping rollout in January 1999 and will facilitate the integration of ongoing technology applications within Human Resources.

A 20-year veteran of JPL, Cureton-Snead has worked on numerous tasks and projects within the Engineering and Science Directorate and Telecommunications and Mission Operations Directorate. Since January 1997 she has worked on the NBS team as the application architecture engineer and most recently served as timekeeping technical manager. ❑

The Mars Pathfinder Project has been selected as the winner of the 1998 project of the year award by the Project Management Institute, a leading nonprofit professional association in the area of project management.

The award will be presented Oct. 13 at the organization's symposium in Long Beach.

The institute, with about 40,000 members worldwide, establishes project management standards and provides seminars, educational programs and professional certification. ❑

For his achievement in leading the design and development of Pathfinder's airbag subsystem, cognizant engineer **Tom Rivellini** has been named the American Institute of Aeronautics and Astronautics engineer of the year.

Rivellini received the award in late September at the AIAA's World Aviation Congress and Exhibition in Anahiem. The organization is the largest professional technical society devoted to the progress of engineering and science in aviation in space. ❑

A JPL subcontract closeout team has been honored for its work in streamlining cross-organizational automated workflow.

JetForm Corp. of Ottawa, Canada, which produces enterprise workflow and electronic forms automation products, named JPL the gold medalist in its excellence awards' innovation category. The awards honor JetForm customers that have created solutions with its products in a creative manner to solve complex problems.

JPL was recognized for its application combining electronic forms and workflow to automate a cumbersome, paper-intensive process of closing out subcontractor contracts. The automation of this process involves many organizations, including Acquisitions, Contract Audit, Subcontract Property, Office of Patents, New Technology, and Security. Automation of this process has increased operational efficiencies (especially through the use of reminders and deadlines), reduced paper and duplication of effort, shortened the closeout process, and improved subcontractor satisfaction.

Team leader **Francine Fisher** of the Acquisition Support And Information Section 623 received the award Sept. 15. ❑

NASA's recent recognition of three minority contractors for their exceptional contributions to the nation's space program includes honors for a Southern California contractor that has aided a number of JPL missions.

Stanford Mu Corp. of Harbor City received a minority subcontractor award for designing and developing special pressure regulator components for the Cassini spacecraft's propulsion module subsystem; Mars Global Surveyor; the Mars Surveyor 1998 Mars Climate Orbiter and Mars Polar Lander.

Lockheed Martin Astronautics of Denver nominated the six-year-old corporation for the honor. Awards are given annually to minority contractors and subcontractors who have demonstrated significant support of NASA's initiatives.

Honors were presented to the three companies Sept. 23 at NASA Headquarters. ❑

The Office of the JPL Ombudsperson has expanded its web site to include a section called "An Open Eye," which contains broad observations from the Ombudsperson that may be of interest to the JPL community. It will be updated every six to eight weeks.

The web site is located at http://jpl-ombuds . ❑

Dr. Eberhardt Rechtin, known as the father of the Deep Space Network, will receive the Caltech Management Association's Excellence in Management Award Oct. 22 at Caltech's Athenaeum.

Rechtin, recognized for pioneering and advancing powerful technologies that continue to serve the nation as the basis for the design of complex engineering and management systems, will also deliver a talk titled "Why Eagles Can't Swim." Rechtin employs this metaphor, along with examples from the telecommunications, space and power industries, to address the complex matter of using systems architecting to discover what excellent organizations can and cannot do.

Reservations for Caltech Management Association members and guests are $32; with $42 for nonmembers. Cocktails are at 6 p.m., with dinner at 7:00 and program at 8:15.

For information, contact Alfred Paiz at ext. 4-2232, or cma.announce@jpl.nasa.gov. Make check payable to Caltech Management Association and send to **Janester Short**, Caltech mail code 405-47. Reservation deadline is Oct. 15. ❑

Product delivery system manual goes to ISO auditor

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

JPL's ISO 9001 effort has begun to take some important steps toward eventual registration in March 1999.

The Lab's product delivery system manual was delivered to a third-party auditor on Monday, Sept. 28. The manual is used to describe how JPL's processes implement the ISO 9001 standard. The product delivery system is a method for maintaining a high level of quality and intended performance of JPL's products over time and for the future. The manual includes product delivery system requirements and has supporting documentation (policies and procedures consistent with the requirements of JPL element policies). A description of the element policies can be found on the Institutional Environment navigator at http://dmie.jpl.nasa.gov.

The third-party audit is held to verify—based on a sampling method—that JPL's product delivery system (also known as quality system) conforms to ISO 9001 requirements. Specifically, the purposes of the third-party audit are to:

• Determine whether JPL's product delivery system conforms to ISO element requirements;

• Determine the effectiveness of the product delivery system in meeting JPL quality objectives;

• Provide JPL with an opportunity to improve the product delivery system.

After reviewing the product delivery manual, the auditing team will issue a report with their findings. A site visit is then scheduled for Oct. 15.

Several ISO-related communication tools are being introduced to the Lab in the following weeks:

• An ISO badge containing the JPL quality policy, as well as emergency and other useful Labwide phone numbers, is being distributed by Security as part of the rebadging process;

• A quality-policy poster designed by Stephen Brewster from Outer Planets/Solar Probe Project/Ice and Fire Missions will be made available to all organizations and projects;

• Videotapes of an ISO 9001 presentation by Jerry Suitor and Richard Brace will be distributed to all divisions for viewing by section, group or individual in order to familiarize the Lab with the implementation process being followed in order to get the Lab registered by March 1999. ❑

Sidewalk astronomer hits Old Town

By MARY BETH MURRILL

He hits the downtown streets in darkness, and he's on a mission.

Armed with a telescope, tripod and star charts, "sidewalk astronomer" Dave Doody of JPL set out into night in Pasadena's Old Town Saturday, Sept. 19 to bring the planets to the people.

It was the second time in two weeks that Doody, a flight operations engineer on the Cassini mission, had volunteered his time as a street astronomer as a member of JPL's Amateur Astronomy Club, which has the telescope on loan from the Lab's Telescopes In Education project.

When he set up a 200-millimeter-diameter (8-inch) Tinsley telescope on the streets of Pasadena the first weekend in September, Doody said that a line of people stretched halfway down the block, and more than 900 were able to view Jupiter and some of its moons over the course of the evening. "People offered money to look, but of course it's free-of-charge," he said.

Doody said that most of the people he meets on his urban skywatching adventures have never before looked at the heavens through a telescope. "When people look at a little dot in the sky with their naked eye, then see it through the telescope, they see why it's so fascinating and why you want to send a spacecraft to it to study it close-up," he said. "Most people are astounded."

Old Town visitors line up to view the heavens through the telescope brought by Dave Doody, center.

A former instructor for Japan Airlines pilots who has also worked as a systems engineer on Santa Catalina Island, Doody is the co-author of "The Basics of Space Flight," a popular web site on JPL's home page. His articles also appear occasionally in popular magazines.

Doody said he plans on setting up further telescope observations from Old Town next year. ❑

Ford

Continued from page 1

The licensing agreement comes on the heels of a less formal Technology Cooperation Agreement that had existed between JPL and Ford since 1993. Under terms of that agreement, JPL and Ford engineers worked cooperatively to refine applications of the emerging technology to Ford's specific needs.

The new license provides Ford with rights to intellectual property of the chip for auto industry applications, while JPL, which has applied for patents to the technology, retains general rights. JPL is managed by Caltech, which serves as the party of record for this license.

The Ford deal is a good example of how JPL technologists can benefit financially as a result of their work that has commercial potential, said Merle McKenzie, manager of JPL's Commercial Technology Program.

In the case of royalty income, inventors may choose to receive as personal income 25 percent of the gross royalties generated from their licensed technologies.

When Caltech elects to take an equity position in a company, the inventor can also receive 25 percent of the stock value held by Caltech. The first step in the process, she said, is filing a New Technology Report with the Lab's Technology and Reporting Team so Caltech can assess the work's commercial potential. In the specific case of the neural chip, that potential has begun to be realized with Ford.

Neural systems were inspired by the architecture of nervous systems of animals, which use neurons, a form of parallel processing elements, to process large volumes of information simultaneously. In vehicle applications, artificial neural networks will "learn" both how to diagnose problems like engine misfires and control the engine to optimize fuel economy and emissions.

"What JPL has brought to the table is expertise in designing and building what are known as neural network 'application-specific integrated circuits,'" said Dr. Raoul Tawel, who led the development at JPL for the chip. "With Ford, we are implementing highly complex neural network software code in dedicated hardware logic. This brings about a tremendous boost in computational ability compared to traditional software-based approaches, enabling real-time onboard diagnostics for the first time."

For misfire diagnostics, it is necessary to observe and diagnose every engine firing event, estimated at more than 1 billion in the life of each car.

In addition, the diagnostic error rate has to be extremely small, less than one in a million, in order to avoid sending false alarm signals to the driver. The new chip will accomplish that task by "learning" diagnostic tasks during the vehicle development process, bypassing the need to develop conventional software that, in any event, can neither perform these tasks as well nor be implemented in large production volumes with standard microprocessors. The neural network chip, designed to carry out parallel neuron computations efficiently, overcomes the computational barriers that prevent this technology from being exploited today.

A detailed, technical explanation of the technology written by Tawel and Nazeeh Aranki of JPL and Drs. Ken Marko and Lee Feldkamp of Ford's neural network team, among several others, is available on the web. "Custom VLSI ASIC for Automotive Applications with Recurrent Networks" can be accessed at http://www.jpl.nasa.gov/ releases/98/ijcnn98.pdf .

For further information about JPL's technology transfer programs, visit http://techtrans.jpl.nasa.gov/tu. html . ❑

NASA, Caltech sign new contract to operate JPL

Caltech has entered into a new five-year contract with NASA to continue managing JPL as a federally funded research and development center through the year 2003.

"JPL has always been a unique institution combining the talents of the academic and government aerospace communities," said Caltech President Dr. David Baltimore. "We believe the synergy enriches both the Caltech campus and NASA."

"This contract allows Caltech and NASA to continue their long working relationship at a particularly exciting time when JPL is preparing a great variety of new missions to explore the solar system, Earth and the universe," said JPL Director Dr. Edward Stone.

The estimated annual value of the cost-plus-award-fee contract is $1.25 billion, for an estimated total value of $6.25 billion over the life of the contract. ❑

NBS

Continued from page 3

tom-designed for JPL. Of these, employees are now familiar with the recently developed online timekeeping system. Fourteen existing applications were also integrated with the system, including Just In Time, Perform and the purchase card system.

Budgeting applications have been available for awhile for projects to do their fiscal year 1999 planning. Human resources and payroll modules will be rolled out to end users in January. "The beginning of the calendar year is a great time for us to bring up the new payroll module," Montgomery said, "because the reporting for payroll is then in sync with everyone's W2 going out."

At the same time, he said, the signing of the new NASA/Caltech contract for the operation of JPL "is also a good time for us to begin a new system and collect our financial data in an improved way."

Using the Oracle approach, every project on Lab will set up their budgets and track data in a new way.

In addition, all those who work in JPL business operations will be affected, Montgomery said. "Most of the tools they're familiar with are going to be replaced. A good example is purchasing. The processes are similar to what they have been. But by providing them with new tools, I think they're going to have a significant advantage in being able to share the same data with other people key in the process."

New Business Solutions was first chartered, Montgomery said, to reengineer the Lab's business processes to help meet its challenges of more frequent missions with quicker turnaround times. He cited an example of the challenge.

"From the beginning of the project, we treated an acquisition as a complete process, starting when someone wants to purchase something, through the placement of the order, receipt, delivery to end user, payment for it and then the closeout. We've put the tools in place that allow all the people who have a role in that process to work much more closely together. That's going to improve our efficiency significantly.

Changing JPL Workplace

One in an occasional series.

"Our process redesign, to a great extent, is intended to push out to the using community the authority and responsibility to do a lot more of the business functions that they've not been doing in the past," Montgomery said. "It's now up to the resource administrators to create accounting structure for projects, to open and close the projects and tasks. There's no more need to go through a financial controls organization. We've taken the middleman out of the equation."

To coincide with the rollout, old JPL account codes are being replaced with new Oracle project/task numbers for all financial transactions. Employees should check for new project/task numbers at http://nbs-web .

Preparing new users for the automated systems has been a daunting task, as more than 1,000 computers and peripheral machines are being set up.

Training on the new systems has included a series of workshops and classes on—among others—acquisition, services administration, asset management, project accounting and budgeting, contract audit, accounts payable, funds administration and timekeeping.

Long-term training will continue with getting new employees up to date, as well as those taking on new tasks in new jobs on Lab.

Montgomery also noted IBS' customer support center, an integrated effort with OAO. Those in need should call ext. 4-HELP (4-4357) for questions or problems on Oracle applications. The NBS home page at http://eis.nbs will offer a number of resources to help users, including a link to the IBS customer support home page.

JPL's rollout is one of the largest implementations of Oracle software in the United States in terms of the number of modules unleashed at one time. "Other companies using Oracle phase them in, for the most part," Montgomery said, "but JPL has decided to go with the 'big bang' approach to develop it all together and bring up at one time." ❑

VLBI

Continued from page 1

It is believed that quasars are powered by gas and the remnants of stars spiraling into black holes that have masses of millions to billions of times that of our Sun. Black holes are objects that are so massive that no light or matter can escape from them. Some of the material rushing into the black hole is thought to be thrown away at enormous speeds to form the observed narrow, radio-emitting jets. By studying these jets, astronomers hope to learn more about the black holes that power them.

Very long baseline interferometry is a technique used by radio astronomers that electronically links widely separated radio telescopes together to form a single instrument with extraordinarily sharp "vision," or resolving power. The wider the distance between the telescopes, the greater the resolving power.

By taking this technique into space for the first time, astronomers have approximately tripled the resolving power previously available with only ground-based telescopes. The Space VLBI satellite system has resolving power more than 100 times greater than the Hubble Space Telescope has at optical wavelengths. In fact, its resolving power is almost equivalent to being able to see a grain of rice in Tokyo from Los Angeles.

The project, a major international undertaking, is led by Japan's ISAS, backed by the National Astronomical Observatory of Japan. Collaborators include JPL; the National Science Foundation's National Radio Astronomy Observatory (NRAO); the Canadian Space Agency; the Australia Telescope National Facility; the European VLBI Network and the Joint Institute for Very Long Baseline Interferometry in Europe. More than 50 scientists associated with these and other collaborating institutions contributed to report published in Science magazine overview paper.

The Space VLBI project's eight-meter-diameter (26-foot) orbiting radio telescope observes celestial radio sources in concert with a number of the world's ground-based radio telescopes. It is in an elliptical orbit, varying between 1,000 and 20,000 kilometers (620 to 12,400 miles) above the Earth's surface. This orbit provides a wide range of distances between the satellite and ground-based telescopes, which is important for producing a high-quality image of the radio source being observed. One orbit of the Earth takes about six hours.

Approximately 40 radio telescopes from more than 15 countries have committed time to coobserve with the satellite. These telescopes include NASA's Deep Space Network antennas in California, Spain, and Australia; the National Science Foundation's Very Long Baseline Array (VLBA), an array of 10 telescopes spanning the United States from Hawaii to Saint Croix; the European VLBI Network, more than a dozen telescopes ranging from the United Kingdom to China; a Southern Hemisphere array of telescopes stretching from eastern Australia to South Africa; and Japan's network of domestic radio telescopes. ❑

Retirees

The following employees retired in October:

William Demore, 42 years, Section 323; **Lloyd Adams**, 38 years, Section 387; **Frank Barath**, 38 years, Section 700; **Robert Blakely Jr.**, 37 years, Section 334; **Fred Friedlander Jr.**, 37 years, Section 643; **John Carnakis**, 36 years, Section 314; **Anthony Giandomenico**, 36 years, Section 352; **Robert Howick**, 36 years, Section 662; **Bruce Gary**, 34 years, Section 386; **Rudolph Russ Jr.**, 34 years, Section 662; **Henry Houze**, 31 years, Section 662; **Robert Ewing**, 29 years, Section 662; **Robert Phen**, 29 years, Section 872; **Fred Sanders**, 27 years, Section 601; **Daniel Taylor**, 26 years, Section 353; **Lester Oien**, 25 years, Section 662; **Kenneth Beutler**, 24 years, Section 662; **Carl Hallstrom**, 24 years, Section 662; **John Griffin**, 23 years, Section 662; **Richard MacGillivray**, 23 years, Section 662; **Theodore Clarke**, 22 years, Section 314; **William Neibert**, 21 years, Section 662; **George Stephan**, 21 years, Section 391; **Louis Trabbie**, 21 years, Section 662; **Sam Jacoby**, 19 years, Section 662; **Richard Neill**, 19 years, Section 662; **Rodolpho DeVera**, 18 years, Section 662; **Albert Thibodeau**, 18 years, Section 662; **Armando Marquez**, 15 years, Section 662; **Fernando Mina**, 15 years, Section 662; **Hyder Ali**, 14 years, Section 940; **Salvator Vasta**, 14 years, Section 662; **Richard Welsh**, 14 years, Section 662; **Joseph Novelli**, 12 years, Section 662; **Ted Ortiz**, 12 years, Section 662; **Arturo Lopez**, 11 years, Section 662; **Sun Kang Kwan**, 10 years, Section 662. ❑

Benefits enrollment starts Oct. 19

The annual enrollment for JPL employee benefits takes place from Oct. 19 to 30. Employees may update dependent information, change medical or dental carriers or renew annual spending accounts at this time.

Employees are again being offered the convenience of a telephone enrollment system for benefits changes. Phone lines will be open seven days a week, 24 hours a day during the enrollment period. All employees will soon receive a personalized enrollment package mailed to their home.

Those participating in health care or dependent care spending accounts are required to enroll annually and must call the telephone enrollment system with their new 1999 contribution amount.

For more information on Caltech benefit plans, the benefits handbook or annual enrollment, access the benefits web site at eis/hr/benefits/benefits.htm.

Health and dental plan representatives will be available Oct. 20 and 22 in the Building 167 cafeteria between 10 a.m. and 2 p.m. to answer questions. ❑

Passings

Dilworth Prisbrey, 69, a retired member of the technical staff in Section 352, died of kidney failure Aug. 28 at Verdugo Hospital in Glendale.

Prisbrey joined JPL in 1963 and retired in 1994. He is survived by his wife, Donna; sons Michael, Richard, Gary and Douglas; 14 grandchildren and three great grandchildren.

Services were held in Brigham City, Utah. ❑

James Spaulding, 75, a retired member of the Laboratory's technical staff, died of pulmonary disease Sept. 15 at his home in Arlington, Va.

Spaulding worked at JPL from 1966–87. He is survived by his wife, Sandra.

No services were held. ❑

Henry Moore, 70, a U.S. Geological Survey geologist who helped select the landing sites for the Viking and Pathfinder missions to Mars, died of a heart attack Sept. 21 in Utah.

Moore also trained Apollo astronauts in geology prior to their moon landings and served on the Pathfinder science team to interpret photos and other data sent to Earth by the Sojourner rover. He is survived by his wife, Patsy Ann; two sons and a daughter. ❑

LETTERS

My family and I would like to thank the people of the Environmental Test Lab, the staff of Section 351 and the ERC for their thoughtfulness following the death of my mother.

Geoff Laugen

❑❑❑

Our sincere thanks to the ERC for the lush green ficus plant sent to us on the death of our beloved husband and father, Thomas H. Bickler.

Marjorie Bickler, Thomas C. Bickler, Dawn Bent

❑❑❑

My family and I would like to thank all our friends at JPL for their kind expressions of sympathy on the passing of my mother.

Bob Gershman

❑❑❑

Thank you to all who came to my retirement party and for the great gifts. Also, thanks to all those who couldn't come to the party but stopped by or called to say goodbye. And a special thanks to Thedra McMillian for arranging the party and for many years of friendship and support. In our day-to-day work we sometimes forget what a special place JPL is but retirement highlights how unique and exceptional it is. JPL people make it that way, and I feel privileged to have worked with so many outstanding people. Thank you all for the opportunities I've had to work with you.

Bob Phen

FOR SALE

BABY ITEMS: crib and mattress $100; chest of drawers & changer $150; car seat/carrier $50; other items at reasonable price; all in vg condition. 248-8853.

BABY/TODDLER ITEMS: Pine crib (like new) with bedding and bumpers ($150); colorful walk-in playhouse ($50); toddler picnic table and bench set ($30); baby stroller, reclines for sleeping ($75); changing table/chest of drawers ($75). 626/355-6573.

BED FRAME, king size, never used, $30/obo. 626/568-8298.

BEDROOM FURNITURE: desk, nightstand, bureau with mirror, all white with gold trim, gd. condition, $150/obo for the set, will negotiate for individual pieces. 626/797-6453, Nancy.

BEDROOM SET, woodgrain (brown) laminated corner group; corner desk, chair, cabinet with drawer, 3-drawer dresser; perfect for a spare bedroom or teenager's room, vg cond., $125/obo. 626/337-7522.

BEDS/MATTRESSES, twin & king sz.; KITCHEN TABLE + 4 chairs. 626/791-2434.

BICYCLE, 43cm Landshark, Reynolds 853 tubeset; 8-speed Shimano Ultegra, 650c wheels, exc. condition; $1,500/obo. 626/793-6504.

BICYCLE, 52cm Simonetti, Easton Elite tubeset; 8-speed Shimano Dura-Ace group, 700c wheels; exc. condition; $1,300/obo. 626/793-6504.

BIKE, tandem beach cruiser, exc. cond., gel seats, $250/obo. 626/357-2741.

CHAIRS (4), ladderback, wicker seats, Early American style; $30 ea. 626/351-9340.

CHILD CARRIER SEAT for bicycle, Rhode Gear, $35; Rhode Gear rear rack, $10. 626/351-9340.

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

COMPUTER, Apple PowerBook 160, $150/obo; PRINTER, HP DeskWriter, $70/obo; TECHNICAL BOOKS, mostly engineering. 240-7253.

COMPUTER, Mac SE with ImageWriter printer and accessories, HD not working, $30. 805/250-0456.

COMPUTER, Macintosh Centris 650, 32MB RAM, 230MB HD, internal CD drive, external SupraFax modem 28.8, manuals, CD ROMs and OS 7.1., $700. 909/845-5807.

COMPUTER STAND, pullout drawer for mouse/keyboard, lower pullout shelf for printer, $25/obo; PRINTER STANDS, beige or gray, $15/ea./obo. 352-9957.

COMPUTER SYSTEM: Apple PowerMac 7200/90/4XCD w/500MB hard drive, 64MB RAM, 4MB VRAM, 512k Level 2 cache; AppleVision 1710 17" Trinitron monitor, keyboard, mouse, and Global Village 56k X2 modem (upgraded to v.90); $1,400/obo. 626/793-6504.

CRIB, Evenflo "Happy Camper" portable, incl. carrying case; $25. 626/351-9340.

DARKROOM EQUIPMENT, Vivitar E-36 enlarger, loader, timer, light, filters, misc., $200/obo. 626/398-3381, Bruce, eves.

DOG, pure breed AKC registered English beagle puppies, $350/ea. with papers. 626/964-3873, Andy or Lila.

DOG, AKC Rottweiler puppies (5 male); born 7/27/98, with papers, first shots and dewormed. 909/592-5040, Kim or Ralph.

DRESSERS, two units, oak, 5 drawers each, excellent condition, 36"w x 46.5"h x 17"d; $150/ea., both for $250/obo. 626/568-8298.

ENTERTAINMENT CENTER, solid oak, 65" W x 75" H, exc. cond., $500. 909/593-4991.

ESTATE/RUMMAGE SALE, Sat., Oct. 3, 9 a.m. - 3 p.m. and Oct. 4, 9 - noon, Arcadia Elks Lodge, 27 W. Huntington Dr., rear parking; jewelry, clothing for entire family, kitchen items, books, other misc. items; sponsored by Arcadia Elks Ladies Auxiliaries, all proceeds donated to disabled children in Calif. and Hawaii.

ESTATE/RUMMAGE SALE, Sat., Oct. 3, 8 a.m. - 3 p.m., 2062 E. Washington Blvd., (betw. Allen/ Altadena Dr.), Pasadena; old items, clothes, furniture, toys and other misc. items.

EXERCISE BIKE, Schwinn, odometer cable broken but still works, $20/obo. 626/573-2564.

FILE CABINETS (4), metal, 4-drawer, legal/letter, beige enamel, $30/ea., one or all. 352-9957.

GARAGE SALE, Oct. 3, many baby items: crib & mattr., $80; playpen, $50; high chair, $50; other items at reasonable prices; 749 N. Mar Vista, Pasadena. 626/798-1839.

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

MOVING SALE: complete set of 160 moving boxes, $150; antique mission-style oak bed with extra long double mattress, $200; antique oak dresser with mirror, $200; new oak youth bed with mattress, $100; oak wall unit (entertainment center), $75; small oak hi-fi cabinet on casters with glass doors, $80; large oak computer desk with hutch, $90; 6 x 9 area rugs (rose/brown oriental), $40 each. 790-1279, eves.

ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifice for $3,000. 790-3899.

OVEN/MICROWAVE combination, Thermador, self-cleaning, in orig. crate, like new, $300/obo. 352-9957.

PERSONAL INFORMATION MANAGER, Seiko "Phone-Pal", $25. 790-3899.

PIANO, Kimball, prime cond., Fr. provincial styling, dk. walnut finish, velvet padded bench, may need tuning. 790-1838, eves.

POWER CENTER, $15. 790-3899.

RECORDING STUDIO, Foster 8-track, low hours, 12-channel, 8-bus console, power amp & effects included, $1,250. 626/791-2700.

SHOES, ladies Avia cross-training, 7W, bought 9/98, too tight, regular $49, sell $16/obo. 626/573-2564, Mary.

SOFA, 8' white Damask, $100; STEREO CABINET/SPEAKERS, $200; MICROWAVE, 1.5 cu. ft., $30; BED, full-sz. w/frame, $100; TV, Sony 25" color, $75; VCR, RCA, $25. 949/673-3353.

SOFTWARE for Mac, all $25 and under. 790-3899.

SOFTWARE, Windows, never used: Win 95 w/Fat 32 ($59), Office 97 CD tutorial ($10), Word 97 upgrade ($25), full version Word 97 ($49), entire WordPerfect Suite 7.0 ($25), Print Studio Window Draw Premier with 33,000 clip art bonus software ($25), Adobe Photodelux ($25), IBM Via Voice ($19), Windows 95 tutorial ($10), New Snappy 3.0 Video Capture, never used, ($69), Decent 2 ($10), deluxe typing tutorial ($9), Compton's New Century CD Encyclopedia ($9) and HP gold blank recordable CDR ($4). 626/335-4409.

SPORTS COINS, box of '88 Topps, 36 unopened packs, incl. McGwire, Ryan, Sutton; MAGAZINES, '54 and '55 National Geographic, exc. cond., various months, $5/ea. 626/914-6083.

SPRINKLER VALVE ACTUATOR, Lawn Genie automatic, new, model 756LG 3/4, $10/each. 790-3899.

STATIONARY BICYCLE, has pulse monitor, magazine rack, programmed exercise routines, or manual tension levels, $300. 790-3854.

STOVE, Thermador cook-top, stainless steel, w/center grill/griddle, in orig. box, like new, $200/obo. 352-9957.

SWEATER, Coogi, from Australia, size small/medium, new, sells for $325 in Nordstrom; $100. 790-3899.

TABLE, dining room, round, mahogany; sits 8 w/2 extensions; almost new; comes w/6 matching chairs; $700/obo. 626/568-8298.

TABLE, dining room, elegant, 6' x 4'; 1" beveled leaded glass, with leaded glass and brass V-shaped pedestals; & 4 high-backed black chrome & brocade chairs; excellent condition; all for $600/obo. 951-9635.

TAPE RECORDER, TEAC A2340 reel-to-reel with TEAC 6-channel audio mixer, $200/obo. 805/250-0456.

TENT, cabin, 9 x 11, 80" high, freestanding, sleeps 6, gd. cond., $60. 626/797-6982.

TREADMILL, Jane Fonda model with cassette player, exercise tape; fits under bed; barely used; cost $300; sell $150/obo. 626/797-3156.

VIOLIN, ½ sz., gd. for elem. student, gd. cond., $75. 909/591-3312.

WINDOW SHUTTERS, wood, interior, painted white, 14 3/4" wide x 67" high, 4 avail., exc. cond., $25/obo for all 4. 626/791-7645.

YARD SALE, Oct. 3, 8:00-4:00; appliances, baby items, Little Tykes; 3737 Burritt Way, La Crescenta.

VEHICLES / ACCESSORIES

'91 ACURA Legend LS, white with blue int., automatic, loaded, 74,000 miles, new Michelin tires, mint cond., $13,500. 626/358-8648.

'96 BMW 328i, black, loaded, exc. cond., sports pkg., 5-spd., a/c sunroof, leather, 6-CD changer, keyless entry, 38K mi., 50K mi. fact. warr., $28,000/obo. 957-7243.

CAMPER SHELL, fits '84-'88 Toyota Extra Cab pickup truck, sliding front/side windows, off-white, $400/obo. 626/793-6504.

Continued on page 8

'74 CHEVROLET, 178,078 mi., 36,036 on rebuilt eng. & rebuilt auto trans., 350 V-8, 3/4 ton, exc. cond., maintenance records, air cond., pwr. steering, pwr. brakes. front disk brakes, 8-ft. bed, bedliner, cargo box, towing pkg., new paint, am/fm cass., custom wheels, custom running boards, dual fuel tanks, $3,100. 805/527-6834.
'78 DATSUN 280Z, exc. cond., interior restored, new injectors & Seabring exhaust, 64,000 orig. mi., $2,700. 626/791-2700.
'72 DATSUN 240Z, rare model, auto, vinyl top, 1 owner, orig, paint, interior restored, dual Webber carbs, Dynomax exhaust, rebuilt from ground up, a true classic, Book $9,500; sell $4,500/obo. 626/791-2700.
'96 DODGE Grand Caravan SE, 3.3 V6 eng., white, 7-passenger, 2 sliding doors, rear a/c, 2 alarms, 34,500 mi., exc. cond., $18,500/obo. 626/798-9941, lv. msg.
'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, very clean, well-maintained, 137K mi., just smogged, orig. owner, $3,000/obo. 626/332-2682.
'96 FORD Contour SE, blk/grey, 32,000+, tinted windows, 4-dr, 5-spd, a/c, power windows/locks, child safety, cruise cont., rear fold-down seats, remote access, V6, $12,000. 362-3358.
'94 FORD Mustang GT conv., 17" alloy wheels, V8, full pwr., very clean, $10,800/obo. 768-1612.
'87 FORD Taurus LX, 76.8K mi., exc. cond., am/fm/cass., lthr., pwr. windows/seat, allow wheels, climt. cont., $2,500. 310/391-2201.
'93 HONDA Civic, very clean, all records, low mi., 5-spd., black, $7,250/obo. 952-7434.
'89 HONDA Accord LX, 4-dr., 5-speed, gold; new radiator, a/c, timing belt, brakes; good cond., runs smooth, 139k mi, $4,200. 248-4637.
'81 HONDA Accord, auto, 4-dr., gd. shape, needs backseat cover, $1,400. 790-0762.
'96 INFINITI Q45, loaded, auto, leather seats, like new, exc. cond., 42K mi., $25,500/obo. 909/599-3230.
'91 INFINITI G20 sport sedan, 5 spd., 87K mi., leather interior, A/C, sunroof, cruise, cassette, excellent condition, well maintained, many extras, $6,700. 626/288-5877.
'90 JEEP Cherokee Laredo, auto, 4x4+, 4.0 liter v-twin engine; remote auto door locks; pwr strg, win, abs breaks; privacy glass; a/c; am/fm/cass. w/prem. sound; spec rims, new tires + full spare; complete tow pkg; exc. cond., $8,500. 951-9635 or 626/794-5196.
'96 MAZDA Protégé DX, 4-dr., burgundy, 5-spd., pwr. steering, a/c, exc. cond., 25K mi., $10,000/obo. 626/564-8985 or 626/791-2434.
'95 MAZDA Miata, 5-spd., pw/s, BRS rims, am/fm/CD/stereo, Alpine amps, JL speakers, 42K mi.,$12,250/obo. 504-6256.
'90 MAZDA MPV minivan, air, V6, full power, new tires, runs great, minor body damage, 1 owner; $4300. 957-5382.
'89 MAZDA MPV, gd. cond., much recent work, $6,250/obo. 626/799-0109.
'88 MAZDA B-2200 truck, 90K on engine, 5-spd, new AM/FM/cass., tires, brakes, camper shell, all service records, $1,700/obo. 626/798-8777.
'87 MAZDA RX7, GXL model, full equip'd, leather int., Kenwood AM/FM/CD stereo, lo blu. bk., $2,500/obo. 626/797-6824.
'80 MERCEDES BENZ diesel, 4-dr., 5-spd., stereo, 160,000 mi., $5,000/obo. 626/359-2827, Hugh or Girlie.
'92 MITSUBISHI Eclipse, black, all pwr. equip., 5-spd., 16-valve DOHC eng., 83,000 mi., just smogged, priced below Blue Book at $4,500. 249-6068.
'84 OLDSMOBILE Firenza, 4d, A/T, A/C, AM/FM cassette (new), 112K miles, good condition, $1,575. 626/794-5035.
SAILBOAT, 13.5-ft. Firebird, great learning boat for youngsters, simple lateen sail system, foam-filled fiberglass hull with all aluminum fittings, easy to carry on car top, $150. 626/791-5049.
'85 TOYOTA Supra, runs great, looks good, fun to drive; DOHC-6, 5-spd., AC, PW, PL, remote locks/alarm, power sun roof; $2,900/make offer. 626/284-9424.
'77 VW van, camper conversion w/roll-back roof; bed, closet, sink &cupboard; hydraulic valve lifters, new alternator, battery, coil and front tires; minor body damage, needs some work; great project car; $1,200/obo. 547-4539.
'72 VW, newer 1835cc eng., avg. cond., $900 firm. 562/464-0446.
'70 VW Bug, rebuilt engine; new: seats, chrome wheels, tires and battery; not running, needs wiring completed; tags and title current; $950/obo. 626/309-0429.

WANTED

GARDENER recommendations for 7,500 sq. ft. yard in San Gabriel; mow, prune, plant, fertilize, etc. 626/284-9424.
HOUSEKEEPER/BABYSITTER for 3 eves./week; flexible days and salary. 790-4594.
HOUSE MANAGER(S) for 2 developmentally challenged young men, priv. home, rm./bd. provided. 626/797-6406, after 6 p.m.
MUSIC LOVER volunteers to join church's English choir in Monterey Pk.; sing 2-3 times a month at 10:30 mass; rehearsals Thurs at 7:30 p.m. 626/573-2564.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
TOY pieces or sets, "K'nex" and "Brio Mec". 626/ 303-3016, Ellyn.
VANPOOL RIDERS, stops along the 118, off-site contractors welcome, vanpool # 20. Ext. 4-0307, Marilyn.

FREE

BRICKS, CONCRETE BLOCKS. 626/351-5485.
CLEAN FILL DIRT [mostly gravel-like], you haul; several cu yds., take as little or as much as you like; 3 blks. ESE of NY & Hill, Altadena. 798-5152.
DOGS: 2 Queensland mix; siblings; 1-1/2 years old; one black and white spayed female with blue eyes, one brown and white male with brown eyes; med. to sm. sized family dogs w/very sweet personalities need loving home. 909/305-9922 after 6 p.m. and weekends, Cindy.
KITTENS, 2 @ 5 mo.old, (1 male, 1 female). to loving home, cute, smart, litterpan-trained. 626/357-2741.
PATIO PANELS, gd. cond., you haul. 626/573-2564, Mary.

FOR RENT

ALTADENA, furnished room in house, TV and cable in room, share ba., full house privileges including washer & dryer, pets okay, female preferred, $350 including utilities. 626/798-2112.
ALTADENA house, 2 bd., 2 ba., bonus rooms & lrg garage; dshwshr., stove, fridg, w/d incl.; wtr., trash, grdnr incl., 5 min./JPL, $1,300. 310/390-1807.
ALTADENA/RUBIO CYN. area, rm. in priv. residence, no smoking, no pets, $350. 626/797-8082.
LA CANADA house, 4 bd. + den + 3 ba., pool, view, guest house, lg. lawn, 1,300 sq. ft. of entertainment/office area, $4,400. 248-6949.
MONROVIA, share fully furn. condo, 2 bd., 1.75 ba., kitch. priv. incl. refrig, stove, dshwsh., wshr/dryr, cent. air/heat, $400, util. pd. 626/375-5189.
MONTROSE apt., furn. rm., microwv., refridg., priv. entr., $350 + sec. dep. 249-0574.
MONTROSE townhouse, 2 bd., 2.5 ba., 3 miles/JPL, quiet sidestrt, newer complex, former model home, bright and airy, $1,187. 248-5848, Robert.
PASADENA, 2 bd. + den/office, 3 ba. apt., cent. air/heat, sm. patio, laundry facil., $1,100 + util. 626/351-9641.
SIERRA MADRE townhouse, roommate sought, 3 bd, 2.5 ba., nice neighborhood, laundry, garage, yd., $425 to $550. 626/836-9254.
SOUTH PASADENA, furn. studio apt. on 1 level, 1718 Huntington Dr. betw. Milan/Marengo; laundry facilities on premises, parking space; non-smoker; no pets; $565, utilities pd. 626/792-9053, Marilyn.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 bath, mud/laundry room, $129,000. 909/585-9026.
LA CANADA house, 4 bd. + den + 3 ba., pool, view, guest house, lg. lawn, 1,300 sq. ft. of entertainment/office area, $695,000. 248-6949.
LAKE CO., N. Calif., 2 1/2 acre lot, in beautiful Kelseyville near Clear Lake, perfect site for permanent or retirement home, 30 walnut trees, paved road, electricity, $36,000. 626/337-7522.
MONTROSE townhouse, 2 bd., 2.5 ba., 3 miles/ JPL, quiet sidestreet, newer complex, former model home, bright and airy, $165,000. 248-5848, Robert.
PALM DESERT, exquisite 2 bd., 2 ba. villa, newly remodeled, w/skylight, patio & 2-car garage; located across Living Desert, great private, secure resort; tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.
PASADENA, 3 bd., 1.5 ba., hwd. flrs, cent. a/h, crown mld, frpl., liv. rm., din. rm., laundry rm., bonus rm., very charming, $264,000. 626/798-9247.
PASADENA, spacious house, 3 bd. + den, 1-3/4 ba., detached 2-car garage, dead-end street, exc. for small kids; quiet, friendly neighborhood, walking dist. to lib., park & grocery, 10 min./JPL; next to Hastings Ranch; $185,000/obo. 790-9275.

VACATION RENTALS

BIG BEAR, 7 mi. from slopes, full kitch., f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night min., no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P, TV/VCP, $75/night. 249-8515.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhome, 2 decks, sleeps 6, tennis, pool, spa. 949/786-6548.
BIG BEAR LAKEFRONT condo, 1 bd., 1 ba., sleeps 4, full kitchen, gym, indoor pool, Jacuzzi, BBQ areas, Oct. 16-23, $75/night. 213/296-6641.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/per night for 4. 248-8853.
CATALINA house, 1 week (Sunday-Sunday) before April 1, '99, except Christmas and New Year's weeks; 5 bd. (sleeps 13), 2 ba.; great for multiple families or lots of friends; one of the best houses in Avalon; walking distance to everything; $1,800. 845-1858, before Oct. 16.
CHARLESTON, S.C., house swap, Dec. 28-Jan. 2. 843/884-8402.
ESCONDIDO, Lawrence Welk, lg. 2-bd., 2-ba. condo, slps. 6, avail. Oct. 18-25, golf, tennis, pools, hot tubs, game/workout rms., $600. 626/836-3931.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba.; swimming, snorkeling, fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: $95/nite/2, 12/15-4/14 rate: $110/nite/2, $10/nite/add'l person. 949/348-8047.
MAMMOTH condo, in Chamonix at lifts 7, 8, 16, 17; 2 bd., 2 ba., slps 6, fireplace w/wood, fully equip. elec. kitchen, microwave, TV, VCR, cable fm stereo, pool & sun area, outdoor Jacuz., sauna, game, rec., laundry rms., play & BBQ areas., conv. to hiking, shops; walk to lifts and Warming Hut, daily/weekly rates; summer rates through Oct. 249-8524.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitchen, TV/VCR, JPL disc. rates; walk to Canyon Lodge. 249-8088.
MAMMOTH condo, slps. 5, summer rates $50/nt., 5 or more nights $40; shuttle stop nearby. 353-7839.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft; sleeps 6-8; fully equipped kitch. incl. microwave, D/W; cable TV, VCR, phone; balcony w/mtn. view; Jacz., sauna; streams, fishponds, close to Mammoth Creek; JPL discount. 626/798-9222 or 626/794-0455.
OCEANSIDE, on the sand, charming 1 bd. + condo, panoramic view, walk to pier/marina, pool, spa, game rm. 949/786-6548.
PALM DESERT, exquisite 2 bd., 2 ba. villa, newly remodeled, w/skylight, patio & 2-car gar.; located across Living Desert, great private, secure resort; tennis cts., multiple pools & spas, clubhouse facil.; great locality, around 2 top resorts. 909/620-1364.
ROSARITO BEACH condo, 2 bd., 2ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
SAN CLEMENTE COVE, 1-bd., 1-ba. condo, slps. 4, avail. Oct. 11-18, ½ blk./beach and pier; hot tub, game rm., $500. 626/836-3931.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach;tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; $995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/wk. low seas., + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

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Universe

http://www.jpl.nasa.gov/info/universe

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JPL Photo Lab

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Jet Propulsion Laboratory

Universe

Pasadena, California Vol. 28, No. 21 October 16, 1998

Ulysses captures cataclysmic gamma-ray flare from shattered star

By DIANE AINSWORTH

The signal of a cataclysmic magnetic flare emanating from a star that cracked apart halfway across the galaxy has been captured by JPL's Ulysses spacecraft and is providing important clues about some of the most unusual stars in the universe.

The magnetic burst from the star SGR1900+14, located in the constellation Aquila 20,000 light-years away, was observed by Ulysses and other spacecraft with high-energy radiation detectors in space on Aug. 27, 1998, as its heavy metal crust fractured and released the most powerful wave of gamma radiation yet observed from this type of star.

"Soft gamma repeaters (SRGs) emit magnetic radiation sporadically, every few years, unlike gamma ray bursts, which explode and disappear," said Dr. Edward Smith, Ulysses project scientist at JPL. "This was the fourth soft gamma repeater to be observed, but unlike the others we have studied, this one emitted an exceedingly intense burst of radiation. We estimate that it released as much energy in a few seconds as the Sun emits in 300 years." Ulysses is a joint mission of NASA and the European Space Agency.

SGR1900+14 is a newly discovered type of star called a "magnetar"—a dense ball of super-heavy matter about the size of a city, but weighing more than the Sun. Objects in this class have the greatest magnetic fields known in the universe. A magnetar is so intense that it powers a steady glow of X-rays from the star's surface, often punctuated by brief, intense gamma-ray flashes and, occasionally, by catastrophic flares like the one observed on Aug. 27. Astronomers think that all these effects are caused by an out-of-control magnetic field—one capable of heating, mixing and sometimes cracking the star's rigid surface.

Using several spacecraft detectors, including the Ulysses gamma ray burst instrument, scientists were able to measure this extremely rare event and pinpoint the precise source of the explosion with unprecedented clarity.

"The star, which has an extremely strong magnetic field, appears to have experienced a 'star quake' so powerful that it created a temporary ionosphere on the night side of Earth and sent two spacecraft into protective safe modes," Smith said.

Data from the Ulysses experiment showed radiation counts that rocketed from background (near zero) levels to several thousand electrons per second. Dr. Kevin Hurley of UC Berkeley, who is principal investigator of the gamma ray burst experiment on Ulysses, reported that energy measurements were two times greater than any other recorded burst.

"The radiation, as seen by the gamma ray burst detector, spiked quickly and soon settled into a series of ever-smaller spikes that clearly revealed the neutron star's rotational period," Hurley reported at a NASA science press briefing on Sept. 29. "The star reminded us of a dying lighthouse. It kept rotating, but the lamp steadily faded away."

Hurley, who had been part of a team observing the star, recorded pulses or flashes of magnetic radiation emanating from the star every 5.16 seconds using another satellite, known as the Japanese/NASA Advanced Satellite for

See Ulysses, page 6

Deep Space 1 nearing final countdown

Although the launch date of the Deep Space 1 spacecraft will not be known for certain until Oct. 22, mission planners continue to prepare for launch on Oct. 24 from Cape Canaveral Air Station, Fla.

The launch window on Oct. 24 opens at 5 a.m. PDT and continues for 51 minutes.

The first launch of the New Millennium Program, Deep Space 1 will test 12 new technologies, including an ion propulsion engine evocative of rocket systems described in science fiction. ❑

Jupiter's 'white ovals' take Galileo scientists by storm

By JANE PLATT

As powerful hurricanes pummel coastal areas on Earth, NASA space scientists are studying similar giant, swirling storms on distant Jupiter that have combined to spawn a storm as large as Earth itself.

Three separate cold storms, called "white ovals" because of their color and egg shapes, have been observed in one band around Jupiter's mid-section for half a century. Two of the storms recently merged to form a larger white oval, according to scientists studying data from JPL's Galileo spacecraft, the Hubble Space Telescope and the agency's Infrared Telescope Facility atop Mauna Kea, Hawaii.

"The newly merged white oval is the strongest storm in our solar system, with the exception of Jupiter's 200-year-old 'Great Red Spot' storm," said JPL senior research scientist Dr. Glenn Orton. "This may be the first time humans have ever observed such a large interaction between two storm systems."

Each of the white ovals that merged were about two-thirds the diameter of the Earth before the merger, when they combined to form a feature as large as Earth. Although scientists have observed the end result of the merger of the two white ovals, the actual "collision" took place under cover of darkness while Jupiter was turned away from view.

This new, powerful white oval has a myste-

See Galileo, page 4

Special Events Calendar

Ongoing

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

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

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

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

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

Wednesday, October 21

Chinese Language Class—Meeting at noon in Building 306-400.

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

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

"Making PDF Documents Work For You"—Chris Hawley, web developer, Section 389, will speak at noon in von Kármán Auditorium.

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

"The Search for Extraterrestrial Life: Lessons From the Earth"—Dr. Ken Nealson, lead scientist for JPL's Astrobiology Research Element, will speak at 8 p.m. in Caltech's Beckman Auditorium. Admission is free. For information, call (626) 395-4652.

Thursday, October 22

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

Friday, October 23

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

Sunday, October 25

Chamber Music—Karen Hwa-Chee Han will offer a program of traditional Chinese and American music, performed on Chinese bowed string instruments. Held in Caltech's Dabney Lounge at 3:30 p.m. Admission is free. For information, call (626) 395-4652.

Tuesday, October 27

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

Wednesday, October 28

Chinese Language Class—Meeting at noon in Building 306-400.

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

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

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

Thursday, October 29

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

Friday, October 30

Just-In-Time (JIT) Product Fair—To be held from 10 a.m. to 2 p.m. in von Kármán Auditorium.

The Flying Karamazov Brothers—The troupe of juggles presents its latest production, *Sharps, Flats and Accidentals*, at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $32, $28 and $24. For information, call (626) 395-4652.

Fri., Oct. 30-Sun., Nov. 1

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

United Way drive begins Oct. 30

Although JPL's United Way campaign kicks off Friday, Oct. 30 with the Halloween Fashion Show, the spirit of giving in some Lab employees began to be demonstrated last month.

JPLers were among 150 people from local companies who donated time and effort to United Way's "Day of Caring" Sept. 19.

The JPL volunteers joined others at the new Casa Maria on Washington Boulevard in Pasadena for yard and landscape improvement.

Casa Maria is planned as a transition/recovery home for women working toward self-improvement and self-reliance in order that they may regain custody of their children. Training for job, family, parenting and home skills will be provided at the United Way-supported facility, which is scheduled to open in spring 1999.

There will even be occasional provision for a resident's child to live with his or her mother at Casa Maria, solidifying the training and transition efforts. The startup budget is being spent on necessary structural repairs, so no money was left to fix up the grounds. "The cleanup and beautification would not have been possible without the Day of Caring volunteers," said Brenda Franklin of JPL's United Way publicity sub-committee.

Information about JPL's United Way campaign is scheduled to be distributed Oct. 29. The campaign, chaired this year by Human Resources Director Sue Henry, runs from Oct. 30 through Nov. 13.

The annual canned-food drive runs from Oct. 26 to Nov. 13. During 1997's drive, JPL employees and contractors donated enough canned goods to feed 1,200 needy families.

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

ERC (Building 114)
Building 167 cafeteria
Building 180 lobby
Building 186
Building 190 cafeteria
Building 264 (repro)
Building 301 second floor
Building 303 cafeteria
Building 525 main entrance
Building 601 (Woodbury)

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

See United Way, page 7

Benefits enrollment now underway through Oct. 30

The annual enrollment for JPL employee benefits takes place from Oct. 19 to 30. Employees may update dependent information, change medical or dental carriers or renew annual spending accounts at this time.

Benefits changes will be made through the telephone enrollment system, which will be open seven days a week, 24 hours a day during the enrollment period. All employees will have a personalized enrollment package mailed to their home.

Those participating in health care or dependent care spending accounts are required to enroll annually and must call the telephone enrollment system with their new 1999 contribution amount. Late enrollments are not permitted.

For more information, access the benefits web site at eis/hr/benefits/benefits.htm.

Health and dental plan representatives will be available Oct. 20 and 22 in the Building 167 cafeteria between 10 a.m. and 2 p.m. to answer questions. ❑

Mars Polar Lander arrives at KSC

By DIANE AINSWORTH

JPL's Mars Polar Lander arrived at Kennedy Space Center (KSC) in Florida on Oct. 1 to begin final preparations for its Jan. 3 launch.

The lander will be the second of two Mars spacecraft to be launched on Delta II vehicles this winter. It will follow Mars Climate Orbiter, scheduled for launch Dec. 10.

The spacecraft arrived aboard an Air Force C-17 cargo plane that landed at KSC's Shuttle Landing Facility following its flight from the Lockheed Martin Astronautics plant in Denver.

The spacecraft is designed to touch down on the Martian surface near the northernmost boundary of the south pole. This is near the edge of Mars' thin sheet of carbon dioxide ice, which will have receded by the time the lander arrives in December 1999, late spring in the southern hemisphere of Mars. The mission's objective is to study the water cycle at the Martian south pole. The lander also will help scientists learn more about climate change and current resources on Mars, studying frosts, dust, water vapor and condensates in the Martian atmosphere.

The Mars Polar Lander is to be readied for launch in KSC's Spacecraft Assembly and Encapsulation Facility-2. Among the activities to be performed will be a functional test

See Lander, page 6

KENNEDY SPACE CENTER PHOTO

In Kennedy Space Center's Spacecraft Assembly and Encapsulation Facility-2, the top of the Mars Polar Lander is removed for testing, which includes a functional test of the science instruments and the basic spacecraft subsystems.

New agreement augments Lab's science data systems support

By MARK WHALEN

JPL has selected Raytheon Company to provide supplemental support to the Laboratory's work in science data systems.

Raytheon's STX business unit will provide services to augment JPL's efforts in science data systems development, implementation and operations, said Moshe Pniel, technical manager of the recently signed contract.

The five-year, $55-million contract, which includes two five-year options, defines six areas of support to be provided by Raytheon to JPL:

- Data system engineering and top-level architecture design;
- Product-generation software development;
- Operations system development;
- Data system operations;
- Routine science mission planning;

See Contract, page 5

DSN pioneer Renzetti dies

Dr. Nicholas Renzetti, a telecommunications pioneer and major force behind the development of NASA's Deep Space Network (DSN), died in his sleep Oct. 7 at his San Marino home. He was 84.

Dr. Nicholas Renzetti

Renzetti joined JPL in 1959 as manager of the DSN Engineering and Operations Section, less than a year after NASA was officially established and JPL transferred from the U.S. Army to the space agency.

In 1964, he began a 10-year position as tracking and data systems manager. He followed that by managing the Laboratory's telecommunications and data acquisition engineering, mission support and science offices. From 1994 to his retirement in 1996 he served as DSN science advisor.

Renzetti, who received his doctorate from Columbia University in 1940, was credited with the DSN's initial systems engineering and development. Among his career highlights was his involvement in establishing the ground systems network for global positioning system (GPS) receivers, and the development of the Goldstone Solar System Radar as a science instrument rather than just as a tracking station.

Renzetti was remembered in an Oct. 12 JPL memorial gathering for his passion, enthusiasm and demand for excellence.

"Nick is recognized for helping make the DSN a scientific instrument of explicit precision and tremendous capability," said Deputy Director Larry Dumas.

Former telecommunications and mission operations director Paul Westmoreland recalled that Renzetti received "a great deal of respect for his tenacious advocacy for JPL programs."

Among the scores of Renzetti's technical papers, articles and contributions to other publications was his authorship of the story of the technological development of the DSN, published in the JPL Space Program Summaries and its successor journals.

Renzetti in his later years developed a photographic history of the DSN, which lives on in the fourth-floor hallway of Building 303 and is posted on the Internet.

Renzetti is survived by his wife, Judith; daughters Alexandra, Cassandra and Valentina; son Nicholas; and four grandchildren.

No services were held. ❑

Volcano flyby

Taller than three Mount Everests and about as wide as the entire Hawaiian Island chain, Mars' giant Olympus Mons volcano is shown as imaged by Mars Global Surveyor's camera on April 25, 1998. Other recently released MGS images are available on the Internet at http://photojournal.jpl.nasa.gov .

Program's purchase of flight computers saves $3.2 million

By MARK WHALEN

NASA's "faster, better, cheaper" approach has been well-demonstrated by JPL's Flight Hardware Logistics Program (FHLP), as evidenced by the recent deliveries of the first of a consolidated procurement of 29 flight computers for upcoming JPL missions.

The procurement was arranged by FHLP, which estimates that the purchase of the hardware from Lockheed Martin Federal Systems will save JPL more than $3.2 million while providing improved delivery times.

The Tropospheric Emission Spectrometer (TES) and Space Infrared Telescope Facility (SIRTF) projects are the first two of nine JPL missions to receive the lightweight flight computer.

"The consolidated procurement approach allows Lockheed Martin to obtain savings in the quantity procurement of long-lead-time parts and in the efficiencies associated with fabricating, testing and delivering all the computers in a continuous run," said Larry Wright, who manages the program office on Lab. "The approach allows JPL to obtain internal savings through use of a single contract technical manager during a shorter contractual period and by sharing common spares."

Valerie Thomas, who was the data and controls project element manager for TES when the first FHLP computer was delivered to that project, found the program to be "very efficient, because each project doesn't have to negotiate its own contract provisions, and the costs are spread among a number of projects." Thomas said the consolidated purchase allowed TES to save more than $100,000. "It made me very happy and made my job a lot easier."

The RAD 6000 flight computer, a derivative of the model employed on last year's Mars Pathfinder mission, is the same as the one being used on the Mars Climate Orbiter, Mars Polar Lander and Stardust, which launch this coming December, January and February, respectively. In addition to TES and SIRTF, it will serve the following additional JPL missions (in order of receipt):

- Microwave Limb Sounder (MLS)
- Microwave Instrument for the Rosetta Orbiter (MIRO)
- SeaWinds
- Genesis
- Galaxy Evolution Explorer (GALEX)
- Mars Surveyor '01
- Mars Surveyor '03

Each of the missions except for MIRO and GALEX will receive more than one of the flight computers. Multiple computers are required to support either multiple pieces of hardware or to provide redundant operation within a single piece of hardware.

Two will be held by FHLP to serve as spares if any repair is necessary. This contributes to overall cost savings for the Lab, as "each project normally would buy its own spare," Wright noted.

The lightweight flight computer, measuring about 23 centimeters wide, 17 centimeters high and 2 centimeters thick (9 by 6 by .9 inches), weighs in at about 1.2 kilograms (42 ounces). It runs 22 million instructions per second.

In addition to the cost savings, noted Lloyd Keith, deputy manager of the Avionic Equipment Section, with the abundance of the Laboratory's upcoming missions, "The program has also turned into a great utility for emergency sharing of these similar types of flight computers. Now, if there's damage to a computer that's close to flight, a project can likely borrow one from another project that can accommodate the time required to repair or replace the damaged unit."

The future bodes well for this type of multiple-purchase procurement, Wright said, noting that small deep-space transponders and power supplies for missions in the near future could be financed and delivered similarly.

"The X2000 Project has a request for proposal to develop the next generation flight computer," he said. "Once that gets invented, we expect that FHLP will deliver it subsequent project users."

"This program has been viewed as highly successful throughout the Laboratory," Keith said. "We've received very positive response from our customers and numerous queries from other NASA organizations." ❑

JPL PHOTO LAB

Lloyd Keith and Valerie Thomas view one of the flight computers purchased in a consolidated procurement by the Flight Hardware Logistics Program.

Galileo

Continued from page 1

rious trait, according to Orton. "We can see it, along with the other white ovals, at visible light and some infrared wavelengths, but we cannot see the new white oval at certain infrared wavelengths that peer underneath the storm's upper cloud layers," Orton said. This might mean the storm is in a transition stage, undergoing a rebirth after the merging of the two storms.

"With mature white ovals, we can see the upwelling of winds in the center, which in turn leads to downwelling around it," Orton said. The new white oval has a very cold center at a temperature of -157 C (-251 F), about one degree colder than its surroundings. "Because of this, the oval may have generated a thick cloud system which obscures the downwelling," Orton said, which could explain the new oval's "disappearing act" at some wavelengths.

Adding to the mystery is the fact that a nearby storm rotating in the opposite direction to the new white oval used to be warmer than its surrounding. "This probably means that the feature contained mostly downwelling winds," said Orton. However, Galileo's photopolarimeter radiometer instrument showed this feature had cooled down to temperatures that were about the same as its surroundings.

Orton suspects that this storm somehow lost power and is no longer spinning as fast or downwelling as strongly as a year ago. This storm was once positioned between the two smaller white ovals that merged, and Orton theorized that when this storm system lost power, it removed the buffering mechanism that kept the two original white ovals apart.

Orton and his colleague, Dr. Brendan Fisher, a Caltech postdoctoral fellow at JPL, based their conclusions about the temperatures using data gathered by Galileo on July 20, 1998, during the spacecraft's 17th orbit of Jupiter and its moons. Although much data from the flyby of Europa in that time period was lost because of a problem with the spacecraft's gyroscope, Galileo's photopolarimeter radiometer gathered the new data on the white ovals before the anomaly occurred.

The photopolarimeter radiometer measures temperature profiles and energy balance of Jupiter's atmosphere, helping scientists study the huge planet's cloud characteristics and composition. Scientists believe that the bright, visible clouds of the white ovals are composed of ammonia.

New images captured by Galileo of lightning on Jupiter, an eclipse and aurora on Jupiter's fiery moon Io, and surface features on two other Jovian moons—Europa and Callisto—are available online at http://photojournal.jpl.nasa.gov .❑

Lab experiment may help clear the air for astronauts

By MARK WHALEN

Several hours after Space Shuttle Discovery launches toward its eight-day, 22-hour mission on Oct. 29, a JPL payload will begin testing to help ensure the health and safety of astronauts for all future human space flight.

By identifying a wide range of organic and inorganic molecules in the air onboard the shuttle, a JPL-designed and constructed device called the Electronic Nose (E-Nose) could be critical to the detection of potentially harmful gases on long-duration missions, especially the future international space station.

"The STS-95 crew in particular and astronauts in general have expressed a lot of interest in E-Nose," said principal investigator Dr. Amy Ryan of JPL. "Until now, if astronauts smelled something unusual, they have had to take a sample of the air for analysis after the flight. We want to develop a device that is not just an alarm, but is able to identify a contaminant and its approximate concentration."

In the close confines of a spacecraft, the air that crew members breathe is filtered and recycled throughout the mission. Since the air supply is limited and very difficult to replace, the buildup of atmospheric contaminants is a concern to crew health. The accumulation of potentially harmful gases poses a more serious threat during long missions aboard a space station or en route to distant bodies in the solar system.

If proven successful during STS-95, the device could be vital for future space crews in detecting chemical leaks, solvent spills and, particularly, electrical fires. The concern, Ryan said, is "there might be smoldering before someone smells it."

E-nose, which consists of an array of different polymeric thin film sensors, will be tested onboard Discovery for its ability to respond to compounds in the parts-per-million range.

Among the 10 toxic compounds E-Nose is trained to sniff out in this experiment are methanol, ethanol, methane, ammonia, benzene and formaldehyde.

To be deployed below an air intake in the shuttle's mid-deck, the E-Nose developmental model—which weighs about 1.4 kilograms (three pounds)—will record data points every 15 seconds for storage on a palmtop computer. Once a day, shuttle commander Curt Brown will collect an independent air sample and an alcohol wipe will be applied to record a daily marker.

During this experimental phase, E-Nose data won't be analyzed in real-time, although that is its long-term goal. "We first want to ensure that the system doesn't produce any false alarms," Ryan said.

Following the STS-95 flight, E-Nose data analysis will be done at JPL by Ryan and coworkers Dr. Margie Homer and Dr. Hanying Zhou. Concurrently, Johnson Space Center will perform toxicology analysis on shuttle air samples taken daily to corroborate E-nose data.

Besides designing the instrument, JPL constructed the sensor assembly, performed most of the preflight testing and developed the pattern recognition software engine that is needed to deconvolute the recorded data.

Four substrates on E-Nose each contain eight sensors for detecting toxic compounds.

The work has been done in collaboration with Dr. Nathan Lewis of Caltech. Early in the instrument's development, Dr. Martin Buehler of JPL made crucial contributions in the design of the device's electronics and its substrates, the ceramics on which the polymers are deposited.

Ryan and JPL Project Manager Dr. Dan Karmon noted that the E-Nose would be a useful system for many non-NASA applications. It could supplement the air quality monitoring of industrial processing, environmental toxins and pollutants, atmospheric composition for food quality assessments, and medical diagnoses, where the device might detect the metabolic products exuded from skin.

"Because of its size, the E-Nose can be used in many locations where larger, more cumbersome—and more expensive—monitors could not fit," Karmon said. "This is especially true on a space station or other spacecraft, where space is at a premium." A small, credit card–sized monitor is a definite possibility for the future, he added. "A device of this size could easily be carried by crew members on the international space station. It can also be networked over a large structure like a factory floor.

"This JPL effort is unique," Karmon added. "It is a NASA effort to test a 'fast insertion' approach to new technologies while doing it with very modest expenditures." ❑

Contract

Continued from page 3

• End-user support operations.

"This is a true example of JPL partnering with industry," said Pniel, who is also manager of JPL's Advanced Spaceborne Thermal Emission Reflectance Radiometer (ASTER) project. "Raytheon sees JPL as a long-term commitment, and our goal is to have Raytheon behave and act as a partner, to provide the Laboratory with access to new information technology, and to bring us new techniques, corporate knowledge and investment."

The contract with Raytheon STX will be administered by JPL's Space and Earth Science Programs Directorate. However, support will be available to any JPL program or mission.

Pniel said an anticipated 100 people will be working under the contract within three to five years.

Raytheon is expected by Thanks-giving to open a new facility in Pasadena to support its JPL work. The Euclid Street location is approximately six miles from JPL, and will include a business development office and a facility for visiting scientists.

Raytheon staff will contribute as "Category X" contractors. Work will proceed on a task order basis as JPL issues individual contract work orders. Pniel said there are currently 17 such orders under proposal by Raytheon for JPL tasks.

"We've never had a software arrangement like this—an umbrella contract that's allowed us to work with all areas of science data systems," Pniel said.

Raytheon will contribute to JPL's new work already on the drawing board as well as missions that have not yet been proposed.

In fact, said contract negotiator Marty Scarbrough of the Acquisition Division, "We hope that eventually this will evolve into a relationship where Raytheon will actually assist JPL in getting and developing new work."

"For some of the work we don't know about yet, we anticipate that Raytheon will participate in segments of proposals," Pniel added.

Raytheon could opt to commercialize science data products they develop in the course of their work with JPL, Pniel said, "If they see a proposal with market-development potential." The company could, for example, make changes to software algorithms that could help adapt it for commercial use.

"Raytheon understands that if they decide to use any software that was either developed by JPL or by Raytheon to do this work, they would need permission from Caltech," he added.

The Raytheon deal came about following a highly competitive procurement.

"There was a major response to the request for proposals from a number of top-notch American companies," Scarbrough said.

A unique aspect of the deal, she added, was the fact that this represented JPL's first Internet-based request for proposals.

The proposal was originally submitted online to 63 bidders, "and because of the large volume of complex documentation involved, contractors liked having electronic access," she said. "It proved to be a very successful way of moving information around."

Raytheon earlier this year signed a contract to perform similar science data systems work for NASA's Ames Research Center in Mountain View, Calif. ❑

News Briefs

Douglas Stetson

Douglas Stetson has been named the manager of the Solar System Exploration Program Office in the Space and Earth Sciences Program Directorate.

Stetson has held a variety of technical and managerial positions since he joined JPL in 1983. He spent about 10 years in the Mission Design Section, specializing in orbital mechanics and planetary mission design and engineering. During that time, he served as the lead mission design engineer for the Cassini mission early in the project's history, and was the study lead for a large number of advanced planetary concept studies.

From 1992 to 1993 Stetson worked at NASA Headquarters in the agency's Solar System Exploration Division. Since returning to JPL he has been heavily involved in strategic and technology planning for JPL's solar system exploration program and has continued to work closely with the NASA Office of Space Science.

Stetson received a bachelor's degree in physics in 1981 and a master's degree in aeronautics and astronautics in 1983 from Stanford University. ❑

JPL employees are invited to nominate individuals or groups for NASA Honor Awards to be presented in 1999.

Nomination information is available from division and section offices. Nominations should be submitted to the immediate administrative supervisor of the nominee, and they will be processed up through their respective line organization. The nominations will be reviewed and those selected will be forwarded to NASA for consideration.

Directorates' final recommendations can be submitted to the JPL awards board chair, **Kirk Dawson**, no later than Monday, Nov. 30.

System procedures for nominations can be found on the Institutional Environment navigator at http:// dmie.jpl.nasa.gov under by searching for "NASA Honor Awards." ❑

Reservations are available at the ERC for a fundraiser to support the La Cañada Flintridge Tournament of Roses' "Martian Mischief" 1999 Rose Parade Float, which is based on the Sojourner rover. The wine-tasting event will be held Sunday, Nov. 1 at the La Cañada Flintridge Country Club. The cost is $40.

For more information, call **Bob Ferber** at (818) 790-2013. ❑

JPL staff are invited to attend the annual Summer Undergraduate Research Fellowship (SURF) Seminar Day, Saturday, Oct. 17 at Caltech. The program is celebrating its 20th year.

The SURF program offers undergraduates the opportunity to do research projects in collaboration with Caltech faculty or JPL technical staff members over a 10-week period, mid-June to late August. A seminar series featuring JPL scientists is also offered as part of the SURF program.

Student presentations are from 10 to 11:40 a.m. and from 1 to 4 p.m., followed by a plenary session at 4:15 p.m. and reception at 5:30 p.m.

A complete schedule is available at http://www.cco.caltech.edu/~surf .

Reservations are not required for the student presentations or plenary session, but are required for a buffet luncheon at 11:45 a.m. in San Pasqual Mall. The cost is $10.

For more information, contact the Student-Faculty Programs Office, (626) 395-2885, or e-mail to sfp@cco. ❑

Ulysses

Continued from page 1

Cosmology and Astrophysics (ASCA). Comparisons of the ASCA data and measurements from other satellites showed that the X-ray pulses were gradually slowing down after the radiation burst subsided.

From its intensity and rotational slowing, scientists calculated that SGR1900+14 has a magnetic field about a thousand trillion times stronger than Earth's magnetic field and about one thousand times stronger than any found elsewhere in the universe, Smith said. During the flashing episode, Dr. Chryssa Kouveliotou of NASA's Marshall Space Flight Center in Huntsville, Ala., who led another team observing the star with sensitive X-ray detectors aboard NASA's Rossi X-ray Timing Explorer satellite, found faint X-rays coming from the star, similar to what they had observed in another soft gamma repeater which turned out to be a magnetar.

Three of the four confirmed soft gamma repeaters—designated 1900+14, 1806-20 and 0526-66—have localized X-ray emissions; 1806-20 and 1900+14 have regular pulsations and 0526- 66 had an eight-second period during its magnetic explosion observed in 1979. It is by comparing the change in the rotational period of these stars across several observations that scientists can measure their magnetic fields.

"Magnetars seem to answer several mysteries about the structure and evolution of stars," said Kouveliotou. "We think magnetars spend their first 10,000 years as soft gamma repeaters. As they weaken with age and slow their rotation, they become anomalous X-ray pulsars—stars that do not have enough 'juice' to flash anymore, but which emit a steady flow of X-rays for perhaps another 30,000 years. After that, they fade to black and drift for eternity through the heavens. The absence of observable pulsars in some supernova remnants just means that the pulsar's lights have gone out sooner than we expected."

Additional information on magnetars or the Aug. 27 burst is available on the Internet at http://www1.msfc. nasa.gov/NEWSROOM/ and http:// www.magnetars.com/ . ❑

Lander

Continued from page 3

of the science instruments and the basic spacecraft subsystems. Checkout of the communications system will be performed, including a verification of the spacecraft's ability to send data to controllers on Earth via the Mars Climate Orbiter and the tracking stations of the Deep Space Network. The spacecraft's radar, used during the final descent, will be installed and the solar arrays will be attached and tested.

The Deep Space 2 microprobes will also be installed on the lander's cruise ring. These two probes, developed at JPL under the New Millennium Program, will test technology and instruments to search for water several feet below the Martian surface. The spacecraft will then be ready for mating with the cruise stage and parachutes used for the trip through the lower Martian atmosphere will then be installed.

Next, the spacecraft will be fueled with its attitude control fuel and undergo spin balance testing. Finally, on Dec. 15, the spacecraft will be mated to a Star 48 solid propellant upper stage booster and then prepared for transportation to the launch pad.

The Mars Polar Lander with its upper stage booster will be transported to Complex 17 on Dec. 21 for hoisting atop the Delta and mating to the second stage. After the spacecraft undergoes a state-of-health check, it will be closed out for flight and on Dec.29 the two halves of the Delta nose fairing placed around it.

At liftoff, the spacecraft weighs 567 kilograms (1,270 pounds), is 1.06 meter (3.6 feet) tall and 3.6 meters (12 feet) long. ❑

ISO pre-assessment audit coming up in November

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

Beginning Nov. 16, a NASA-selected third-party registrar, Det Norske Veritas (DNV), will visit the Lab to conduct an audit over the span of a few days to assess the Lab's readiness for ISO 9001 certification. DNV is one of the leading providers of assessment and certification for quality and environmental systems worldwide.

ISO audits follow a pre-determined procedure. For example, they always start with the highest official on the site. They are done one-on-one in the presence of a JPL escort. Nonconformances—that is, places where processes do not follow the ISO standards reflected in the JPL policy requirements—will be identified during the audit. Findings of nonconformances will be reported by DNV. Corrective action notices will be assigned to the appropriate employees who will then follow the necessary process to correct nonconformances.

Managers have gained an overview of the corrective/preventive action process through their attendance in classes over the last two weeks. These classes for management will continue and eventually include a more detailed class involving root cause analysis and other aspects of the process.

To prepare for the upcoming audits, all employees should understand the purpose for maintaining a quality product delivery system. They need to know which processes and procedures apply to their particular job and know where to locate them. Employee notebooks are being created and the URLs and templates for determining this information will be downloadable from the ISO web page at http://iso. Employees and their group supervisors are responsible for compiling these notebooks.

The employee notebooks will contain the following information: ISO worksheets, work authorization memo (WAM), a process map pertaining to specific work area, training records, URLs indicating the location of pertinent organizational charts, and URLs that indicate the location of process policies and procedures used to perform given tasks. These notebooks will be kept in hard copy in binders at employees' workstations. Eventually, notebooks will reside in shared online folders accessible by both employee and group supervisor.

In addition, employees need to be able to determine which policies and procedures are current. The most up-to-date version of any policy will be found in DMIE and can be found using the IE Navigator at http:// dmie. ❑

Passings

Ivey Jackson Justice Jr., 64, former manager of the DSN Resources and Safety Office, died of a heart attack Sept. 18 at his Pasadena home.

Justice, who joined JPL in 1970, managed Office 901 from its inception in July 1994 to April 1995. He then worked in the Telecommunications and Mission Operations Directorate's Business Operations Office 910. He retired in 1997.

Justice is survived by his wife, Kathleen, daughter Shiobian Brannon and one granddaughter.

Cremation services were held in Ireland. ❑

Stephen Kozak, 82, a retired senior engineering assistant in Section 337, died of heart failure Sept. 19 at his home in Glendora.

Kozak worked at JPL from 1963–85. He is survived by his wife, Estelle; daughter Marcia Houser; sons Stephen, Ron and Ray; and sister Wanda.

Services were held at Riverside National Cemetery. ❑

Frederick Brodish, 66, a retired senior instrument specialist in Section 351, died of heart failure Oct. 1 at Kaiser Hospital in Panorama City.

Brodish joined the Lab in 1968 and retired in 1995. He is survived by his wife, Dorothy, four children and seven grandchildren.

Memorial services were held Oct. 5. ❑

Halloween fashion show on mall Oct. 30

JPL's annual Halloween fashion show will be held on the steps of Building 180 on Friday, Oct. 30 starting at 11:45 a.m. Each participant in full costume will receive a $5 gift certificate for ERC merchandise.

Displays by community service agencies supported by United Way and a lunch special offered by cafeteria contractor Eurest will be featured.

The United Way canned food donation drive will begin the same day. ❑

United Way

Continued from page 2

Caltech's Family Night, held in association with the United Way drive, will be held Oct. 23 at 5 p.m. in Beckman Auditorium. This free event features a pasta dinner, balloon sculpture, face painting, a caricaturist and Disney's recent film "Mulan." Tickets are available free of charge at the ERC office through Oct. 20.

For more information, go online to http://hr/unitedway . ❑

LETTERS

Thank you to all my friends at JPL and in 665 for the lovely plant sent to me in sympathy for the loss of my sister. It is a kindness that is greatly appreciated at this hard time.

Virginia Glassett

❑❑❑

My wife, Susan, and I wish to thank the ERC for the beautiful plant sent to us on the death of her mother, Elizabeth Taylor.

Bob and Susan Edelson

❑❑❑

I would like to thank the Caltech Credit Union, my coworkers and members for all the cards, flowers, gifts and well wishes I received my last day of work. I will miss all of you but have many good memories to take with me into my retirement. Thank you all very much.

Arlyce J. Oien

❑❑❑

Thank you, all who came to my party, those who couldn't make it, and all of you who took time to wish me well on my retirement. Thank you, Charmaine, Laura and Jan, for making the arrangements and setting up the food and drink. The party was a warm and generous event. I'm looking forward to trying out my new shotgun barrel, with interchangeable chokes (on clay birds).

Anthony Giandomenico

❑❑❑

What a blast! Thanks to all the people who made my retirement party such a hilarious success. Who else's retirement has featured a cross-dresser and a stripper in Von Kármán Auditorium? Special thanks to the planning committee, the testimonial people, and the actors in the Managing Magnificence skit. And thanks to all the Martians and SESPD folks who signed pictures for me. I also appreciate all the people who came to say goodbye. For those who missed it, it was videotaped. You can all keep track of my post-JPL adventures at http://www.managingcreativity.com.

Donna Shirley

FOR SALE

AIR CONDITIONER, AC 4800 BTU, new 7/98, $150; WASHER/DRYER, Maytag, stacked, 3 yrs. old, new $1,000, sell $500/obo. 626/398-3954, eve., 909/607-3812 (d), Margo Malakoff.

BABY/TODDLER ITEMS: colorful walk-in playhouse ($75); toddler picnic table and bench set ($25); baby stroller, reclines for sleeping ($75); changing table/chest of drawers ($50). 626/355-6573.

BASEBALL CARDS, '87 Topps rack packs, 45 cards, $10/ea., possible McGwire and other major stars, unopened packs of 15 each. 626/914-6083.

BED, black leather 6-ft. hide-a-bed from Jennifer Convertibles, good condition, $120/obo. 626/445-3864.

BED FRAME, king size, never used, $20/obo. 626/568-8298.

BED SET, Little Mermaid, twin comforter, sheets, pillowcases, and canopy, $15. 626/798-0329.

BEDROOM FURNITURE, oak youth set; platform twin bed, bookcase headboard, desk w/hutch, lg. armoire, exc. cond., orig. $4,500, sell $1,500. 626/447-6423.

BEDSPREAD, double, tailored, quilted, eggshell color, brand new, never used, cost $139, sell $50/obo. 909/593-4046.

BICYCLE, Bianchi Limited; large frame, perfect condition, could use new tires, $500. 805/255-8933, John.

BICYCLE, BMX, good condition, $50. 952-8455.

BICYCLES: specialized 1991 Allez, 23-inch (58.4 cm) carbon fiber frame, Suntour 12-speed shifters, very light and stiff, choice of triathlon or standard drop bars, Look pedals, $410 firm; Fuji 12 speed, medium size, good condition, aluminum wheels, Suntour shifters, $100 firm. 626/794-0886, Ted.

CALLER I.D. UNIT, Pacific Bell, PA25, $30. 310/618-8977.

CARPET, discount price. 909/984-7717.

CELL PHONE, Nokia model 2190, GSM digital, brand new sealed in the box, leather case, car and home charger, $125/obo. 323/935-3432.

CHAIR, blue velvet occasional, vg cond., $75; LAMPSHADES, 2 off-white pleated, exc. cond., $20; LIGHT FIXTURES, recessed eyeball, $15/ea. 626/798-2531.

COLLECTIBLES, Gone With The Wind plates ($25 each) and Franklin Mint Dolls ($100 to $250); all have original boxes and certificates. 626/301-9965, lv. message or e-mail: millerX4@aol.com.

COMFORTERS, 1 king blue/yellow floral w/matching duster, shams, $50; 1 queen cream/rose w/duster, $40; both exc. cond. 626/798-2531.

COMPUTER, Mac PowerCenter Pro 210 with 4GB HD, 604e, 16x CD, 64 MB RAM, 4m video, ultrawide SCSI, 60 MHz bus, G3 upgradable, fast and powerful, sac. $1,000. 323/258-8917.

CORNER GROUP SET, laminated, woodgrain (brown) for bdrm (i.e. corner desk, chair, cabinet w/drawer, 3-drawer dresser), perf. for spare bedrm. or teenager's rm, vg cond., $125/obo. 626/337-7522.

DINING ROOM TABLE, elegant, 6' x 4'; 1" beveled leaded glass, with leaded glass and brass V-shaped pedestals; & 4 high-backed black chrome & brocade chairs; excellent condition; all for $600/obo. 951-9635.

DINING ROOM TABLE, exquisite 6-foot long, 1" thick beveled glass table, glass V-shaped pedestals, with 4 high-backed black chrome & brocade chairs; perfect condition; all for $525/obo. 249-4561.

DINING ROOM TABLE, round, mahogany, sits 8 with two extensions, almost new, comes with 6 matching chairs, $700/obo. 626/568-8298.

DINING TABLE, Duncan Phyffe style, clever turn-top table, 4 chairs newly upholstered, $300/obo. 626/301-9965, lv. message or e-mail: millerX4@ aol.com.

DINING TABLE, 5' oval wooden, recently refinished natural top & cherry legs, $50; ARMCHAIR: roomy, comfortable with gray/white stripe slipcover, $90. 626/793-7771, Andy.

DOGS, miniature dachshunds, AKC, male and female, blk/tan, red, chocolate/red. 352-1991.

DRESSERS, two units, oak, 5 drawers each with top drawer lined with cedar, excellent condition, 36"w x 46.5"h x 17"d, $150 each, both for $250/obo. 626/568-8298.

EXERCISE BIKE, Voit CX 1200 Ergometer, exc. cond., hardly used, $60/obo. 248-9561.

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

EXERCISE MACHINE, Soloflex, exc. cond., $300. 626/447-6423.

FURNISHINGS, misc: oak roll-top desk, oak dining table & chairs, oak bar/stools, TV console, grandfather clock, brass chandelier, small fridge, small freezer, ping pong table. 626/791-1266.

GRANDFATHER CLOCK, Howard Miller design, key-driven, 3-chime, w/moon dial, elm burl décor, new oiler kit & manual incl.,

Continued on page 8

$800. 249-6071.
HAIR DRYER, professional, chair style, works well, $35/obo. 956-1744.
HIDE-A-BED, Simmons queen size, excellent condition, brown tones, $300; GUITAR, Yamaha 12-string, exc. condition, $200; OBOE, Conn, exc.condition, $200. 248-5274 or dshirley@earthlink.net.
MOVING SALE, upright freezer, $100; washer, $50; dryer, $75; mtn. bikes, $35; microwave, $30; Baldwin upright piano, $500. 626/794-3576.
NON-PROFIT SALE, Sat., Nov. 28, 10 a.m. - 2 p.m.; 100s of new or refurbished home electronic items at rock-bottom prices; Nintendo game systems, $99; 700 popular game cartridges at low, low prices; TVs, TV/VCRs, microwaves, cordless phones, personal copiers and much more, all carry warranty; Frostig Center, 971 N. Altadena Dr., Pasadena, a private non-profit center educating children with learning disabilities.
PENDANT, diamond, .25 ct., white gold chain, appraised $600, sell $300; CHRISTMAS BELLS, Lladro, $15/ea. 626/798-2531.
REFRIGERATOR, apt. size, lg. capacity, frost free, 5 yrs. old, exc. cond., $175; FIREPLACE ACCESSORIES: wrought iron/chrome pedestal w/brush, shovel, poker & stand, beautiful, never used, $75. 249-4561.
SKI RACK ACCESSORY, Yakima "Buttondown 6," still in box, list $99, sell $60; Weber BBQ, $20. 352-6778.
SURFBOARD, exc. condition, $120. 626/577-5479, Jorge or jorgev@earthlink.net.
TELEPHONE ANSWERING MACHINE, General Electric, black, microcassette, voice time/day stamp, hardly used. 626/844-4383.
TICKETS, Scott Adams (Dilbert) live at the El Rey theatre, early October, 2 tickets at face value, $60/each. 323/935-3432, Allan.
TYPEWRITER, Sharp PA-3030II portable electronic., bi-directional print, lift-off correction, 20-character liquid crystal display, built-in spelling checker, user manual, plus more, good condition, $45/obo. 626/564-8329.
WASHER/ELECTRIC DRYER, GE, like new, white, under 1 year old; set $550/obo. 323/258-7977.
WINE RACK, rod iron, free standing, $35. 626/798-0329.
WOODEN BLOCKS, children's Playskool, with storage trunk, $20. 626/798-0329.

VEHICLES / ACCESSORIES

'95 BMW 318 ISA, white, exc. cond., auto, upgraded sound, 37K mi., LoJack, extended warranty, $21,000. 562/695-5197.
CAR RAMPS, like new, extra heavy-duty, 10-ton rated, $40; TIRES, Uniroyal Laredo, 30 x 9.50 XR15, for LT, lots of tread, 10/32, $30/tire; all for $80. 249-6071.
'90 CHEVY Lumina APV mini-van, loaded, only 54,400 miles, new brakes, newer tires, new battery, auto, PS, PW, PDL, A/C, 7 passenger seats, cruise control, cassette, tilt, exc. condition. $7,199. 909/594-3935.
'84 DODGE D-50 pickup truck, vg cond., auto, 2.6 eng., tilt wheel, bedliner, shell, very clean, well maintained, 138K mi., just smogged, orig. owner, $3,000/obo. 626/332-2682.

NOTICE TO ADVERTISERS

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

Universe

Editor
Mark Whalen

Photos
JPL Photo Lab

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

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

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

'96 FORD Contour, 33,000 mi., loaded, 5-speed, V6, tinted windows, blk. w/gray interior, exc. cond., $12,000. 362-3358.
'89 HONDA Accord LX, 4-dr., 5-speed, full pwr., gold; new radiator, a/c, timing belt, brakes; runs smooth, 139k mi, $3,900. 248-4637.
'85 HONDA Interceptor 500, red/blue on white, 23k miles, full faring; always garaged; pretty bike but needs some work, does not presently run, $1,100/obo. 790-6922.
'85 HONDA Shadow 700cc, V-Twin, shaft drive, automatic valve adjustment, water-cooled, excellent tires, low maintenance, reliable, good condition, red and black, $1,800. 626/794-0886, Ted.
'77 HONDA Civic, new brakes, recent tune-up (major), new battery, needs smog & current license tags, as is, $500. 249-6071.
'92 HYUNDAI Elantra, vg cond., 94K, 30 mpg, a/c, am/fm/cass., $3,500/obo. 909/305-1029.
INSTRUMENT GAGES, Steward Warner stage III, all back lit, fits VW '62-'74, with housing, volts, amps, vacuum oil pressure and tach, $175. 249-6071.
'90 JEEP Cherokee Laredo, auto, 4x4+, 4.0 liter v-twin engine; remote auto door locks; pwr. strg, win, ABS brakes; privacy glass; a/c; am/fm/cass. w/prem. sound; spec rims, new tires + full spare; complete tow pkg; exc. cond. $8,500. 249-4561.
'88 KAWASAKI Ninja 600, 10.3K miles, accessories incl.: motorcycle cover, leather tank cover, Arai helmet, kryptonite lock; clean, 2nd owner, must sell, $2,250/obo. 323/223-5086 or page at 323/340-5850.
'97 MAZDA Protégé, dark blue w/tan interior, 41,000 mi., Mazda-maintained, $10,500. 626/294-0426.
'90 MAZDA MPV minivan, air, V6, full power, new tires, runs great, 1 owner, $4,300. 957-5382.
'87 MAZDA RX7, GXL model, full equip'd, leather int., Kenwood AM/FM/CD stereo, lo blu. bk., $2,500/obo. 626/797-6824.
MERCEDES BENZ repair manuals for model 300D Turbo-Diesel; 1 for engine, 2 for chassis. 952-0052.
'86 MERCEDES BENZ 190E, auto, beige, leather, smog certified, vg cond., orig. owner, $3,500. 790-3802, Bill.
'93 MERCURY Villager GS minivan, 73K miles, excellent condition, Michelin tires, $9,900. 626/791-8849.
'83 NOMAD travel trailer, '93 interior, 24 ft., front lounge, slps. 4, SC, <1 yr. awning, air, microwave, TV ant, am/fm/cass., bath fan, equalize hitch incl., $4,000, TR6276, 626/355-6891.
'83 SUBARU coupe, needs body work, runs well, $350. 626/447-6423, after 6 p.m.
TRAILER DOLLY, Power Caster, 110V, model PC-2, $250. 626/355-6891.
'95 VW Jetta III, black, 58k, 5 spd., A/C, moonroof, pwr. windows/locks, AM/FM/cass, cruise, ABS, alarm, more, exc. condition plus extd. warranty; going back to school, must sell, $12,500/obo. 790-6922.

WANTED

APARTMENT for Ph.D. student visiting JPL for 8 mo.; max. $650/mo. 626/792-1168.
CLARINET, used, reasonable price, or for rent, or for loan; we will take good care of your instrument. 626/357-9708 eves., Lynda.
MODEM, 33.6K or faster, with drivers for Pentium. 626/405-1971, Joe.
SIGNATURES of Pathfinder and Sojourner people who didn't yet sign Donna Shirley's Pathfinder poster, in Mars Exploration Office, 264-419.
SOUND CARD with drivers for Pentium, not more than 3 years old. 626/405-1971, Joe.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
TOY pieces or sets, "K'nex" and "Brio Mec". 626/303-3016, Ellyn.
VANPOOL RIDERS, stops along the 118, off-site contractors welcome, vanpool # 20. Ext. 4-0307, Marilyn.
VANPOOL RIDERS, Long Beach/Lakewood, JPL vanpool #14, 6:45 a.m.-3:45 p.m., Ext. 3-2706, John.
VOLLEYBALL PLAYERS, coed, all levels of play, Tuesdays 8:00-10:00 at Eagle Rock High School, $4/night. 956-1744, Barbara.
WELDING EQUIPMENT, used oxy-acetylene. 323/662-4089.

FREE

CLEAN FILL DIRT [mostly gravel-like], you haul; several cu yds., take as little or as much as you like; 3 blks. ESE of NY & Hill, Altadena. 798-5152.
DOG, Rottweiler/Doberman mix; female, 1 yr. old, spayed, current shots; house trained and knows basic commands; great with kids and cats; to good home. 626/351-0097.
ENGR BOOKS, engineering materials, design graphics & geometry; a little weathered. 626/798-0329.
FIREWOOD, already cut to length, you haul. 626/798-2925.
FUTON FRAME, converts from couch to bed, you pick up. 626/296-0313.
FUTON MATTRESS, queen, w/o frame, clean. 790-0801.
KNITTING MACHINE, Maruyama, brand new but 30 yrs. old; for fine yarn. 909/593-4046.
SKYLIGHT, 2 x 4 feet, frosted, double pane Plexiglas, used for 1 year. 352-6778.

LOST & FOUND

Found: Sterling silver earring with black onyx stone and silver detail work creating an impression suggestive of a peacock feather, found 1 Oct. in East parking lot near bus stop at row 10, owner should contact lost and found at ERC.

FOR RENT

EAGLE ROCK, hilltop home, art deco, 2 bd., 1 ba. + office/bonus w/separate ba., modern white w/wood floors, $1,300. 213/254-5350.
EAST PASADENA, sm. rear studio house; new stove, refrig.; water, gardener pd.; new paint and refurbishment; no smoking; $485. 626/791-8113.
HOLLYWOOD KNOLLS area, 1 bd. apt. in 7-unit bldg. (adjacent to Universal, Griffith Park, and Toluca Lake in Burbank); hillside community w/close fwy. access (~15 min./JPL); outside floor entr., newly remodeled, hardwood oak floors, new refrig., dishwasher, a/c-heat pump, solar heated water incl., laundry rm. downstairs, parking; non-smoker. 626/798-3235.
LA CANADA house, 3 bd., 2 ba., living rm., dining rm., family rm., den, lg. fenced yd. w/patio & deck, basketball court, fruit trees, walk to JPL, water & gardener incl., $2,000, 4532 Viro Rd. 790-8216.
LA CANADA house, 3 bd., 2 ba., furnished, gardener provided, nice area nr. JPL and schools, children and pets OK, $1,975. 714/854-5240.
LA CRESCENTA condo, 2 bd., 2 ba., 10 min./JPL, great school. 890-5655 or 626/286-2880.
MONROVIA, share fully furn. condo, 2 bd., 1.75 ba., kitch. priv. incl. refrig., stove, dshwsh., wshr./ dryr., cent. air/heat, $400, util. pd. 626/357-5189.
PASADENA, 2 bd. + den/office, 3 ba. apt., cent. air/heat, sm. patio, laundry facil., $1,100 + util. 626/351-9641.
PASADENA, 425 S. Oakland Ave, between Del Mar & California Blvd., close to JPL & Caltech, near bus stop, spacious, furnished, 1 bd., 1 ba., private patio, private off-street carport, on-site laundry, $1,250. 626/797-3101.
PASADENA, fully furnished condo, loaded, gated bldg., 1115 Cordova East #121, lg. studio, lg. kitchen, 2 blocks to Caltech; non-smoker; no pets, $675. 626/792-9053, Marilyn.
PASADENA house, 3 bd., 1 ba., lg. fenced yd., 2-car gar., frplc., laundry, spa, nr. JPL & Rose Bowl, $1,250 + util. 626/794-3576.
PASADENA, newly remodeled Craftsman bungalow; 2 bd., 1 ba.; good residential area; hardwood floor in living room and dining room; water, trash and gardener provided; see to appreciate, $1,200. 683-9935, eves.
PASADENA, 2-bd., 1½-ba. townhouse-style apt., near PCC, built-in range & oven, central a/c, carpets, drapes, disposal, laundry, covered parking, $725. 790-7062.
SUNLAND house, 4 + 2, quiet st., mtn. vw., lg. rooms, fireplace, hardwood floors, new tile, stained glass windows, lg. fenced yd., new tile and paint. 548-0588.

REAL ESTATE

EAGLE ROCK condo, 1 bd., 1 ba., 820 sq. ft., light and airy end unit w/1 common wall on quiet cul-de-sac, cent. a/h, built-in microwave, range, dishwasher, convenient to L.A., Glendale, Pasadena; $87,500. 626/584-4188.
LAKE CO., N. Calif., 2 1/2 acre lot, in beautiful Kelseyville near Clear Lake, perfect site for a permanent or retirement home, 30 walnut trees, paved road, electricity, $36,000. 626/337-7522.
PASADENA, spacious house, 3 bd. + den, 1-3/4 ba., detached 2-car garage, dead-end street, exc. for small kids, quiet & friendly neighborhood, walking dist. to lib, park & grocery, 10 min./JPL; next to Hastings Ranch. 790-9275.

VACATION RENTALS

BIG BEAR cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P, TV/VCP, $75/night. 249-8515.
BIG BEAR CITY, near airport, 2-bd., 1-ba. cabin, nicely furnished, sleeps 8; fireplace, TV, full kitchen; $100 cleaning deposit; $50/nite weekdays, $150/weekends. 909/982-2986.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhouse, 2 decks, sleeps 6, tennis, pool, spa. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/per night for 4. 248-8853.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: $95/nite/2, 12/15-4/14 rate: $110/nite/2, $10/nite/add'l person. 949/348-8047.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, sunny, quiet, full kitchen, TV/VCR, JPL disc. rates, walk to Canyon Lodge. 249-8088.
MAMMOTH condo, in Chamonix at lifts 7, 8, 16, 17; 2 bd., 2 ba., slps 6, fireplace w/wood, fully equip. elec. kitchen w/microwave & extras, TV, VCR, cable fm stereo, pool & sun area, outdoor Jacuz., sauna, game, rec., laundry rms., walk to Cyn. Lodge, shops, lifts, hiking; special midweek rates; summer rates through Oct. 249-8524.
OCEANSIDE, on the sand, charming 1 bd. + condo, panoramic view, walk to pier/marina, pool, spa, game rm., sleeps 4. 949/786-6548.
PACIFIC GROVE house, 3 bd., 2 ba., fp, cable TV/VCR, stereo/CD, well-eqpd. kitch. w/microwv., beaut. furn., close to golf, beaches, 17 Mile Dr., Aquarium, Cannery Row, JPL discount. 626/441-3265.
PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR; carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.
ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach; tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; $995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/wk. low seas., + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

Jet Propulsion Laboratory

Universe

Pasadena, California Vol. 28, No. 22 October 30, 1998

New Millennium lifts off with DS1

Technology validation for 21st century missions begins with Oct. 24 launch

Bursting through a dark gray cloud seconds after its Oct. 24 launch from Florida's Cape Canaveral Air Station, JPL's Deep Space 1 mission emerged to successfully blast off the first project in NASA's ambitious New Millennium Program.

Early signs indicated a successful start to the mission, which was launched at 5:08 a.m. Pacific Daylight Time (PDT) Saturday.

Now more than twice the moon's distance from Earth, the spacecraft was deemed to be in excellent condition in its fifth day of flight on Oct. 28.

Following the launch, a delay of about 13 minutes was experienced in picking up the spacecraft's first ground-station signal. To the simultaneous delight of flight controllers and a JPL launch-hour gathering of friends and family of mission personnel, telemetry was received from the spacecraft at the Deep Space Network's tracking station near Canberra, Australia, at 1 hour, 37 minutes after launch.

About seven hours after launch, the flight team sent commands instructing the spacecraft to transmit stored data capturing spacecraft conditions from the time of launch until the first signal was received. These data are expected to tell engineers if any condition on the spacecraft contributed to the delay in picking up the first signal.

At the time that ground controllers were looking for a spacecraft signal, the flight team was prepared to send contingency commands to the spacecraft, but the signal was eventually received about 5 minutes before the contingency plan would have been put into effect. The slight delay in signal acquisition is not expected to have any impact on the mission.

Spacecraft engineers on Wednesday, Oct. 28 successfully diagnosed and corrected a glitch that had resulted in one of Deep Space 1's solar panels temporarily pointing away from the Sun. Spacecraft operations were not affected because more than adequate power is provided by just one solar panel, said Deputy Mission Manager Dr. Marc Rayman at JPL.

Engineering data from the spacecraft is being analyzed to determine whether the glitch was due to a random error induced in the spacecraft's solar array electronics caused by natural radiation in space.

Spacecraft commands were also successfully sent Oct. 27 to begin preparation of various system components for the planned Nov. 9 start-up of the ion propulsion engine. In addition, a control device for the ion propulsion engine was turned on, the first step in the two-week process to condition the system for its first use.

On Oct. 30, the spacecraft is scheduled to execute its first turn in a maneuver designed to point the ion engine in a sunward direction to allow solar heating to "bake" off contaminants such as water vapor and other atmospheric chemicals that typically remain on spacecraft surfaces after launch.

Engineers have noted an improvement in the somewhat erratic behavior of the spacecraft's star tracker. The device—not one of the mission's 12 new technologies—from time to

See DS1, page 5

KENNEDY SPACE CENTER PHOTO

A Boeing Delta II rocket hurtles Deep Space 1 through the morning clouds after its Oct. 24 liftoff from Cape Canaveral Air Station, Fla.

Galileo shows another Jupiter moon may have ocean

Studies indicate similarities between Callisto, Europa

By JANE PLATT

Jupiter's second largest moon, Callisto, may have a liquid ocean tucked under its icy, cratered crust, according to scientists studying data gathered by JPL's Galileo spacecraft.

The Galileo findings, published in the Oct. 22 issue of the journal Nature, reveal similarities between Callisto and another of Jupiter's moons, Europa, which has already displayed strong evidence of a subsurface ocean.

"Until now, we thought Callisto was a dead and boring moon, just a hunk of rock and ice," said Dr. Margaret Kivelson, space physics professor at UCLA and principal investigator for Galileo's magnetometer instrument, which measures magnetic fields around Jupiter and its moons. "The new data certainly suggest that something is hidden below Callisto's surface, and that something may very well be a salty ocean."

This premise was inspired by Galileo data indicating electrical currents flowing near Europa's surface cause changes in Europa's

See Galileo, page 5

Special Events Calendar

Ongoing

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

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

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

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

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

Friday, October 30

Halloween Fashion Show—To be held on the steps of Building 180 starting at 11:45 a.m. Each participant in full costume will receive a $5 gift certificate for ERC merchandise. The United Way canned food donation drive will also begin.

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

The Flying Karamazov Brothers—The troupe of juggles presents its latest production, *Sharps, Flats and Accidentals*, at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $32, $28 and $24. For information, call (626) 395-4652.

Open Enrollment Ends—Benefits open enrollment phone lines will close today. Call (888) 605-9622 to make all necessary changes to 1999 benefits plans. Confirmation letters will be sent the week of Nov. 9 to all employees who make changes.

Fri., Oct. 30-Sun., Nov. 1

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

Tuesday, November 3

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

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

Wednesday, November 4

"A New Mars: The View From Mars Global Surveyor"—Project Manager Glenn Cunningham will speak at 8 p.m. in Caltech's Beckman Auditorium. For information, call (626) 395-4652.

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

Chinese Language Class—Meeting at noon in Building 306-400.

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

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

Thursday, November 5

"Amazon Journal"—Oscar-nominated filmmaker Geoff O'Connor will show excerpts from his documentary and discuss his book of the same title. To be held at Caltech's Beckman Institute Auditorium at 7:30 p.m. Admission is free.

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

Friday, November 6

Inti-Illimani—The eight-member ensemble from Chile will perform traditional and contemporary music with a global influence. Held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $32, $28 and $24. For information, call (626) 395-4652.

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

Friday, November 6

"Space VLBI: Zooming In On Black Holes"—Robert Preston, Space VLBI project scientist, will speak at 1 p.m.in von Kármán Auditorium.

Fri., Nov. 6-Sun., Nov. 8

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

Tuesday, November 10

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

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

"The Structure and Design of A User-Friendly Web Site"—Don Cheney, web developer, Section 393, will speak at noon in von Kármán Auditorium.

Wednesday, November 11

Chinese Language Class—Meeting at noon in Building 306-400.

JPL/Caltech Flying Club—The fall membership meeting will be held at 7:30 p.m. on the Caltech campus in 269 Lauritsen. Anyone interested in flying club aircraft or learning to fly is invited. A brief business meeting will be followed by presentations on the Edwards Air Force Base high-altitude physiology course and flying the DC-3. E-mail or call Bob Ferber at ext. 4-3463 or Greg Detweiler at Caltech at (626) 395-1697.

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

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

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

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

SESPD Lecture Series—Robert Staehle of Outer Planets/Solar Probe Projects will discuss Europa Orbiter, Pluto-Kuiper Express and Solar Probe. At 11 a.m. in von Kármán Auditorium.

Thursday, November 12

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

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

"The Pathfinders"—This new video production , a fast paced, 36-minute documentary of the Mars Pathfinder mission, will be shown in von Kármán Auditorium at 11:30 a.m. and 12:30 p.m.

Friday, November 13

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

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

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

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

Saturday, November 14

Caltech-Occidental Concert Band—A free concert featuring the music of Gershwin, Mozart, and Bernstein will be held at 8 p.m. in Caltech's Beckman Auditorium. For information, call (626) 395-4652.

Downtown, West L.A. headed north, GPS research suggests

By MARY HARDIN

Downtown and West Los Angeles are moving toward the San Gabriel Mountains and the metropolitan area in between is being and will be squeezed slowly over the next several thousand years, according to researchers using precise satellite surveying techniques at JPL.

The measurements suggest that new mountains may be forming to the south of the high San Gabriel Mountains.

The results come from the Southern California Integrated Global Positioning System (GPS) Network, an array of 60 current and 250 planned GPS receivers that continuously measures the constant, yet tiny, movements of earthquake faults throughout Southern California.

"We've known for some time that the area between the coastline and the Mojave Desert is being squeezed together by the constant movement of Earth's crust," said Dr. Donald Argus, a geophysicist at JPL. "This new research helps pinpoint the area that's being squeezed. Specifically, downtown and West L.A. appear to be moving toward the San Gabriel Mountains at about one-fifth of an inch (half a centimeter) per year."

Argus was scheduled to present his finding Oct. 29 at the annual meeting of the Geological Society of America in Toronto, Canada.

"While this research does not mean that an earthquake in Los Angeles is imminent, one possible conclusion is that the earthquakes that occur in Los Angeles might be concentrated in the northern part of the basin," Argus said.

The GPS surveying system uses radio signals transmitted from a constellation of 24 Earth-orbiting satellites that are jointly operated by the U.S. Departments of Defense and Transportation. Equipment on the ground receives signals from several satellites at a time, allowing scientists to pinpoint the position of a receiver to better than 0.4 inch (1 centimeter).

"The regional project is designed for exactly this kind of study. Our goal is to observe and monitor the slow, small motion, called strain, of the ground in greater Los Angeles," said JPL's Dr. Frank Webb, chair of the Southern California network. "This research helps us learn where earthquakes are more likely to happen, and helps with estimating the regional earthquake hazard in Southern California. It enables other agencies to make priorities about earthquake mitigation activities, including emergency preparedness and retrofit strategies."

There are now about 60 GPS receivers on the ground around Southern California with two new sites being added every week. The earthquake network began in 1990 with only four GPS receivers as a prototype project funded by NASA. It detected very small motions of Earth's crust in Southern California associated with other California earthquakes in June 1992 in the town of Landers and in January 1994 in Northridge.

The Southern California network includes a number of institutions using GPS for earthquake research. The consortium is coordinated by the Southern California Earthquake Center, a National Science Foundation science and technology center headquartered at USC. The array is operated by JPL, USC, the U.S. Geological Survey and the Institute of Geophysics and Planetary Physics at UC San Diego's Scripps Institution of Oceanography.

More information about SCIGN is available at: http://milhouse.jpl.nasa. gov. ❑

Astronauts chosen for JPL's SRTM mission

An international cadre of astronauts will support JPL's next Earth radar-mapping mission when NASA launches Space Shuttle Endeavour in September 1999.

The Shuttle Radar Topography Mission (SRTM) evolved from the Space Radar Laboratory missions that flew on two space shuttle flights in 1994. The effort is a partnership between NASA and the Department of Defense's National Imagery and Mapping Agency (NIMA). In addition, the German and Italian space agencies are contributing an experimental high-resolution imaging radar system.

A key SRTM technology is radar interferometry, which compares two radar images taken at slightly different locations to obtain elevation or surface-change information. SRTM will take two images at the same time—one from the radar antennas in the shuttle's payload bay, the other from the radar antennas at the end of a 60-meter (200-foot) mast extending from the shuttle. Combining the two images produces a single 3-D image.

The SRTM 3-D pictures—called visualizations—of Earth's surface will be used by scientists for studies of flooding, erosion, land-slide hazards, earthquakes, ecological zones, weather

See SRTM, page 6

Next stop: KSC

Deep Space 2 Project Manager Sarah Gavit is interviewed in Building 125 clean room by channel 4's Conan Nolan during the last media viewing of the two probes before they are shipped to Kennedy Space Center for a Nov. 10 integration onto the Mars Polar Lander. Photo at right shows the small size of the device's aftbody. Deep Space 2, the second of several missions in the New Millennium Program, will crash into the surface of Mars at speeds of up to 645 kilometers per hour (400 mph) and must survive extremely low temperatures. The Mars Polar Lander is scheduled for launch Jan. 3, 1999, just 24 days after the Mars Climate Orbiter is launched.

BOB BROWN / JPL PHOTO LAB

McCleese, Zurek named to new positions

Dr. Daniel McCleese

Dr. Richard Zurek

Two JPL employees have recently been named to new management positions at the Laboratory.

Dr. Daniel McCleese has been named chief scientist and manager of the Office of Strategy and Science Program for the Mars Exploration Directorate, and Dr. Richard Zurek has been named manager of the Earth and Space Sciences Division.

McCleese is principal investigator on the Pressure Modulator Infrared Radiometer, an instrument on Mars Climate Orbiter due for launch in December that will study the red planet's climate and weather. McCleese chairs the Mars Expeditions Strategy Group, a NASA advisory panel that developed the exploration strategy that the space agency and its international partners are following in the search for evidence of life on Mars. The group provides guidance to NASA and JPL on the current series of missions to Mars, including future sample-return missions.

McCleese has a doctorate in atmospheric physics from Oxford University, where he was a Fulbright Scholar. He joined JPL in 1976 and managed the Planetary Atmospheres Section before serving most recently as manager of the Earth and Space Sciences Division.

Zurek will continue as project scientist for the Mars '98 mission, which will launch two spacecraft, Mars Climate Orbiter and Mars Polar Lander, in December 1998 and January 1999, respectively. He has served as lead scientist for JPL's Earth and Planetary Atmospheres Research Element since 1994. Zurek has studied the upper atmosphere of Earth and the atmosphere of Mars, using data from spacecraft including the Upper Atmosphere Research Satellite (UARS), Mariner 9 to Mars and the Viking orbiters and landers at Mars.

Zurek has a bachelor's degree in mathematics from Michigan State University and a doctorate in atmospheric sciences from the University of Washington, Seattle. Following post-doctoral appointments in research at the National Center for Atmospheric Research and the University of Colorado's Laboratory for Atmospheric and Space Physics, he joined JPL in 1976. ❑

News Briefs

Andrea Stein

Andrea Stein, manager of the Technical Information Section 644, has been awarded the 1998 Medal of Excellence Award by Women at Work, a non-profit career and job resource center based in Southern California.

Stein was scheduled to receive the award Oct. 29 at the Doubletree Hotel in Pasadena.

Employed at JPL since 1978, Stein was nominated for the award by JPL's Advisory Council for Women. The council said it based the nomination on Stein's exceptional leadership, fairness, judgment, decision making, dedication, innovation and communications skills.

She is a member of the Caltech Management Association, Society for Technical Communication, Planetary Society and Research Institutes Publishing Executives. ❑

Mel Roberts

Mel Roberts, acquisition operations and planning principal in the Engineering and Science Directorate, has received NASA's Technical Leadership Award for his leadership and advocacy in support of the agency's Small and Disadvantaged Business Utilization Program in the procurement area.

Roberts accepted the award at NASA's Minority Business and Advocates Awards Ceremony at Headquarters last month. During the ceremony, he also accepted an award on behalf of the Laboratory, as JPL was recognized for its outstanding performance in contracting and subcontracting to small, small disadvantaged, and women-owned businesses.

During FY '97, JPL met or exceeded all NASA-negotiated goals in those categories.

Roberts is contract technical manager for the JPL's technical support efforts personnel contracts (TSEPs), which involve 600 contractors and total about $300 million in value. He also serves as a liaison between JPL's technical divisions and program/project directorates to the Business Opportunities Office and Acquisition Division. ❑

JPL has named an asteroid in memory of CNN space correspondent **John Holliman**, who was killed in a car accident Sept. 12.

The asteroid, discovered by JPL astronomer **Eleanor Helin** on April 30, 1989 at the Palomar Observatory, will now be called 6711 Holliman. It has a diameter of about 10 kilometers (6 miles). The asteroid moves in an orbit between Mars and Jupiter.

Holliman reported extensively on the role JPL played in space exploration. He was the network's lead anchor for the Pathfinder mission to Mars in July 1997, reporting on the landing and the subsequent mission as the spacecraft sent back video from the planet's surface. ❑

The Caltech Concert Band seeks a few more players to fill out the group.

Particularly needed at this time, said director **William Bing**, are flute players and a bassoonist.

If interested, e-mail him at wbing@cco.caltech.edu. ❑

Galileo

Continued from page 1

magnetic field. "This seemed to fit nicely with other data supporting the idea that beneath Europa's icy crust, a liquid ocean might be serving as a conductor of electricity," Kivelson said.

Armed with that information, Kivelson and UCLA colleagues Drs. Krishan Khurana, Raymond Walker and Christopher Russell set out to test a similar theory about Callisto, "although it seemed far-fetched at the time," Kivelson said. The team went back and studied data obtained during Galileo's flybys of Callisto in November 1996, and June and September of 1997.

Kivelson and her colleagues found signs that Callisto's magnetic field, like Europa's, is variable, which can be explained by the presence of varying electrical currents associated with Jupiter that flow near Callisto's surface. Their next challenge was to discover the source of the currents.

"Because Callisto's atmosphere is extremely tenuous and lacking in charged particles, it would not be sufficient to generate Callisto's magnetic field; nor would Callisto's icy crust be a good conductor, but there very well could be a layer of melted ice underneath," Kivelson said. "If this liquid were salty like Earth's oceans, it could carry sufficient electrical currents to produce the magnetic field."

Lending further credence to the premise of a subsurface ocean on Callisto, Galileo data showed that electrical currents were flowing in opposite directions at different times. "This is a key signature consistent with the idea of a salty ocean," Khurana added, "because it shows that Callisto's response, like Europa's, is synchronized with the effects of Jupiter's rotation."

Although scientists consider the possible presence of an ocean on Europa as one factor hinting that life could have developed there at some point, it is doubtful that Callisto could harbor life, according to Galileo Project Scientist Dr. Torrence Johnson of JPL.

"The basic ingredients for life—what we call 'pre-biotic chemistry'—are abundant in many solar system objects, such as comets, asteroids and icy moons," Johnson explained. "Biologists believe liquid water and energy are then needed to actually support life, so it's exciting to find another place where we might have liquid water. But energy is another matter, and currently, Callisto's ocean is only being heated by radioactive elements, whereas Europa has tidal energy as well," from its greater proximity to Jupiter.

This artist's concept, a cutaway view of Jupiter's moon Callisto, is based on recent Galileo data that indicates a salty ocean may lie beneath Callisto's icy crust. The moon's cratered surface lies at the top of an ice layer, depicted here as a whitish band, which is estimated to be about 200 kilometers (124 miles) thick. Immediately beneath the ice, the thinner blue band represents the possible ocean, whose depth must exceed 10 kilometers (6 miles), according to scientists studying data from Galileo's magnetometer. The mottled interior is composed of rock and ice.

Galileo flies by Callisto four more times between May and September of 1999, which may yield more clues about the possibility of a Callisto ocean. However, Kivelson said that scientists will rely heavily on theoretical models to test their interpretations about Callisto.

Kivelson and her team also are reexamining magnetometer data from Jupiter's largest moon, Ganymede, to address the tantalizing concept that Callisto and Europa may not be the only moons of Jupiter with subsurface oceans.

The latest Galileo exterior images of Callisto, released on Oct. 13, and a new artist's concept of a cutaway view of the moon's interior are available on the Internet at http://photojournal.jpl.nasa.gov . ❑

DS1

Continued from page 1

time appears to fail for a second or two, but for the most part is operating normally. This is not expected to impact the mission.

The flight team spent the first two days after launch transitioning the spacecraft from launch to flight configuration. Two of the new technologies that the mission was designed to flight-test were validated within the first two hours after launch—its solar concentrator arrays, which use cylindrical lenses to concentrate sunlight onto 3,600 solar cells; and a small deep-space transponder, or radio transmitter/ receiver.

Another key new technology to be validated for spaceflight, the ion engine, will be tested for the first time in approximately one week. Once it is in regular use, the engine will thrust for 50 percent of the primary mission.

During the mission, a total of 12 new technologies are scheduled to be validated for space missions of the 21st century. In addition to the solar concentrator arrays, small deep-space transponder and ion engine, the other technologies are:

• Autonomous navigation, which will allow the spacecraft to take over parts of its navigation formerly carried out by ground controllers;

• Remote agent, a software package capable of planning and executing many onboard activities with only general directions from ground controllers;

• Beacon monitor operations experiment, which simplifies the way that the spacecraft communicates information about its condition to ground controllers;

• Miniature Integrated Camera Spectrometer (MICAS), a 12-kilogram (26-pound) containing a camera, ultraviolet imaging spectrometer and infrared imaging spectrometer;

• Plasma experiment for Planetary Exploration (PEPE), which combines several instruments that study space plasma, or charged particles, most of which flow outward from the Sun;

• Ka-band solid-state power amplifier. The as-yet-seldom-used Ka-band, which thus far has proven more vulnerable to interference from weather on Earth, allows the same amount of data to be sent over smaller antennas with less power as compared with missions using lower-frequency, X-band transmitters;

• Low-power electronics, which involves low-voltage technologies, low-activity logic, low-energy architectures and micro-power management;

• Multifunctional structure, combining thermal management and electronics in one load-bearing structural element, in contrast to traditional spacecraft fabrication that separates these elements;

• Power activation and switching module, which combines eight power switches grouped in redundant pairs, capable of monitoring four electrical loads.

Deep Space 1 will attempt to fly by asteroid 1992 KD in July 1999. The asteroid, discovered by JPL astronomers Eleanor Helin and Ken Lawrence in 1992, was chosen from more than 100 flyby possibilities. The asteroid's diameter is believed to be about 3 to 5 kilometers (2 to 3 miles), and during the flyby the spacecraft's autonomous navigation system will attempt to guide it to within 10 kilometers (6 miles) of the asteroid's surface, making it the closest flyby of a solar system body ever attempted.

Scientists hope to learn more about 1992 KD's shape, size, surface composition, mineralogy, terrain, rotation speed and, perhaps, its interaction with the solar wind.

The Deep Space 1 spacecraft was designed and built by Spectrum Astro Inc. of Gilbert, Ariz. ❑

Cassini program team receives NASA's most prestigious honors

By MARY BETH MURRILL

The teams that made the most outstanding contributions to the success of JPL's Cassini mission to Saturn were presented with NASA's prestigious Group Achievement Awards in a recent ceremony held at JPL.

The event marked the first anniversary of the Cassini's launch Oct. 15, 1997.

"On behalf of the entire NASA team, I would like to congratulate the honorees and thank all of you for doing your part to open the air and space frontiers for our children," said NASA Administrator Daniel Goldin in congratulatory remarks sent to the Cassini program team.

"Cassini's launch and first year of flight have been characterized by flawless performance, and we want to honor the teams of people who've made that possible," said Cassini Program Manager Bob Mitchell.

Mitchell presented the awards to team leaders for groups representing the mission's science and mission design, the spacecraft development, orbiter instruments, mission and science operations, support services, spacecraft and instrument contractors, the Titan IV launch vehicle, the Huygens probe and science payload.

The winners:

Program Office: Program Office Team, Program Review Board, Launch Approval Team, Planning, Assessment and Integration Team.

Science and Mission Design Team: Science and Mission Design Office, Cross-Systems Engineering Team, Navigation Design Team, Public Outreach Team, Trajectory and Mission Design Team, Mission Engineering Team, Investigation Scientists.

Spacecraft Team: Spacecraft Office Team, Spacecraft Review Board, Antenna Subsystem Team, Assembly, Test and Launch Operations Team, Attitude and Articulation Control Subsystem Team, Cabling Design and Fabrication Team, Command and Data Subsystem Team, Electronic Packaging and Fabrication Team, Electronic Parts Team, Environmental Requirements and Test Team, Materials and Contamination Team, Mechanical Devices Team, Mechanical Ground Support Equipment Design and Fabrication Team, Mechanical Hardware Fabrication Team, Mechanical Systems Team, Mission Assurance and Safety Team, Power and Pyrotechnic Subsystem Team, Problem/Failure Operations Center, Propulsion Module Subsystem Team, Quality Assurance Team, Radio Frequency Instrument Subsystem Team, Radio Frequency Subsystem Team, Radioisotope Thermoelectric Generator and Radioisotope Heater Unit Team, Reliability Engineering Team, Structures Design and Analysis Team, Systems Engineering Team, Telecommunications Systems Team, Thermal Design and Implementation Team.

Instruments (Orbiter): Science Instrument Office Team, Payload Engineering Team, Science Calibra-tion Subsystem Team, Cassini Plasma Spectrometer Team, Cassini Radar Team, Composite Infrared Spectrometer Team, Cosmic Dust Analyzer Team, Dual Technique Magnetometer Team, Imaging Science Subsystem Team, Ion and Neutral Mass Spectrometer Team, Magneto-spheric Imaging Instrument Team, Radio and Plasma Wave Science Team, Radio Science Subsystem Team, Ultraviolet Imaging Spectrograph Team, Visible and Infrared Mapping Spectrometer Team, Interdisciplinary Scientists (Orbiter).

Mission and Science Operations: Mission and Science Operations Management Team, Mission and Science Operations Review Board, Data and Computing Services Element, Deep Space Network Team, Distributed Operations Interface Element, Real-Time Operations Element, Science Operations Element, System Engineering and Coordination Element, Uplink Operations Element, Flight System Operations Element.

Support Services: Acquisition Division Team, Contract Audit Team, Cost and Performance Analysis Team, Cost and Price Analysis Team, Documentation Services Team; Duplicating, Document Distribution, and Engineering Document Services Team; Facilities Team, Graphics Services Team; Office of General Counsel; Photographic/ Imaging Team, Property Team, Security and Protective Services Team, Shipping and Receiving Team, Transportation Team, Travel Accounting Team.

Cassini Spacecraft and Science Instrument Major Contractors: Actel Corporation (field programmable gate array), Adcole Corporation (sun sensor), AEC-ABLE Engineering Co., Inc. (magnetometer boom), AlliedSignal Aerospace Company, Guidance Systems Division (reaction wheels), Cincinnati Electronics (visual infrared mapping spectrometer), CTS Corporation, Microelectronics Division (solid state power switch), Foils Engineering (launch approval support), GEC Plessy Semiconductor, Inc. (CMOS logic devices), Harris Semiconductor Space Operations (CMOS logic devices), Honeywell, Inc., Hughes Aircraft Company, Hughes Electron Dynamics Division (X-band traveling wave tube assemblies), Johns Hopkins University, Applied Physics Laboratory (magnetospheric imaging instrument), Kaiser Marquardt, Inc. (Cassini Rocket Engines), Linear Technology Corporation (RAD-HARD high-reliability parts), Litton Guidance and Control Systems (electronic subassembly packaging and fabrication support), Litton Guidance and Control Systems Space Operations (inertial reference unit), Lockheed Martin Astronautics (propulsion module subsystem), Lockheed Martin Federal Systems (engineering flight computer, processors, and ASICs), Lockheed Martin Information Systems (power pyro subsystem), Microsemi Corporation (RAD-HARD high-reliability parts), Motorola, Inc. (deep-space transponders), National Semiconductor (RAD-HARD high-reliability parts), Officine Galileo (stellar reference units), Pressure Systems Incorporated (propulsion subsystem tank forgings), Q-Tech Corporation (oscillators), Schaffer Magnetics Incorporated (imaging science subsystem filter wheels), Southwest Research Institute (Cassini plasma spectrometer), TLD Systems (ADA software compiler), TRW Incorporated (solid-state recorders), University of Arizona (descent imager/spectral radiometer), University of Chicago (cosmic dust analyzer/high-rate detector), University of Colorado (ultraviolet imaging spectrograph), University of Iowa (radio and plasma waves subsystem), UTMC Microelectronics Systems, Inc. (ASICs).

Titan IV: Titan IV United States Air Force Management Team.

Huygens Probe Project Team: European Space Research and Technology Centre (Huygens Project Team), European Space Operations Centre (Operations Team), Aerospatiale (prime contractor), Aerospatiale Acquitaine (front shield), ALCATEL ETCA S.A. (power conditioning), Alenia (probe data relay), Alliant Techsystem Inc. (batteries), APCO Tech Systems (back cover structure), Austrian Aerospace (EGSE, MGSE, MLI), CAPTEC (software verification), CASA (structure, harness) CIR (payload simulator), CRISA (structural and thermal unit model), Daimler-Benz Aerospace (integration and test), Dassault Aviation (pyros), DNV (reliability, configuration, control), FCI Interconnections (connectors), Fokker Space BV (special model SM2), IGG Component Ltd. (high-reliability parts), Kongsberg Aerospace (system EGSE), LABEN (command and data handling), Logica (on-board software), Martin-Baker (parachutes), Oerlikon Contraves AG (shield structure and separation mechanisms), Saab Ericsson Space (antennas, receivers), Systron Donner (probe accelerometer), Terma Elektronik AS (timer unit), UPCO Technologies (PDD cartridge), Ylinen Electronics Co. (radar altimeter).

Huygens Payload: Aerosol Collector and Pyrolyzer Team, Descent Imager/Spectral Radiometer Team, Doppler Wind Experiment Team, Gas Chromatograph/Mass Spectrometer Team, Huygens Atmospheric Structure Instrument Team, Surface Science Package Team, Interdisciplinary Scientists (Probe). ❑

SRTM

Continued from page 3

forecasts and climate change. The data's military applications include mission planning and rehearsal, modeling and simulation. Other possible uses include optimizing locations for cellular phone towers and improving topographic maps for backpackers, firefighters and geologists.

The SRTM STS-99 crew is: Commander Kevin Kregel; Pilot Dom Gorie; and Mission Specialists Dr. Janet Kavandi, Dr. Janice Voss, Dr. Mamoru Mohri, and Gerhard P. J. Thiele.

Kregel was selected as an astronaut in 1992. He has logged more than 41 days in space during three missions.

After being selected as an astronaut in 1994, Gorie served as pilot earlier this year on STS-91, the ninth and final Shuttle-Mir mission of the U.S.-Russian Phase One Program.

Kavandi was selected as an astronaut in 1994 and flew on board Discovery earlier this year with Gorie on STS-91.

With STS-99, Voss will be making her fifth space flight.

Mohri, of the Japanese Space Agency, is a member of the 1996 astronaut class. STS-99 will be his second space flight.

Thiele, of the European Space Agency, is a member of the 1996 astronaut class. This will be his first flight. ❑

Lab's cross-cultural mentoring program kicks off

JPL employees are encouraged to participate in Laboratory's Cross-Cultural Mentoring Program, which supports NASA's and JPL's goal to build a work force that is representative, at all levels, of America's diversity.

On Oct. 26, Deputy Director Larry Dumas kicked off the semi-annual program with an e-mail encouraging participation. The program description and application were included.

The program, begun with a six-month pilot in 1995–96, was developed to enable managers and employees to become more open to a diverse way of thinking, behaving and communicating, and to become more aware of career development opportunities.

The program will match protégés with mentors in order to increase exposure of both groups to cultural diversity and expose each group to their experiences and work environments. Participation is voluntary.

Protégés and mentors will be given an orientation during which they will set mutual goals. The pairs will meet every two weeks for a period of one year to discuss various topics such as their culture, career goals, JPL cultural norms, and JPL procedures. Through the one-on-one interaction, the protégé will gain insight into JPL which will assist the protégé in career decisions.

Additionally, training sessions, group meetings and other activities will provide opportunities for engaging in discussions and sharing ideas.

Protégés in the pilot program reported having increased visibility, a better understanding of JPL processes and improved communication across differing backgrounds. The mentors reported increased understanding of cross-cultural differences and having an opportunity to impart "lessons learned."

To qualify as a protégé, the individual must be a minority or female at Staff or Senior level and be a regular, benefit-based, full time, exempt JPL employee with at least two years' JPL experience. Division mentoring representatives match protégés with mentors who are senior in experience and from different cultural backgrounds and divisions.

Deadline for applications to reach Fairhurst, mail stop T1703, is Nov. 11. The divisions will select the finalists for the 18 available protégé slots. All applicants are notified of their status on Jan. 7, 1999. The mandatory orientation meeting for mentors and protégés will be on Jan. 28.

Members of the design team are: Alice Fairhurst (chair, Section 195), Kent Frewing (310), Holly Hargis (340), Joy Hodges (724), Edwin Kan (341), Carmen Nunez-Morton (303), Phil Morton (341), Betty Preece (213), Tom Renfrow (389), Tuyet-Lan Tran (394), and Gail Watson-Ashe (387). The committee members represent the Advisory Council for Minority Affairs (ACMA), the Advisory Council for Women (ACW), JPL division mentoring representatives, and experienced mentors.

For more information about the program, contact Alice Fairhurst at ext. 4-3124 or check the Career Services and Professional development home page at http:// hr/development/careers/ .

Other web sites providing information include:

ACMA (http://vision.jpl.nasa.gov/ jpl/ACMA);

ACW (http://eis/acw);

African-American Resource Team (http://eis/~hdillard/aart)

Amigos Unidos (http://eis/au);

Asian-American Council (http://eis/aac)

Diversity Affairs Office (http://eis/hr/diversity/newsletter). ❑

Passings

Barry Cooper, 53, technical group supervisor for the Commun-ication & Messaging Systems Group in Section 394, died of heart failure Oct. 17 at Verdugo Hills Hospital.

Cooper had worked at JPL since 1970. One of his recent accomplishments at JPL was the delivery of the current Eudora system for e-mail.

He is survived by his wife, Tonja Harris of Section 314; daughter Rachael and sons Sammy and Kevin.

Memorial services were held Oct. 22 at Forest Lawn Memorial Park, Los Angeles.

Cooper's family requested that in lieu of flowers, donations in his name be made to Children's Hospital in Los Angeles. ❑

Roy Cox, 80, a retired security guard in Section 613, died of emphysema and pneumonia Oct. 13 at his home in Gig Harbor, Wash.

Cox joined the Laboratory in 1980 and retired in 1983. He is survived by his wife, Leticia; daughter Darlene Valosay and two grandchildren. ❑

Retirees

The following employees retired in November:

Daniel Bergens, 45 years, Section 507; **Allan Conrad**, 39 years, Section 785; **Paul Westmoreland**, 39 years, Section 900; **Richard Arguijo**, 36 years, Section 351; **Franz Borncamp**, 36 years, Section 920; **Fred Krogh**, 31 years, Section 395; **Edgar Svendsen**, 31 years, Section 507; **Herbert Fessinger**, 17 years, Section 195; **Joan Strange**, 11 years, Section 820. ❑

LETTERS

We would like to express our sincere appreciation and gratitude to our friends in the IBS, NBS and Acquisition divisions and all others who attended and contributed to our twins' baby shower. We are overwhelmed and touched by your generosity. Each and every gift we received is very needed. Extra special thanks to Audrey Ridley, Glenda Anderson, Susan Flanagan and Suzy Dollar for coordinating and organizing this truly memorable event.

Melanie and Richard Budiman

❑❑❑

Many thanks to all the friends who made my years at JPL so wonderful. Special thanks to those who attended my retirement luncheon and contributed to the great gifts. Maggie Porter did a superb job of arranging it. Thanks, Maggie. I will miss all of you at JPL a lot and will think of you often.

Fred Sanders

❑❑❑

Thanks to Linda, Joan, DiDi, Sheila, Donna, Debbie, Don and the others for throwing the best-ever retirement party, and the speakers for their kind words about my 45-year career at JPL. The gifts were wonderful too. My wife, Lillian, and I will have fond memories of the event for the rest of our lives.

Dan Bergens

FOR SALE

AIRLINE TICKET, R/T, for anywhere American Airlines flies in U.S., $475; FISH TANK, 10 gal., with everything, incl. 2 extra $50 spare filters, $45; PAINTINGS, modern art, orig. up to $1,000, sell $50-$100; SOFTWARE, Word 97 upgrade, $19; WordPerfect Suite 7.0, $25; Eudora 4.0, $19; Adobe Photodelux, $19; IBM Via Voice, $19; Snappy 3.0 video capture, never used, $49. 626/335-4409.

ARMOIRE, dark pine, approx. 73" H x 41" W x 24" D, lots of storage space, good condition, $100; COAT, leather, full length, size 10, burgundy, trench-coat style, excellent condition, $100. 249-6883.

BED, twin, with box springs in gd. condition, $50. 626/449-8461.

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

BEDSPREAD, king, periwinkle blue, lightly quilted, almost new, $30. 626/398-4960.

BICYCLE, Bertoni "Italian frame", 59cm, Shimano 600 grupo, clipless pedals, brand new Mavic clincher wheels, regal seat, pristine cond., $400; add shoes & helmet, $450. 213/660-9272, Carlos.

BICYCLE, Fuji 12-speed, medium size, good condition, aluminum wheels, Suntour shifters, $100 firm. 626/794-0886, Ted.

BICYCLE, vintage Bob Jackson touring tandem with nice components including decent brake, $1,000. 626/796-3314.

CAMCORDER, Sony Hi8, model CCD-TR700, exc. condition, $350. 626/355-8561.

CAMERA EQUIPMENT: 2-Canon F1 bodies; 2-135mm lenses; 2-50mm lenses; external light meter; strobe; various filters & accessories; special price for complete package, or sold separately. 541-1340, eves.

CARPET, wool, light slate blue, 12' x 13', pd. $750 10 yrs. ago; sell for $100. 626/357-8210.

CD PLAYER, Denon, 5-disc changer, exc. cond, $75; CD STORAGE TOWERS (2), hold about 200 CDs, black metal, $25. 626/966-0023, Gregg.

CEMETERY PLOTS (4), in Rose Hills Memorial Pk., Cypress Lawn Section; 2 gravesites for $1,400 or 4 for $2,500. 805/739-9204.

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

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

COMPUTER, PC CPU, 486 upgraded to 150 MHz Pentium, 1.2 MB drive, 16 MB memory, $300/obo. 626/577-6638, Suzanne.

COMPUTER, PowerMac 520c laptop, 16Mb RAM, 320Mb hard drive, 19.8 modem, Ethernet & SCSI, 2 batteries, external CD & Zip drive, software, $1,000/obo. 957-2898, Keith.

COMPUTER POWER CONTROL CENTER, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, $20. 790-3899.

CRIB and (new) mattress, $75; crib bedding also available. 626/798-1839.

DIET TAPES, Jenny Craig, set of 14, $50. 790-3899.

DINING SET, Mediterranean style, large, with 6 high back chairs, 2 with arms. 790-4811, eves.

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

FURNITURE: antique oak dresser w/mirror, $175; Singer sewing mach. w/wood cabinet, 40 yrs. old, $40; oak sq. side table, $40; comforter/blanket wood stand, $25; antique oak 3-drawer rectangular dresser, $225; all like new. 626/564-9155, after 5:30 p.m.

FURNITURE: 2 car seats, $20/ea.; washer, new, $250; gas dryer, $250; small microwave, $50; bedroom set, cal king frame w/matching dresser, 2 night stands, $500; dining table, round w/4 capt. chairs; changing table, $35; 13" color TV, $50. 548-5082.

LAMPS (night), 4 units, crystal ball shape; 2 are 1 ft. tall (7" dia), 2 are 1.5 ft. tall (9" dia); $30 for sm. pair, $50 for lg. pair, $70 for all/obo (909) 592-0780, Ana.

LAUNDRY CART, heavy duty, hotel-style wheeled but suitable for home use; heavy gauge chrome tubing, canvas bag, about 30" square w/ball bearing caster wheels; vg condition; over $100 when new, sell $40; 3 blks from JPL. 952-8803, Don or Carol.

MAGAZINES, Sky & Telescope back issues, About 100 from 1978-86, good condition, $50/obo. 626/296-0912.

ORGAN, Technics SX-EX50M, U & L manual each 44 keys, pedal 13 keys, 1-touch play, play sequencer, voice setting computer tone selector, techin-chord, tempo set, Autoplay chord, too many features to list, like new, $2,000/obo. 626/446-6456.

ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifice for $3,000. 790-3899.

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PERSIAN RUGS, assorted, different sizes and kinds, $100 to $1,690 each. 626/446-6456.
PERSONAL INFORMATION MANAGER, Seiko "Phone-Pal", $25. 790-3899.
PLATES, collector's, cute cat design, $5/ea. 805/297-5234.
PRINTERS, Epson FX-80 dot matrix, like new, $49/obo; Epson LQ-510 dot matrix like new, $99/obo. 626/446-6456.
SECURITY SYSTEM, home, DSC PC1500 w/motion detector, siren, YUASA battery, transformer, cent. control box & keypad, $50. 790-7062.
SHELVES, Mahogany "Barrister" style; antique, unusual collapsible design; 8 shelves in set plus top and base; $500 - prefer to sell as complete set. 626/796-3314.
SOFTWARE for Macintosh, all $25 and under. 790-3899.
SOFTWARE, Windows, never used: Windows 95 complete version ($49), Office 97 CD tutorial ($9), Print Studio Window Draw premier edition w/33,000 clip art bonus software ($19), Windows 95 tutorial ($9), Decent 2 ($9), Sealed Deluxe typing tutorial ($9), Compton's New Century CD encyclopedia ($9), HP gold blank recordable CDR ($3). 626/335-4409.
SPORTS COINS, '88 Topps, 36 unopened baseball packs; Ryan, Seaver, Bench, MacGwire, Bonds, Valenzuela; $20 for box; CARDS, '87, unopened, poss. MacGwire rookie + other major stars, $10 for 45 cards. 626/914-6083.
SPORTS EQUIPMENT, rower, like new, $50/obo; ski simulator, like new, $50/obo. 626/446-6456.
SPRINKLER VALVE ADAPTERS Lawn Genie automatic, model 756LG 3/4, new, $10 each. 790-3899.
STOOLS (2), like new, quality, hardly used, moving out sale, $290/pair/obo. 626/446-6456.
SWEATER, Coogi, from Australia, size small/medium, sells in Nordstrom for $325, new, $100. 790-3899.
TABLE, dining rm., round, mahogany, sits 8 w/two extensions, almost new, comes w/6 matching chairs, $700/obo; matching China buffet, $1,000/obo; all for only $1,500/obo. 909/592-0780, Ana.
TABLE TENNIS TABLE, Harvard, exc. cond., 1 yr. old, pd. $180, sell $80. 562/695-5197.
TV STAND, oak, on coasters w/storage below and VCR shelf, can easily accommodate up to 27", $50. 626/398-4960.
WATER JUG, Brita, 2-gallon unit with 4 unused filters, $20/obo. 626/568-8298.

VEHICLES / ACCESSORIES

BED LINER for small pickup truck, black plastic, good cond., best offer. 626/966-5391.
CAMPER SHELL for full-sz. Ford truck, incl. carpeted seats & storage units, blue, $600/obo. 626/797-5387.
'87 DODGE Ram van custom conversion, brown/gold, captain's chairs & more, runs great, dependable, 48,000 mi., $5,200. 249-3677.
'94 FORD Aspire, 2-dr. hatchback, red, 5-spd., a/c, CD/stereo, dual airbags, good cond., runs exc., no engine problems, 70K mi., $3,600 firm. 626/574-7398.
'95 HONDA Accord EX, loaded, mint condition, 24K mi., LoJack, 12-CD changer in trunk, rear spoilers, leather interiors, power moonroof/windows/ locks/seats/etc., regular maintenance, 4 door, cashmere, $18,500. 714/771-4737.
'94 HONDA Civic EX, black, 2 dr., sunroof, power locks, a/c, 5 speed, tinted glass, 45k miles, 75k warr., vg condition, all maint. papers, $10,500/obo. 790-7129.
'85 HONDA Shadow 700cc, V-Twin, shaft drive, automatic valve adjustment, 6 speed (w/overdrive), water cooled, excellent tires, low maintenance, reliable, good condition, red and black, includes street fairing and Tourmaster saddlebags, $1,800. 626/794-0886, Ted.
'81 HONDA CB 750K w/windjammer fairing, black/chrome, good cond., runs great, needs minor elec. wk., 40K mi., $800/obo. 626/574-7398.
'88 KAWASAKI Ninja 600, 10.5K mi., accessories incl. Arai helmet, kryptonite lock, $2,250/obo. 323/223-5086.
'97 MAZDA Protégé, dark blue w/tan interior, 41,000 mi., Mazda-maintained, $10,500. 626/294-0426.
'89 MAZDA MPV, gd. cond., new paint, tires, radiator, engine work; $4,950/obo. 626/799-0109.
'91 NISSAN Maxima SE sedan, pearl white, automatic V-6, power window, power lock, am-fm stereo, cassette, Sony 10-disc changer, sunroof, new tires, tint windows, very clean car, exc. condition, $7,600/obo. 626/584-0878, x116.
'83 NOMAD travel trailer, '93 interior, 24 ft., frnt lounge, slps. 4, SC, <1 yr. awning, air, microwave, TV ant, am/fm/cass., bath fan, equalize hitch incl., TR6276, $4,000. 626/355-6891.
'89 OLDS 88 Royale sedan, 4 door, original owner, exc. condition, $3,500. 626/355-8561.
'89 PONTIAC Grand Am SE, quad4 engine, pwr. windows & locks, am/fm/cass. stereo, orig. owner, $4,500/obo. 323/255-1106.
'85 PORSCHE 911 Carrera, 1 owner, all service records, 94K mi., $18,500. 619/429-1247.
'91 SUZUKI DR 350S, street & fwy.-legal enduro, grt. cond., new tires, brakes, chain & sprocket; Baja 4-gal. fuel tank; oil cooler; O'lean racing exhaust w/spark arrestor; great commuter, easy to park. 626/798-3041.
'98 TAHOE trailer by Thor, 24', queen-sz. bed, sofabed, dinette-bed, microwv., awning, air, stereo, all amenities, used 3x, $11,500. 805/533-4255.
'94 TETON 5th-wheel trailer, 40' Atlanta III, 3 slideouts, sbs fridge, conv. microwave, 2 a/c and furnaces, 2 roof fans, 7KW Onan gen., HWH hydraulic lifters, awnings, new tires, no smoking, mint cond., in Palm Springs. 760/345-3713.
'88 TOYOTA Corolla FX, 2-dr., white, new tires, runs great, registered to Sept. '99, will be smog-checked before sale, $2,099/obo. 626/744-2767.
'85 TOYOTA Celica GT liftback, red, 3D, 112,673 mi., a/c, cruise cont., am/fm, great cond., $1,800/ obo. 248-4003.
VW Jetta, red, fast, cute, $1,500. 248-0491.

WANTED

APARTMENT OR HOUSE in Pasadena, 3 bd., close to Caltech if possible. 626/791-7044.
BABYSITTER in Valencia, infant needs care MWF, must drive, flexible salary. 805/291-1602.
DISKS for SAT test prep, 3.5", Kaplan or Princeton. 626/969-6938, Mary.
ROOMMATE to share furnished 3-bd., 3-ba. Pasadena apt. with Caltech post-doc, move in immed., $400 + 1/3 util. 626/351-9641.
SHOPPERS, Elks Ladies Auxiliary will hold "Dress Party - Shop 'Til You Drop" Wed., Nov. 11, 5:30-8:30 p.m.; latest famous fashions for winter and holidays from Nordstrom, Robinson's-May, Macy's, Bloomingdale's; sizes 4-24; nothing over $38; no admission; 27 W. Huntington Dr., Arcadia, lots of parking in 2 rear lots.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
VANPOOL RIDERS, stops along the 118, off-site contractors welcome, vanpool # 20, Ext. 4-0307, Marilyn.

FREE

CLEAN FILL DIRT [mostly gravel-like], you haul; several cu yds., take as little or as much as you like; 3 blks. ESE of NY & Hill, Altadena. 798-5152.
DOG, smooth-coat chow, 1 yr. old, 50-lb. male, red-brown, affectionate, beautiful, healthy, needs good home. 562/496-4314.
FIREWOOD, you pick up. 626/794-2431.

LOST & FOUND

Found: Female Boxer mix, in East Lot Friday, Oct. 9, 2 years old; now in great health, obedience trained, likes cats; full medical records avail.; owners were contacted, not interested. 626/796-3466.

FOR RENT

EAGLE ROCK hilltop house, gorgeous, 3 bd., 2 ba., all modern, easy access to JPL/Caltech, $1,300. 213/254-5350.
LA CANADA house, 3 bd., 2 ba., living rm., dining rm., family rm., den, lg. fenced yard with patio & deck, basketball court, fruit trees, walk to JPL, water & gardener incl., 4532 Viro Rd.; $2,000. 790-8216.
LA CANADA house, 3 bd., 1 1/2 ba., new carpet, very clean, fenced yd., dbl. garage, near JPL, water and gardener pd., $1,900. 790-6382.
MONTROSE apt./room, furn., priv. entr., $350 + sec. dep. 249-0574.
PASADENA apt., 2 bd., 2 ba., cent. air, small patio, laundry facil., $775 + util. 626/351-9641.
PASADENA, lg. 1-bd. apt., spacious living rm., hwd. flrs., kitchenette, laundry facilities on premises, parking space, very charming, 569 N. El Molino, $650. 626/403-7171.
PASADENA townhouse-style apt., near PCC, 2 bd., 1 ½ ba., refrigerator, built-in range & oven, cent. a/c, carpets, drapes, disposal, laundry, covered parking, $725.
N. SAN GABRIEL townhouse, 20 min./JPL, 3 bd. + den, 2 ½ ba., LR w/fp, cent. a/c, 2-car garage w/auto opener, water/trash/gard. incl., no pets, $1,200. 626/821-2007.
N. SAN GABRIEL, with Temple City schools; elegant, 3 bd. + den/4th bd., 2.5 ba., fireplace, master suite, small charming garden, like new, no pets, 9050-E Arcadia Ave., $1,495. 626/939-3853.
ROOM in lg. house close to JPL, furn., shared ba., laundry & kitch. privileges, non-smoker, clean and must like dogs, $450 + 1/3 util. 626/ 797-5570.
SIERRA MADRE apt., 2 bd., 1.5 ba., quiet, view, balcony, $790. 626/355-7318.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
EAGLE ROCK condo, 1 bd., 1 ba., 820 sq. ft., light and airy end unit w/1 common wall on quiet cul-de-sac, cent. a/h, built-in microwave, range, dishwasher, convenient to L.A., Glendale, Pasadena; $87,500. 626/584-4188.
LA CANADA, walk to JPL, 2 bd., 1 ½ ba., den/office/dining rm., immac. privacy, concrete driveway, cent. air/heat, updated kitchen, $365,000, agt. 790-3508.
PALM DESERT, 2 bd., 3 ba., den, sep. din./lv. rms., on golf course at Palm Valley, 12" tile floor w/bordered carpet, marble frplc., Corian kitch./ba., mirrored walls, custom built-in wall units, $310,000 furnished. 362-0571.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.

VACATION RENTALS

BIG BEAR, 7 mi. from slopes; full kitchen, f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night min.; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR cabin, walk to village, quiet area, 2 bd., sleeps 8, compl. furnished, F/P, TV/VCP, $75/night. 248-8515.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhouse, 2 decks, sleeps 6, tennis, pool, spa. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/night for 4. 248-8853.
CORNWALL, ENGLAND, August 1999 total solar eclipse; prime location campsite on the path of totality; includes lecture series by Caltech, JPL and UK astronomers; http://www.ctg-windows.co.uk/ eclipse.html. 626/356-2998.
HAWAII, CANCUN, FREEPORT or JAMAICA, 4 nights/5 days in a 5-star resort, $50/nt. 848-7445.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, private house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling , fishing, spectacular views, near restaurants, golf courses and other attractions. 626/584-9632.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: $95/nite/2, 12/15-4/14 rate: $110/nite/2, $10/nite/add'l person. 949/348-8047.
LA JOLLA, ocean view, steps to gorgeous beach, 1 bd., sleeps 4, fully equipped kitchen, linens, hot tub; Thanksgiving week, Nov. 23-27. 626/844-4670, Sandie or Mike.
LAKE TAHOE, N. shore, 2 bd., 2 1/2 ba., sleeps 6; great location, all amenities; private sandy beach; walk to golf, fishing 150 yds. from front door; 2 miles to casinos; available in Oct./Nov.r at very special rates (3-day min.). 626-355-3886, Rosemary or Ed.
MAMMOTH condo, studio + loft, 2 ba., fireplace w/wood supplied, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitchen w/microwave, terrace, view, amen. 714/870-1872.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, full kitch., TV/VCR, covered prkng; walk to Cyn. Lodge; JPL disc. 249-8088.
MAMMOTH condo, in Chamonix at lifts 7, 8, 16, 17; 2 bd., 2 ba., slps 6, fireplace w/wood, fully equip. elec. kitch. w/microwave & extras, TV, VCR, cable fm stereo, pool & sun area, outdoor Jacuz., sauna, game, rec., laundry rms., walk to shops, lifts; special midwk. rates. 249-8524.
OCEANSIDE, on the sand, charming 1 bd. + condo, panoramic view, walk to pier/marina, pool, spa, game rm., sleeps 4. 949/786-6548.
PACIFIC GROVE house, 3 bd., 2 ba., fp, cable TV/VCR, stereo/CD, well-eqpd. kitch. w/microwv., beaut. furn., close to golf, beaches, 17 Mile Dr, Aquarium, Cannery Row, JPL discount. 626/441-3265.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, for vacations or long term, newly remodeled, w/skylight, patio & 2-car garage; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas, clubhouse facilities; great locality, around 2 top resorts. 909/620-1364.
ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., l8-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/ski lifts, gourm. kitch., bikes, sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, in/outdoor pools, hot tub and beach; tennis, 10 min./skiing, casinos/golf, 1 hr./wine country; $995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/wk. low seas., + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

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Universe

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