Jet Propulsion Laboratory

Universe

Pasadena, California Vol. 29, No. 6 March 19, 1999

TOPEX gets new lease on life

Use of backup altimeter could extend mission for months or years

By DIANE AINSWORTH

Engineers have given JPL's TOPEX/ Poseidon ocean topography satellite a new lease on life by successfully switching the principal instrument onboard the satellite to operate on its backup unit, extending the spacecraft's already unprecedented lifetime of monitoring ocean circulation patterns worldwide.

With the switch to a fresh altimeter, the highly productive TOPEX/Poseidon mission, which produced the accurate prediction of the globally destructive El Niño phenomenon of 1997-98, could last for months or years to come. The satellite, launched in August 1992, was originally designed to last three to five years.

Last month, commands were sent to the U.S.-French satellite to turn off its primary radar altimeter, which was showing signs of age, and to activate the backup altimeter. Preliminary data from the satellite analyzed by the TOPEX/Poseidon team at JPL indicated that the backup, or "side-B" instrument, is operating smoothly.

"Barring any unforeseen problems with data acquisition, we will continue to use the spare altimeter to provide global ocean topography data," said David Hancock III, altimeter instrument scientist at the Wallops Flight Facility in Virginia, whose team is monitoring operational data from the joint NASA-Centre National d'Etudes Spatiales (CNES) satellite.

Dr. Philip Callahan, head of the calibration team at JPL, said his team is calibrating data from the new altimeter to extend TOPEX/ Poseidon's ability to record global ocean changes as subtle as 1 millimeter per year (0.04 inches per year) well into the new millennium. "This work is an excellent testing bed for cross calibration of TOPEX/ Poseidon with its successor, JASON-1, which is scheduled for launch in May 2000," he said.

From an orbital altitude of 1,336 kilometers (830 miles) above Earth, TOPEX/Poseidon has successfully acquired data on sea-surface

See TOPEX, page 6

Use of a new altimeter on TOPEX/ Poseidon could extend the lifespan of the satellite by months or years. In orbit since 1992, TOPEX/Poseidon was originally designed to last three to five years.

'La Niña' hangs on

By DIANE AINSWORTH

The cold pool of water in the Pacific known as "La Niña" still persists, although it is slowly weakening, according to scientists studying new data from the U.S.-French TOPEX/ Poseidon satellite.

A new image, produced using sea-surface height measurements taken by the satellite, is available on the Internet at http://www.jpl.nasa.gov/elnino/ . It shows sea-surface height on Feb. 27, 1999 relative to normal ocean conditions, reflecting the heat content of the ocean.

The low sea level or cold pool of water along the equator (shown in purple and blue), commonly referred to as La Niña, still dominates the equatorial Pacific Ocean. This La Niña, which first appeared in May through June 1998, still persists, although it is slowly weakening, scientists say. Given its persistence and present strength, the ocean cooling trend is expected to continue to exert a strong influence on global climate systems throughout the spring and into the early summer. This situation is similar to the 1997-1998 El Niño, which extended into early summer 1998.

The world's oceans are the great reservoirs of heat that influence global climate because they can cool or heat the atmosphere above. This transfer of heat drives weather patterns across both land and sea. La Niña provides a physical link connecting the large, slow changes in the ocean with predictable changes in day-to-day weather.

"La Niña shifts the high-altitude weather

See Niña, page 7

8 JPL instrument proposals selected for funding

By MARK WHALEN

Eight JPL proposals were selected in February for funding by NASA's Planetary Instrument Definition and Development Program, which supports the advancement of spacecraft-based instrument technology that shows promise for use in scientific investigations on future planetary missions.

JPL-based principal investigators submitted 15 proposals for the program. Overall, a total of 39 proposals from NASA and other institutions were submitted to the program, with 14 selected for funding.

The JPL-based investigations were awarded a total of $2.8 million for development. Investiga-tions are for one to three years in duration.

"The goal of this program is to develop instrument concepts that can then be proposed to future NASA planetary exploration missions," said Dr. James Kaufman, manager of the program at JPL. "The program provides funding to develop technologies up through laboratory breadboarding." Laboratory breadboards are used to determine the feasibility of instruments and to produce data on the principles of operation. They do not meet any spacecraft-related resource requirements, such as mass, power and size.

"JPL has never experienced such a high success rate with PIDDP proposals," Kaufman said. "We are extremely pleased with the selection results."

The JPL proposals selected, and their principal investigators, are:

"A Novel 'Proton-Transfer-Reaction-Ion Mobility Detector' for *In-Situ* Detection of Organic Species Relevant to Future Mars Surveyor/Outer Solar System Missions." Dr. Isik Kanik is principal investigator (PI).

"Miniature Ground-Penetrating Radar Probe for Planetary Stratigraphy and Subsurface Water-Ice Detection." Dr. Soon Sam Kim, PI.

"A Low-Noise, Ultra-Broad-band Heterodyne Sensor for Studies of Planetary Atmospheres and Comets." Dr. William McGrath is PI.

"Combined Gamma-Ray, X-Ray and Neutron Spectrometer for Surface Surveying and Sample Selection." Dr. Albert Metzger, PI.

"Miniature Solid State Spectrometer for *In-Situ* Ap-plica-

See PIDDP, page 4

Special Events Calendar

Ongoing

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

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

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

Parent Support Group—Meets the fourth Tuesday of the month at noon. For location, call Jayne Dutra at ext. 4-6948.

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

Friday, March 19

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

Ladysmith Black Mambazo—A Zulu art form, the group's high-kicking dance and á cápella singing have gained international renown. To be held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $35, $31 and $27. For information, call (626) 395-4652.

Von Kármán Lecture Series—Joseph Beerer, Mars Global Surveyor flight operations manager, will speak at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Monday, March 22

"How to Succeed in Business Without Crashing"—This talk will be given by Bob Severino, president of Dubbs & Severino, a company that turned JPL-developed technology into a cockpit warning system that provides terrain proximity alerts to pilots. Held at noon in the Building 167 conference room.

Wednesday, March 24

Computer Help—Jeff Sachs of Section 394 will provide an overview of the benefits of using the AFS distributed file system to manage computer files. Learn how to share files, set up group space, access data, publish web pages, obtain online help, change passwords, create protection groups and more. A 15-minute question-and-answer session will follow. At noon in the Building 167 conference room.

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.

Mock ISO 9001 Interview for Software Developers—This mock audit interview will show employees a possible scenario of what could happen during the ISO audit the week of March 29. Held at noon in the Building 167 cafeteria, east side.

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, March 25

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.

Java Session—Dr. Terence Parr will lead three one-hour sessions that will include a programmer's overview of Java's key features, client/server applications and details of Java's current and future implementation. Sessions begin at 1 p.m. in the Building 167 conference room.

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

Friday, March 26

Folk Music—Singer/songwriter Peggy Seeger will perform at 8 p.m. in Caltech's Dabney Lounge. Tickets are $12. For more information, call (626) 395-4652.

Investment Advice—TIAA/CREF representative Greg Coburn will present "Your Distribution Options" at noon in the Building 167 cafeteria, northeast corner. Seating is limited.

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

Monday, March 29

Investment Advice—Fidelity Investments representative Jasson Rasmussen will be available for retirement and investment counseling. Call (800) 642-7131 to schedule an appointment.

Wednesday, March 31

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, April 1

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

Friday, April 2

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

WIRE loss under study

Scientific mission ends when hydrogen designed to cool telescope escapes

By MARK WHALEN

Investigations by NASA and JPL are under way to determine causes leading to the end of the scientific mission of the Wide-Field Infrared Explorer (WIRE).

After a successful launch March 4 from Vandenberg Air Force Base, the spacecraft began to experience attitude control problems during its second pass over the ground station at Poker Flat, Alaska. Ground controllers determined that WIRE was beginning to spin instead of maintaining a stable position in orbit.

By Saturday, March 6, controllers were slowly gaining control of the spacecraft, but the entire supply of frozen hydrogen needed to cool its primary scientific instrument—a JPL-developed, cryogenically cooled infrared telescope—was released into space, ending the spacecraft's scientific mission of exploring the history of star formation in the universe.

"We are very disappointed at the loss of WIRE's science program," said Dr. Ed Weiler, NASA's associate administrator for space science at NASA Headquarters. "We are establishing a formal anomaly investigation board to find out what happened, which will help us to plan future missions. I'm confident that many of the scientific goals can be accomplished by upcoming missions such as the Space Infrared Telescope Facility (SIRTF), so it will be science delayed rather than science lost."

At JPL, a review board led by Matt Landano, deputy manager of the Space Science Flight Projects Program Office, has begun to review the portions of the mission's development for which JPL has responsibility and to support activities being conducted by the Goddard Space Flight Center in Maryland.

"Our team is in the very preliminary stages of its investigation," Landano said, adding that the mission operations team at Goddard, which built the spacecraft, is analyzing flight data and "trying to develop their best understanding of what happened."

"We must not rush to judgment," said Landano, a JPL veteran who investigated anomalies on Galileo and other missions. "The key is for us to be objective, systematic and comprehensive in our investigation, and to try to find the root cause for what took place and to identify actions to preclude future occurrences."

The eight-member JPL team, which will look into such issues as mission assurance, mechanical devices, cryostatic mechanisms and design, electrical systems, attitude control and dynamics, and test verification, is scheduled to complete its findings by early June.

Information gathered by the JPL and Goddard teams will also be used to support the NASA Headquarters–appointed review board.

Based on preliminary real-time data, spacecraft controllers believed the primary telescope cover was released about three days earlier than planned. As a result, sunlight began to fall on the instrument's cryostat, a container of frozen hydrogen designed to cool the instrument to minus 260 Celsius (-436 F)—cold enough so that the telescope's own heat emissions would not mask the infrared light that it would have attempted to detect in space.

The hydrogen then warmed up and vented into space at a much higher rate than it was designed to do, causing the spacecraft to spin. Controllers do not yet know what specifically caused the cover to be released.

As of March 11, controllers regained control of the spacecraft, returning it to three-axis operation. ❑

NEAT surprise: Asteroid hunters find supernova

"We were fishing for salmon, and instead we caught a whale."

—Dr. Steven Pravdo,
Near Earth Asteroid Tracking project manager,
on unexpected supernova discovery

By JANE PLATT

Astronomers searching for asteroids headed toward Earth have stumbled upon a harmless but fascinating discovery—an exploding star, also known as a supernova.

The supernova, named 1999am, is located in a galaxy about 650 million light-years away. (A light-year is the distance light travels in one year, about 9.5 trillion kilometers or 6 trillion miles.) The star was unknown to astronomers until it was captured by the camera on the JPL-managed Near Earth Asteroid Tracking (NEAT) system on Feb 18. The NEAT images show the star as it looked just a few weeks after the ancient explosion took place.

"We were fishing for salmon, and instead we caught a whale," said Dr. Steven Pravdo, project manager and co-investigator for NEAT. "The project is designed to look for asteroids and other objects that might pose a potential hazard to Earth. This supernova discovery is an added bonus for astronomers in general."

Supernova 1999am is a "Type Ia supernova," which means that before it exploded, it was a white dwarf star in orbit with a companion star. Near the end of its life, the white dwarf captured so much material from its companion that it became too massive to support itself, and exploded with as much energy as 100 billion suns. The supernova is now nearly as bright as the galaxy surrounding it, which is known as CGCG 060-009.

NEAT, with asteroid hunter Eleanor Helin as principal investigator, has been in operation since December 1995. It uses a large, sensitive and fully automated charge-coupled device (CCD) camera mounted on a 1-meter-diameter (39-inch) telescope. The telescope is operated by the U.S. Air Force atop Mt. Haleakela on the island of Maui, Hawaii.

Since the middle of 1998, NEAT scientists have posted their data on a web site through a program called SkyMorph, a collaboration between JPL and NASA's Goddard Space Flight Center in Maryland. While the NEAT project detects Earth-approaching objects by looking for celestial bodies that move over a period of time, the data can be used also to hunt for stationary objects that become brighter or dimmer over time. Thus, the images present a smorgasbord of astronomical options—NEAT scientists pick out asteroids, while other astronomers select various cosmic morsels through the public Sky Morph web site.

"Through SkyMorph, astronomers may find an array of interesting objects, including supernovae," said Pravdo, principal investigator for SkyMorph. "In this case, we sent our data directly to the Lawrence Berkeley National Laboratory in Berkeley, Calif. Dr. Greg Aldering and other scientists with their Supernova Cosmology Project immediately found 1999am."

Pravdo said the Lawrence Berkeley scientists found the supernova by comparing images taken in February with previous NEAT data. They could clearly see a change in brightness, indicating the star had exploded and become a supernova. They further confirmed their finding with additional observations by ground-based telescopes. Feb. 18 marked the first time NEAT scientists forwarded new data directly to the Berkeley lab, and as Pravdo pointed out, "We struck paydirt."

For information and an image of 1999am, go online to http://huey.jpl.nasa.gov/~spravdo/snanima.htm.

For more information on the NEAT project, go to http://huey.jpl.nasa.gov/~spravdo/neat.html.

Information on SkyMorph is available at http://skys.gsfc. nasa.gov/skymorph/skymorph.html. ❑

'Happy face' greets MGS

On the first day of the mapping phase of Mars Global Surveyor's mission, the spacecraft's camera was greeted with this view of "Happy Face Crater" on the east side of Argyre Planitia. The crater is officially known as Galle Crater, and it is about 215 kilometers (134 miles) across.

The Mars Global Surveyor spacecraft successfully began its prime mapping mission at 4 p.m. Pacific time on March 8.

The spacecraft is executing a sequence of commands with its high-gain antenna in a fixed position. During this sequence, Global Surveyor records science data for nine orbits (about 18 hours) when all the instruments are pointed at Mars and then spends three orbits (about six hours) pointed at Earth playing back the data.

During the playback orbits, the flight team can receive data from Global Surveyor only when the spacecraft is in view of Earth. For about half of each orbit, there is no communication with the spacecraft because it is behind Mars and out of view. ❑

LightSAR proposals sought

By DIANE AINSWORTH

NASA is seeking proposals for a low-cost, advanced imaging radar technology that will reduce the cost and enhance the performance of Earth observing satellites—opening new opportunities for the U.S. commercial remote-sensing industry.

Managed by JPL, the Lightweight Synthetic Aperture mission, or "LightSAR," is part of NASA's long-term effort in the development and productive use of imaging radars. Past NASA radar missions, which have been short in duration, have established the potential of imaging radar to expand scientific knowledge of Earth and the planets.

The satellite's capability to observe the Earth day and night in all weather is expected to result in numerous scientifically valuable and commercially lucrative applications. For example, LightSAR will have the unique capability to continuously monitor minute changes in the Earth's surface, down to the one-millimeter level, which will lead to improved understanding of natural hazards such as earthquakes and volcanoes.

The satellite's advanced capabilities also will greatly help improve governments' emergency management efforts and may prove useful to industries involved in disaster recovery. Other applications of the satellite will include observing the movements and changing size of glaciers and ice floes as part of long-term Earth climate studies. Forest regrowth and global vegetation maps produced by LightSAR will support NASA's on-going studies of the Earth's environment.

LightSAR's high-resolution imaging capability has significant commercial potential for mapping the Earth's surface, environmental surveillance, crop monitoring and land management, planning and development. One of the unique features of this NASA program will be to encourage proposers to share the costs of developing and deploying the satellite's capabilities in return for commercial rights to data.

Besides NASA centers, proposals for mission development and operations using LightSAR are being sought from many organizations, including educational institutions, industry, nonprofit institutions, federally funded research and development centers and other government agencies. The LightSAR announcement of opportunity is available via the Internet at http://www.earth.nasa.gov/nra/current .

Proposals must be submitted by May 10, 1999. Further information about the LightSAR mission is available from Richard Monson, NASA's associate director for exploratory missions, at (202) 358-3552, or via e-mail to oesresponse@hq.nasa.gov . ❑

PIDDP

Continued from page 2

tions." Dr. William Smythe, PI.

"Spectrometer-on-Chip Using Surface Plasmon Tunable Filter and Active Pixel Sensor Technologies." Dr. Yu Wang, PI.

"Quantum-Cascade Laser Spectrometer for In-Situ Measurements of Atmospheric and Evolved Gases on Mars, Titan, Venus and Europa." Dr. Christopher Webster, PI.

"Atmospheric Electron X-Ray Spectrometer (AEXS): Breadboard Instrument Development." Dr. Jaroslava Wilcox, PI.

In addition, Kaufman said, JPL has a major role in one other selected investigation: "Miniature Geochronology Instrument for Surface Deployment on Mars: Breadboard Development." Prof. Brian Stewart of the University of Pittsburgh is PI, with Drs. Greg Cardell and Mahadeva Sinha as JPL co-investigators.

Kaufman noted that recent successful JPL instrument developments that started out as PIDDP investigations include the Miniature Integrated Camera Spectrometer (MICAS), now flying on Deep Space 1; components of the Mars Volatiles and Climate Surveyor (MVACS) on Mars Polar Lander; and the Raman spectrometer, set for Mars rovers on the 2003 and 2005 missions.

About a dozen other JPL-developed instruments have received funding through the program, he added.

At JPL, the program is managed by the Planetary Advanced Instruments Office 712.

The 1999 NASA research announcement for the program is available online at http://space-science.nasa.gov/nra/99-oss-01. Proposals are due Aug. 4.

For more information, contact Kaufman at ext. 3-1228. ❑

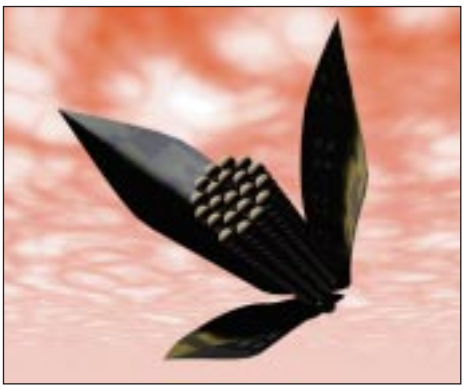
Investigators of recently funded PIDDP proposals, from left, top row: Drs. Isik Kanik, William McGrath, Christopher Webster, Jaroslava Wilcox, Greg Cardell and Mahadeva Sinha. Front row: Drs. Soon Sam Kim (left) and Yu Wang.

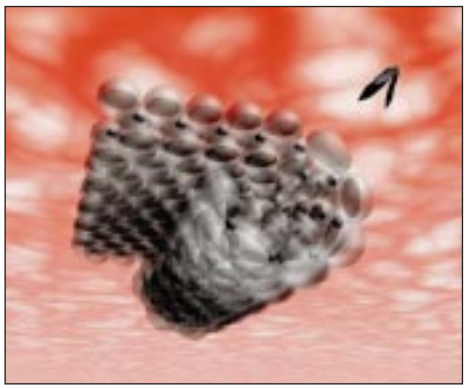
Art students present unique ideas for future inflatables

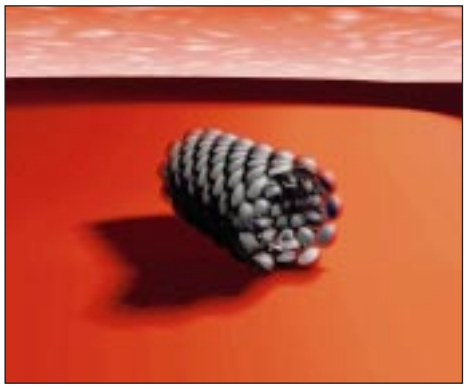
By JOHN G. WATSON

As NASA shifts toward faster, better, cheaper missions to Mars, the pressure to decrease hardware weight, volume and cost is accelerating. One unique response has been the development of ultra-lightweight inflatable technologies, ranging from antennas and solar arrays to rovers and solar sails, launched folded up like origami and expanded to full-scale size when needed.

A current Art Center College of Design course with the evocative title of "Project X" is devoted exclusively to the development of "out-of-the-box" ideas for inflatable technologies with potential use for future NASA robotic outposts on Mars—ideas that may seem right out of science fiction.







As part of his mid-term, Art Center College of Design "Project X" student James Piatt, below left, receives feedback on his concept (top pictures) of a robotic roll of what looks like bubble wrap, but could focus the sun's rays with its individual cells to fuse Martian sand into bricks. Providing their insights as JPL engineers and managers involved with inflatables and robotics are (left to right) Art Chmielewski, Brian Wilcox, Brian Cooper and Mike Sander.

Rules include: laws of physics can't be broken; there should be a reasonable chance of deployment by 2030; and the simpler, more astonishing, creative, imaginative and unusual, the better.

As their mid-term, students at the Pasadena campus presented their ideas individually and in small groups to JPL's Mike Sander, Brian Wilcox, Brian Cooper and Art Chmielewski on March 10. Also on hand—serving to make the young students noticeably nervous (as if the presence of savvy JPL engineers hadn't already served that purpose)—was the Pasadena Star News, which described the projects as "igloo-like shelters, cars propelled by blow-up sails and a robotic roll of what looked like bubble wrap, but could focus the sun's rays with its individual cells to fuse Martian sand into bricks."

Other projects included a pod of inflatable probes that would store oxygen and electricity for use by human explorers on subsequent missions and toy rovers whose owners would receive personally tweaked science data directly to their home PCs.

"In the past, some of the most creative ideas for new inflatable technologies have emerged from brainstorming sessions during which entirely new ways of approaching problems have been put on the table," said Space Inflatable Technology Manager Art Chmielewski, who has provided JPL guidelines for the class since its inception. "Now students with fresh design ideas are adding their perspectives to this creative mix, using their talents to push the limits of imagination in the robotic exploration of Mars."

Art Center College of Design graduates are leaders in the new design of such familiar consumer products as automobiles, bicycles, furniture and telephones. Art Center is an internationally recognized, independent college offering bachelor or master degrees in advertising, environmental design, film, fine art, graphic design, illustration, photography, product design and transportation design. ❑

News Briefs

Dr. Robert T. Menzies, manager of JPL's Microwave and Lidar Technology Section 386, has been named division editor of the Optical Society of America's most widely read journal, Applied Optics.

In this capacity, Menzies will oversee the publication's Lasers, Photonics and Biomedical Optics section, one of three categories of optics featured each month. The section covers issues such as laser systems, laser materials and design, optoelectronics, laser instrumentation, atmospheric optics and propagation, lidar and remote sensing, meteorological optics and ocean optics.

Menzies has been with JPL since 1970, and has managed Section 386 since 1997. Previously, he supervised the section's Laser Remote Sensing Group. ❑

The JPL Library now offers ComputerSelect, a new information resource that provides a wealth of information on computer-related products and companies. Hardware, software and applications are all covered.

Profiles of companies and product specifications can be retrieved, as well as articles about those companies and products. Product charts can be created to make comparisons of features such as price, date announced, compatibility and parameters specific to the type of product. Searching for information is flexible and can be done in a variety of ways.

ComputerSelect also has a glossary of computer-related terms and up-to-the-minute news from national news organizations.

To access ComputerSelect, go to the library's Beacon home page at http://beacon and click on Electronic Abstracts & Indexes, then click on ComputerSelect from the resulting page.

Librarian **Barbara Amago** said the JPL site license for the system allows for three concurrent users, but the allocation will be increased with high demand.

Employee briefings on Computer-Select will be included in the activities planned for Tuesday, April 13, during the library's annual National Library Week festivities. Briefings will be held in Building 111-111 at 11 a.m. and 1:30 p.m. on that day.

For more information, contact the JPL Technical Library reference desk at ext. 4-4200. ❑

Passings

Henry Cox, 72, retired from the former Telecommunications and Data Acquisition Office 440, died of heart failure Jan. 7.

Cox joined the Laboratory in 1977. He served as tracking and data systems mission manager for Pioneer 10, which flew by Jupiter in 1973, and Pioneer 11, which flew by Jupiter in 1974 and Saturn in 1979. He also served in that capacity for the final Voyager encounter in 1989, and continued in that position until his retirement in 1994.

Cox is survived by his wife, Billie, and three children.

Funeral arrangements were private. ❑

Stephen Yager, 80, a retired design engineer in Section 356, died of cancer Feb. 28.

Yager joined JPL in 1956 and retired in 1984. He is survived by his wife, Adele, and daughter Marilyn.

Funeral arrangements were private. ❑

TOPEX

Continued from page 1

heights, produced global maps of winds and waves, and detailed land and ice-sheet topography since 1992. It has recorded billions of time-specific measurements of ocean and topography to an accuracy of approximately 3 centimeters (1.2 inches).

An international team of scientists has used the data to study global climate changes and such phenomena as the El Niño warming pattern in the Pacific Ocean, which occurs about every two to seven years, and a reverse trend, known as La Niña, which seems to follow El Niño winters and cools large expanses of ocean water. (See accompanying story.)

Although the primary altimeter, or "side A," is still operational, components have started to degrade from wear and tear on the satellite. The operations team

See TOPEX, page 7

JPL Director Dr. Edward Stone and Public Services Office Manager Kim Lievense, at right, join members of the Troy High School team, which won regional competition in the National Science Bowl Feb. 20 at JPL. From left are coach Kurt Wahl, Mark Rudner, Srinivas Panguluri, Jason Wen, Clinton Conley and Jason Shih.

Troy High takes Science Bowl regional at JPL

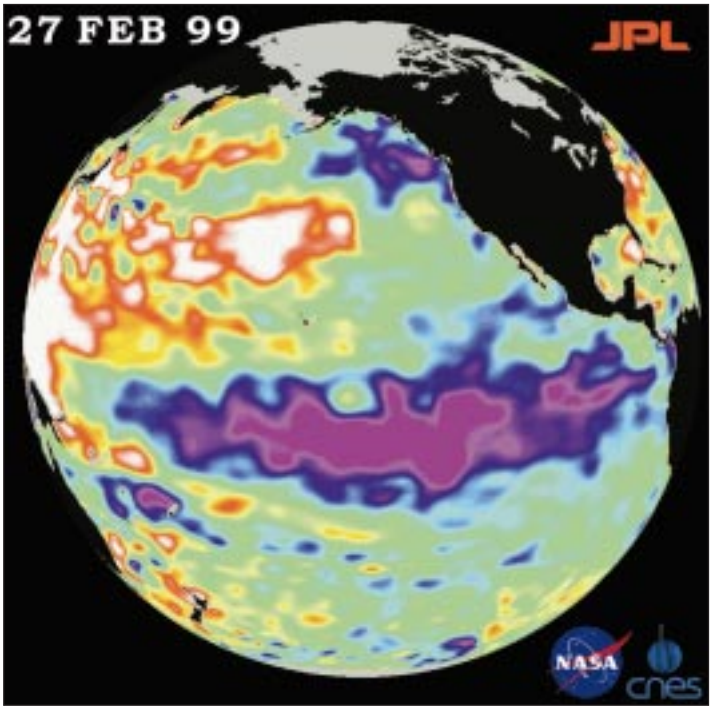
Troy High School of Fullerton defeated 23 teams from Los Angeles and Orange counties in regional competition of the National Science Bowl Feb. 20 at JPL, and will go on to represent Southern California in national competition this spring.

Modeled after the "College Bowl" television show of the 1960s, the competition was first organized by the U.S. Department of Energy in 1991.

The competition started with a round-robin event in which every team—represented by four students and one alternate—played five rounds, followed by a double-elimination tournament for the top eight teams. Competitors answered questions on biology, chemistry, physics, astronomy, Earth science, computer science and mathematics.

The Troy team and its coach, Kurt Wahl, will go on to the nationals this spring at the 4-H Center near Washington, D.C., all expenses paid.

Members of Troy's team, along with that of the second- and third-place finishers at the JPL regional—Woodbridge High School of Irvine and Palos Verdes High School of Rolling Hills Estates, respectively—each earned a space robotics model and tickets to the Aquarium of the Pacific in Long Beach and Knott's Berry Farm in Buena Park. ❑



Niña

Continued from page 1

highway known as the 'jet stream,'" said JPL oceanographer Dr. William Patzert.

"It funnels storm tracks to the Pacific Northwest, which has resulted in heavy rainfall and lots of snow in that region so far, as well as the upper Midwest. Much of the Southwest, by contrast, has been shielded from stormy weather and, as a result, has received significantly less precipitation than normal to date.

"This year's La Niña was average in its intensity, but at its peak, it was associated with a 15- to-20-centimeter deep trough (6 to 8 inches) in the central tropical Pacific," Patzert said. "The depression was correlated with a 2- to- 3-degree Centigrade (about 3.5 to 5.5 degrees Fahrenheit) dip in normal ocean surface temperatures."

The image also shows that the very large, unusual area of higher or warmer water (shown here in red and white) in the western Pacific Ocean, from the tropics to the Gulf of Alaska, continues to expand. Although the appearance of this feature is not fully understood, it is recognized as influential to overall weather and climate.

The white areas in the image indicate that the sea-surface height is between 14 and 32 centimeters (6 to 13 inches) above normal; in the red areas, sea-surface height is about 10 centimeters (4 inches) above normal. The green areas indicate normal conditions. The purple areas are between 14 to 18 centimeters (6 to 7 inches) below normal, and the blue areas are between 5 to 13 centimeters (2 to 5 inches) below normal. ❑

TOPEX

Continued from page 6

expects to be able to use side B of the altimeter for the next several years, but will be able to switch back to side A if necessary, Hancock said.

The Wallops Flight Facility Observational Science Branch, Wallops Island, Va., which is part of NASA's Goddard Space Flight Center Laboratory for Hydro-spheric Processes, worked with the JPL science and engineering team to provide specifications for using the backup altimeter system. The team, in conjunction with members of Goddard's Applied Engineering and Technology Directorate, Greenbelt, Md., was responsible for designing the fully qualified, backup altimeter, built by the Johns Hopkins Applied Physics Laboratory in Baltimore. ❑

LETTERS

The Vosicky family would like to express their deep appreciation for the kindness expressed by the JPL community at the passing of the father of Gene Vosicky. It is comforting to know that we have so many caring and good friends at JPL.

Gene and Paulette Vosicky

❑❑❑

My family and I would like to thank my friends and co-workers at JPL for the wonderful and thoughtful "before and after" baby showers in honor of my newborn daughter, Jazmine Rebekah. All gifts have been greatly appreciated. Also, thank you, ERC, for the beautiful card and baby shirt.

Sonia Mejia

❑❑❑

My family and I would like to extend our sincere thanks to all our friends and co-workers at JPL for their kind thoughts and prayers during the recent passing of my mother-in-law. A special thanks to the JPL-ERC Club for the lovely plant and their expression of sympathy.

Emma Ramos

FOR SALE

AUDIO EQUIPMENT, Yamaha pre-amp, Dolby surround sound decoder, many a/v inputs, univ. remote, exc. cond., $99/obo. 909/592-2279.

BEDROOM SET, youth platform bed, bookcase, headboard, armoire, desk w/hutch, all heavy oak, great shape, over $4,000 new, sell $1,400. 626/447-6423.

BEDROOM SET, oak, large dresser (5 shelves), dressing table with 9 shelves and mirror, headboard, end table, TV stand, vg cond., $249/obo for all. 909/592-2279.

BICYCLES (2): 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.

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

COLLECTIBLES: 1910 wicker doll buggy, child's 1930s maple table with two bowed-back chairs, children's doll dishes and glassware, old handcrafted hardwood doll furniture, plus much more. 626/585-8213.

COMPUTER, laptop, Toshiba Satellite Pro, Intel Pentium 90, 1.2GB HD, 16MB RAM, 4x removable CD-ROM, 3.5" removable floppy, color display, Win95 and MS OFFICE 97, includes $50 laptop carrying case, all for $600. 310/937-5923.

COMPUTER, laptop, new (<100 hours) MegaImage with 12.1 active matrix screen, 56K modem, Office 97 pro, ($900), Microsoft Publisher 97 ($19) new in box Logitech Color Video Cam ($95), MS Picture it ($19), new Hands free kit for Nokia 2100 series cell phone ($25), new NiMH extended life battery for Nokia 6160/6190 ($39), Word 97, Eudora 4.0 or Adobe Photo Delux ($15), never used leather briefcase ($50), Motorola cellphone with case/charger ($49), Motorola Goldflex alphanumeric pager ($99). 366-6134.

COUCH, sectional, beige, almost new, $500. 248-8853.

CRIB with new mattress and bedding, white, $60. 626/798-1839.

CRIB, Simmons, oak, with mattress/fitted sheets, $150. 626/796-8803.

CROCK POT square by Rival with Corningware, $15/obo. 626/568-8298.

DESK, steel, foreman's, 36W x 28D x 38H, standing height, sloped top, storage drawer + several cubbyholes; cost $250, sell $45. 352-0075, Kurt.

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

DOG HOUSE, large, w/floor attached, Igloo type, gd. cond., $80. 626/969-8830, Eric.

DRYER, gas, by Roper, 4 cycles, less than 2 years, extended warranty, exc. cond., $190. 626/792-6295.

ELECTRONICS: used Peavey equipment 2 - T-300 high-freq. projector 12" woofer midrange horn tweeter; 1 - standard pa mixer amp, 4 inputs, $350 firm. 626/305-0886, Shirley.

EXERCISE EQUIPMENT, Cardioglide, $75; miscellaneous equipment, $10-$25. 626/441-1496 or jeanmg_98@yahoo.com.

EXERCISE EQUIPMENT, Fitness Flyer, includes booklet, exc. cond., $95. 626/355-8491.

EXERCISE EQUIPMENT, Soloflex, free standing, $250/obo. 626/447-6423.

FOOTBALL CARD, Jerome Bettis-autographed in Notre Dame uniform, classic 4-sport rookie card, 1 of 63,400, $25; 200 assorted baseball or football cards, major stars, rookies and inserts, will include favorite team or player, $20. 626/914-6083.

FURNITURE: matching sofa, loveseat, chair and ottoman, $325; dinette set, $115; entertainment center, $100. 248-8936.

FURNITURE: bamboo couch & loveseat; cushions need recovering, $300; wicker & glass coffee table & end table, $100/pr. 626/351-8198.

FURNITURE, bedroom, girl's double dresser, desk, corner unit, 2 hutches, end table, mirror, exc. cond., $450. 626/355-8491.

GUITARS: 1 older for practice/learning, good tone, hard carrying case, $75; 1 brand new Yamaha, with soft carrying case; $200; electronic tuning device, $25. 249-4561.

HAM GEAR, handheld Icom transcdeiver IC-2GXAT (7w) 2M mobile YAESU FT-2500M (50w), 2M base Wshcraft antenna, Astron RS-20M power supply, MFJ-1270C packet controller, all exc. cond., with all access. and papers, $338 for all. 626/333-7112.

MOVING SALE, electric dryer, Sears Kenmore, 4 years old, exc. cond., $175 or trade for comparable gas dryer; Kenmore microwave, lg. capacity, auto defrost; dinette set with corner benches, 3' x 4' table + 2 chairs. 626/358-2134.

MOVING SALE, twin bed mattress, box spring (old) and miscellaneous near new accessories: comforter $30/obo, blanket $10/obo, pillows, sheets, etc. 626/585-0038.

ORGAN, electronic, with separate speaker by Gulbransen, exc. cond., $200/obo. 805/250-0456.

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

PHOTOGRAPHS, 40" x 30", color, framed, two tall-ship pictures taken by a professional photographer, vg condition; one of a Spanish tall ship in the SF Bay, one of a German tall ship taken near Puerto Rico; $75/each, $130 for both/obo. 626/568-8298.

PICTURE FRAMES, three made of brass, 22" x 28", $7/each, $18 for all three/obo. 626/568-8296.

PRINTER, Canon BJ-100; works great; needs cartridge, $35/obo. 626/797-3156.

PRINTER, Xerox Diablo 630 with wheels/ribbons, excellent condition, $20/obo. 626/568-8298.

REFRIGERATOR, small, 7 cubic feet, clean, fairly new, excellent condition; ideal for bar, guest house, cabin, or dorm room; $100/obo. 323/227-7799, Martin.

RUG, Chinese hand-tufted wool, 7' x 10', colors: berry, tan & pale green, very good condition, appraised at $900, sell $300/obo. 626/799-6196.

SANDWICH MAKER by Oster, makes two sandwiches, $10/obo. 626/568-8298.

SLIDE, child's, giant, sandbox, table, vg cond.; STATIONARY BIKE, vg cond., $50. 367-3045.

SOFA, L-shaped, white and light blue stripes, very clean, $75. 310/937-5923.

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

SPEAKERS, for Infinity Studio Monitor home stereo, 10" woofers, 5" midrange, polycell high-output tweeters, hi-freq. level adjuster; H-31", W-14", D-15"; black w/black grill; I moved, no room for these great speakers, $250/obo. 249-0038.

SPRINKLER VALVE actuators, Lawn Genie model 756LG3/4, new, $10 each. 790-3899.

STEEL for fences, 3/4 in. square cross section by ~6 ft, 120 lin ft, $25. 248-8936.

SWEATER, Coogi, from Australia, new, sells in Nordstrom for $325, $100. 790-3899. TABLE, coffee, approx. 60 x 30; matching end table, approx. 24 x 27; exc.condition, oak with leaded glass

Continued on page 8

inserts; $250/both. 626/296-1537.
TABLE, dining room, round, mahogany, sits 8 with two extensions, almost new, comes with 6 matching chairs, picture on ERC board; $650/obo; matching China buffet, $950/obo; all for $1,400/obo. 909/592-0780, Ana.
TABLES, glass, four 2-shelf tables with brass feet, three make up a coffee table (one round 2.5-ft. dia., two "half-moon"), fourth is a round end table (2.5-ft. diameter), $125/obo. 909/592-0780, Ana.
TABLES, walnut, two 2.5-ft square end tables, one 3-ft diameter coffee table, $150 all three. 626/448-4383.
TAPE RECORDER, TEAC reel to reel with 4-channel audio mixer, exc. condition, $200/obo. 805/250-0456.
TELEPHONE ANSWERING MACHINE, General Electric, black, microcassette, voice time/day stamp, hardly used. 626/844-4383.
TV, Mitsubishi 27 in. (CS27303), with remote & owner's guide; very good picture; very good condition; picture-in-picture mode; $130/obo. 626/351-7615.
VIDEO GAME, Sega Genesis w/Sega CD, includes 2 game pads and 2 joysticks, 12 CDs: Space Ace, Dragons Lair, Lethal Enforcer w/gun, etc.; 30+ cartridges: Road Rash, John Madden, etc.; all like new in original boxes, $400. 626/355-6350.
VIDEO GAME, Super-Nintendo set: system, 2 controllers, 7 games, exc. cond., $ 49. 909/592-2279.
WEDDING DRESS, excellent condition, used once, kept in garment bag; white straight dress with long sleeves, bow in the back, $40/obo. 626/568-8298.
WINE RACKING, redwood, single-bottle depth, 6 ft. high by 12 ft. long, and 4 ft. high by 5 ft long; will also include chiller unit, $500. 626/355-8706.
WASHING MACHINE, good condition, $75. 323/226-0622.
WASHER/DRYER, Magic Chef, both for $300. 504-9235.

VEHICLES / ACCESSORIES

'77 CADILLAC Coupe deVille deElegance, tilt, A/C, AM/FM, 8-track, 6-way power seats, cruise, pwr. steering, PW, PL, pwr. trunk, automatic lights, 83K miles, very clean; new tires, brakes, master cylinder, belts, alt.; $2,200. 249-6786.
CAR COVER, fits Mustangs '94 on; multi-layered, moisture resistant; brand new in box, with new cable and lock, $75. 323/265-3181.
'91 CHEVROLET Camaro, 74k miles, baby blue exterior/light gray interior, loaded, AM/FM Kenwood stereo w/cassette and face attachment; pwr. steering, doors and windows; ABS brakes, air bag; $7,500/obo. 875-4744, Aaron.
'91 DODGE Ram van 150LE, 8 cyl., 109" wheel base, 8 passenger, pw/pb/ps/ac, 5.2 engine, alarm, smoke-free int. very clean, must see, $8,500/obo. 626/797-8562.
'98 FORD Explorer, Eddie Bauer, 7K miles, pwr. windows/door locks, auto, awd, climate cont., am/fm/stereo/CD, premium sound syst., rear air cond., keyless, much more, salvage title, $19,990/ obo. 909/599-3230.
'95 FORD Explorer, Eddie Bauer 4x4 w/After Market Stereo, CD changer & alarm syst., leather interior like new; 86,000 mi. w/100,000 transferable warr.; exc. cond.; $17,800 firm. 800/937-9200, pager.
'93 FORD Taurus, good cond., 4 dr., 3.8L, lt. blue; power seat, windows, mirrors, door locks & trunk release; auto, airbags, 78K miles, am/fm/cass., tilt wheel, $5,900/obo. 790-1622.
'94 HONDA Accord LX, auto, air cond., power windows, power door locks, cruise control, am/fm/ cass., 65K miles, salvage title, great condition, $7,500/obo. 909/599-3230.
'90 HONDA Accord EX, orig. owner, sunroof, auto, a/c, ps/pb, exc. mech. cond., paint like new, maroon w/ivory interior, 120K miles, $6,200/obo. 626/296-1537.
'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/obo. 626/794-0886, Ted.
'74 HONDA CL-360 Street Scrambler, stored since 1976, many new parts, $850/obo. 562/423-2224, Fred.
'72 HONDA CB-350, stored since 1976, many new parts, $850/obo. 562/423-2224, Fred.
'94 JEEP Grand Cherokee Laredo, V8, 4 x 4, up-country, tow pkg., hunter green/gray, all options, exc. condition in & out, 107K miles, $10,900. 352-5638.
'93 JEEP Wrangler Sport Utility 2D 4WD, excellent condition, 5-speed manual trans., 4.0L inline 6 cyl., soft-top, blue two-tone paint, running boards, power steering & brakes, tilt wheel, AM/FM cassette stereo, premium sound package & overhead speakers, locking trunk, alarm w/microwave proximity sensor, 55k miles, $9,500/obo. 626/398-6356.
'85 JEEP Cherokee, 4WD, black exterior, auto, pwr. steering & brakes, tinted windows, tilt steering, am/fm/cass./CD, $3,000 firm for quick sale. 310/915-0074.
'96 LEXUS ES 300, immaculate, leather, 6 CD, sun/moon roof, chrome wheels, new tires, 33K miles, $25,500. 790-3508.
'90 MAZDA B2200 pickup truck, 95M, extended cab, bed-liner, pop-up sunroof, am/fm/cass., a/c, auto, chrome wheels, $2,450/obo. 352-0075, Kurt.
'78 MERCEDES 300D, silver, 80,000 on rebuilt engine, $4,000. 952-6007.
MOTORCYCLE HELMETS: Shoei, pearl white, 7 1/8 - 7¼ size, excellent condition, hardly used; one is "full face" RF 200 w/clear & smoke face shields; other is "open face" RJ 101V; $200 each/both for $300. 626/335-1816.
'93 NISSAN pickup, King cab, auto, air cond., am/fm/cass., shell, 64K miles, $5,500. 909/599-3230.
'88 NISSAN Sentra E Wagon, blue, new transmission, 126K miles, automatic, reliable, single owner, hitch, am/fm cassette, rear defrost, intermittent wipers, tilt wheel, $1,200 firm. 626/432-6955, Pat.
'96 TOYOTA Previa, supercharged, sunroofs, CD player w/cassette, $19,000/obo. 541-0131.
'88 TOYOTA Tercel, 2-door coupe, a/c, p/s, auto, avail. 4/1/99, $2,800/obo. 626/449-2795.
'86 TOYOTA Camry, 4 door, loaded, auto, a/c, power windows, radio/cass, below Blue Book, $2,700/obo. 790-6283, after 5 p.m.
TRAILER, small wheel, $75. 248-8936.

FREE

CATS, 2, adorable, 1 1/2 & 2 yrs. old, both female, spayed, all shots up-to-date, come with lots of toys, food; one tiger stripe, the other calico; very loving, they must go together; current owner has severe asthma and must find new home for them. 362-7427.
IGUANA, green, comes with good appetite, custom habitat available. 626/797-3156.
MAGAZINES, s-f, large box, mostly IASFM, analog; some F&SF, Ellery Queen, Hitchcock, Aboriginal. 956-6336.

LOST & FOUND

Found: friendly black neutered Chow Chow, approx. 1 year old, desparately needs a home. 626/799-8979.

WANTED

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
VOLLEYBALL PLAYERS, coed, all levels of play, Tuesday nights 8-10 at Eagle Rock High School, $4/night. 956-1744, Barbara.

FOR RENT

ARCADIA, cozy, furnished room, includes laundry, kitchen privileges, pool; no smokers, $350. 626/448-8809, Shary.
ARCADIA townhome, 2 bd. + den, 1.75 ba., c/a, f/p in liv. rm., balcony, 2-car enc. gar. w/ample storage space, pool & spa, washer/dryer, prime location, quiet, close to all, no pets, $1,300 + sec. deposit. 626/446-2989.
EAGLE ROCK house, art deco, spacious, sunny, clean; lg. yd., office space, view a/c, appliances, fireplace, garage; avail. April 25; $1,100. 626/794-7281.
GLENDALE, darling, large 1 bd. apt. with small bonus rm., newly re-decorated, wall to wall carpets, air conditioning, dishwasher, $650 incl. water, gas and basic cable. 241-9448.
GRANADA HILLS, looking for 1 person to share lg. remodeled home; gardener, c/a, cable, fireplace, hardwd floors, recessed lighting, patio, BBQ, new appliances, washer/dryer, spa and office; rm. has 2 windows, attached ba.; N. of Rinaldi, only 20 min./JPL; $495 + ½ util. + deposit; no smoking, no pets. 366-6134.
LA CRESCENTA house, quiet cul-de-sac, high in foothills, upper Briggs Terrace, 3 bd., 2 ba., 2-car garage, fenced yd., large deck, washer/dryer, refrigerator, 2 fireplaces, built-in microwave, $1,850 + security. 249-3204, Mike or Ann.
PASADENA, share 3-bd., 3-ba. apt. with Caltech post-doc; fully furn., laundry facil., parking space; 3 mi./PCC & Caltech, male pref., $400 + 1/3 util. 626/351-9641.
PASADENA townhouse-style apt., nr. PCC, 2 bd., 1½ ba., built-in range & oven, refrig., central a/c, carpets, drapes, laundry, disposal, cvrd. parking, $725. 790-7062.
PASADENA, roommate wanted to share 2-bd., 2-ba. apt., secure entry & secure underground parking, central air/heat, pool, sauna, laundry facilities, 5 min./JPL, Del Mar/Euclid avenues. 626/796-2719, Jennifer.
PASADENA studio condo, fully furnished, gated complex at 1115 E. Cordova, 2 blocks north of Caltech at Wilson Ave.; carport, pool, patio and laundry facilities on premises, non-smoker, no pets, $675 plus electric. 626/792-9053, Marilyn.
SOUTH PASADENA, furn. studio apartment, 1718 Huntington Dr. between Marengo and Milan; units on 1 level, parking space, laundry facilities, utilities paid, on bus lines, convenient shopping; non-smoker, no pets; $565. 626/792-9053, Marilyn.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
IDYLLWILD mtn. home, 2 bd. 1 ba., located on 0.6 acres, great view of Garner Valley, large deck, $76,500. 626/798-1574.
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 and 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 minimum; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR LAKE cabin near village, 2 bd., sleeps 8, completely furnished, large fireplace, TV/VCP, $75/night. 249-8515.
BIG BEAR LAKE cabin, near ski area, lake, shops, village, forest, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc. price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT lux. townhome, indoor pool/spa, nr. skiing, beaut. master bdrm. suite, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125 per night for 2, $175 per night for 4. 248-8853.
HAWAII, Kona oceanfront condo on Big Island of Hawaii; 1 bd., 1 ba., sleeps 4, 50 yards from ocean, two pools, private beach, all amenities and good restaurants nearby; week of July 9-16 only (timeshare), $500/week. 790-8069.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwv., dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: $95/nite/2, 12/15-4/14 rate: $110/nite/2, $10/nite/add'l person. 949/348-8047.
HAWAII, Oahu, certificate good for 1-2 adults, 4 nights accommodations, airfare not included, expires June 30, $200. 626/917-0231.
LAKE TAHOE, North shore, 2 bd., 2-1/2 ba., sleeps 6, great location, all amenities, private sandy beach, pool, walk to golf course, fishing 150 yards from front door, 2 miles to casinos, JPL discount rate, book now for summer. 626/355-3886, Rosemary or Ed.
MAMMOTH condo in Chamonix at lifts 7, 8, 16, 17; walk to Warming Hut, 2 bd., 2 full ba., slps. 6, fully eqpd. elec. kitch., microwv. & extras, frplc./wood, color TV, VCR, FM stereo, o/d Jacz., sauna; gm., rec. & lndry. rms., walk to shops, lifts; spec. midwk. rates. 249-8524.
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.
MAZATLAN, week of 10/11-18, 7 nites, Pueble Bonito resort, 1 bd., sleeps 6, on the beach, partial kitchen, airfare not included, $1,050. 626/917-0231.
OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.
PACIFIC GROVE house, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kitchen w/microwv., beaut. furn., close to golf, beaches, 17 Mile Drive, Aquarium, Cannery Row, JPL discount. 626/441-3265.
PALM DESERT, exquisite, 2 bd., 2 ba. villa for vacations or long term, newly remodeled, w/skylight, patio & 2-car gar.; located across the Living Desert, great private, secure resort w/tennis cts., multiple pools & spas and 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., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
SAN FRANCISCO, Nob Hill honeymoon suite (sleeps 2 max), full kitchen, maid, concierge, $125/nite; $750/wk. 626/797-3156.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., slps. 12+, 2-lev. frplacs, decks overlk. priv. dock/ski lifts, gourm. kitch., bikes, boats, color TVs, VCR, ster. w/tape/disk, pools, hot tub & bch.; tennis, 10 min./skiing, casinos/golf, 1 hr./wine cntry; $995/wk. hi seas. [15 June to 15 Sept; 22 Nov. to 1 March]; + $90 clean fee; 3-day min. 626/578-1503, Jim Douglas.

NOTICE TO ADVERTISERS

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

Universe

Editor
Mark Whalen

Photos
JPL Photo Lab

Universe is published every other Friday by the Public Affairs Office of the Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109.

Advertising is a free service offered only to JPL, Caltech and contractor employees, retirees and immediate families.

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.