Jet Propulsion Laboratory

Universe

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Public goes wild about science

A model of the Pathfinder lander and Sojourner rover was but one of the popular attractions at the Laboratory's annual open house May 30-31. Twenty-seven thousand attended on Saturday, with another 25,000 visitors on Sunday, an all-time record for the weekend.

New DS1 trajectory selected

Near-Earth asteroid will be flyby destination; launch set for Oct. 15

By JOHN G. WATSON

Mission planners for JPL's Deep Space 1 have selected a near-Earth asteroid, 1992 KD, as a flyby destination.

Last April, NASA announced that the launch date for this technology validation mission was to be rescheduled from July 21 to Oct. 15, with the launch period extending to Oct. 30. The new launch date precluded flying by planned destinations, including the previously announced asteroid McAuliffe, making it necessary to choose a new target. Deep Space 1 is scheduled to fly by the newly chosen asteroid 1992 KD on July 28, 1999.

This asteroid was chosen from more than 100 flyby possibilities. Its elliptical orbit curves within and outside of Mars' orbit of the sun, at its farthest going out more than three times farther from the sun than Earth. Although scientists believe its diameter is approximately three kilometers (1.9 miles), they know little else about the body. With this flyby, they can learn more about its shape, size, surface composition, mineralogy, terrain and rotation speed.

"This new mission offers excellent opportunities for us to test our payload of advanced technologies that are so important for future space exploration," said Dr. Marc Rayman, Deep Space 1's chief mission engineer. "At the same time, the mission itself will be an impressive demonstration of the capability of these technologies, while the potential for bonus scientific return is extraordinary."

Deep Space 1 is the first launch of the New Millennium Program, a series of missions designed to test new technologies so that they can be confidently used on science missions of the 21st century. Among the 12 technologies that the mission is designed to validate is an ion propulsion engine that fires electrically charged xenon atoms from its thrusters; this is the first time it has ever been used as the primary propulsion system in deep space. Also being tested are autonomous optical navigation, a solar concentrator array and an integrated camera and imaging spectrometer.

The last instrument, also known as the Miniature Integrated Camera Spectrometer, or MICAS, will be validated by making science observations of asteroid 1992 KD, among several other methods. The flyby will also help to test both a miniature integrated ion and electron spectrometer instrument, also termed the Plasma Experiment for Planetary Exploration (PEPE), and the spacecraft's autonomous optical navigation system. The remaining new technologies will be tested during cruise and thrusting phases both before and after the flyby.

By October 1999, Deep Space 1 will have completed its mission of demonstrating new technologies and will be on a trajectory to encounter Comet Borrelly, one of the most active comets that regularly visit the inner solar system.

Further information about Deep Space 1is available at http://nmp.jpl.nasa.gov/ds1/ . ❑

JPLers part of team discovering possible extrasolar planet

NASA's Hubble Space Telescope has given astronomers their first direct look at what is possibly a planet outside our solar system—one apparently that has been ejected into deep space by its parent stars.

The discovery, made by Susan Terebey of the Extrasolar Research Corporation in Pasadena and her team—which included Deborah Padgett, Michael Brundage and Dave Van Buren of Origins Science Operations and Data Analysis, Section 728—using Hubble's Near Infrared Camera and Multi-Object Spectrometer (NICMOS), further challenges conventional theories about the birth and evolution of planets, and offers new insights into the formation of our own solar system.

Located within a star-forming region in the constellation Taurus, the object, called TMR-1C, appears to lie at the end of a strange filament of light that suggests it has apparently been flung away from the vicinity of a newly forming pair of binary stars.

At a distance of 450 light-years, the same distance as the newly formed stars, the candidate protoplanet would be 10,000 times less luminous than the sun. If the object is a few hundred thousand years old, the same age as the newly formed star system from which it appears to have been ejected, then it is estimated to be two to three times the mass of Jupiter, the largest gas giant planet in our solar system.

Also possible is that the object is up to 10 million years old, the same age as other young stars nearby, in which case it may be a giant protoplanet or a brown dwarf star. A brown dwarf star is a small star that has failed to sustain nuclear fusion.

The candidate protoplanet is now 209 billion kilometers (130 billion miles) from the parent stars and predicted to be hurtling into interstellar space at speeds up to 10 kilometers per second (20,000 mph)—destined to forever drift among the Milky Way's starry population.

Hubble researchers estimate the odds at 2 percent that the object is instead a chance background star.

"If the results are confirmed, this discovery could be telling us gas giant planets are easy to build. It seems unlikely for us to happen to catch one flung out by the stars unless gas giant planets are common in young binary systems," Terebey said. "The results don't directly tell us about the presence of any terrestrial planets like Earth. However, we believe gas giants do influence the formation of much smaller rocky planets."

Current models predict that very young giant planets are still warm from gravitational contraction and formation processes. This makes them relatively bright in infrared light compared to old giant planets such as Jupiter. Even so, young planets are difficult to find in new solar systems because the glare of the central star drowns out their feeble glow. Young planets ejected from binary systems would therefore represent a unique opportunity to study extrasolar planets with current astronomical technology.

The discovery also challenges conventional theories that predict gas giant planets take millions of years to coagulate from dust in space. Instead, it favors more recent ideas that large, low-density planets may condense out of gas very quickly, at the same time as their parent star.

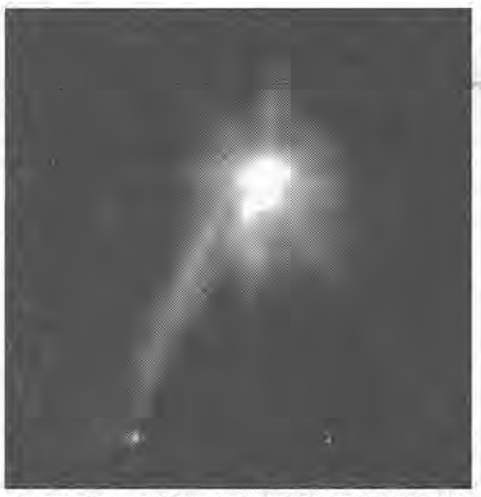

PHOTO COURTESY EXTRASOLAR RESEARCH CORP. AND SPACE TELESCOPE SCIENCE INSTITUTE

Hubble Space Telescope near-infrared image of newborn binary stars reveals a long thin nebula pointing toward a faint companion object that could be the first extrasolar planet to be imaged directly.

The candidate protoplanet was accidentally discovered by Terebey and colleagues while studying Hubble infrared images of newly formed protostars in a molecular cloud in Taurus. The exquisite sensitivity and sharpness of NICMOS clearly revealed the object's pinpoint image. However, it might have been dismissed as a background star if not for the presence of a bizarre 209-billion-kilometer (130-billion-mile-long) filamentary structure that bridges the space between the binary pair and the candidate protoplanet. ❑

MGS shows more evidence of abundant water, thermal activity in Mars' past

By DIANE AINSWORTH

New mineralogical and topographic evidence suggesting that Mars had abundant water and thermal activity in its early history is emerging from data gleaned by JPL's Mars Global Surveyor spacecraft.

Scientists are getting more glimpses of this warmer, wetter past on Mars while Global Surveyor circles the planet in a temporary 11.6-hour elliptical orbit.

Findings from data gathered during the early portions of this hiatus in the mission's orbital aerobraking campaign were being presented the last week of May at the spring meeting of the American Geophysical Union in Boston.

Among many results, the thermal emission spectrometer instrument team, led by Dr. Philip Christensen of Arizona State University, has discovered the first clear evidence of an ancient hydrothermal system. This finding implies that water was stable at or near the surface and that a thicker atmosphere existed in Mars' early history.

Measurements from the spectrometer show a remarkable accumulation of the mineral hematite, well-crystallized grains of ferric (iron) oxide that typically originate from thermal activity and standing bodies of water. This deposit is localized near the Martian equator, in an area approximately 500 kilometers (300 miles) in diameter.

Fine-grained hematite, with tiny particles no larger than specks of dust, generally forms by the weathering of iron-bearing minerals during oxidation, or rusting, which can occur in an

See MGS, page 3

Lab to initiate new badging, security processes

By MARK WHALEN

In an effort to update and streamline Laboratory security and access, the Security and Protective Services Section will soon begin an effort to issue new badges to all JPL personnel and install a state-of-the-art badge reader system.

Beginning June 15 and continuing for about a month, employees and contractors will be scheduled to have their pictures taken for the new badges, according to facility security officer Steve Wells. Based on the number of personnel, sections or divisions have already been scheduled, with makeup sessions available for those not at work during those times.

New badges will be issued in mid-to-late August.

See Badges, page 2

'Spe' calls it a career

Richard "Spe" Spehalski, program manager of the Cassini mission to Saturn and former manager of the Galileo mission, retired June 5, capping a nearly four-decade-long career at JPL in which he was responsible for the successful development and launch of two of NASA's most historic flagship missions to the outer planets.

In honor of his leadership of the Galileo and Cassini projects, Spehalski on June 2 was awarded NASA's highest honor, the Distinguished Service Medal, presented by NASA's associate administrator for space science, Dr. Wesley Huntress.

"Over nearly four decades, Spe has provided outstanding leadership to JPL flight projects and programs, including the management of Galileo and Cassini during critical phases of their development and flight," said JPL Director Dr. Edward Stone. "These two missions are the last great flagship planetary flights of discovery of the 20th century, and their success has been critical to support for a vigorous program of solar system exploration.

"The Laboratory, NASA and the nation owe Spe and the teams he led a debt of gratitude for their accomplishments. His personal leadership of the Cassini launch approval efforts, in particular, was heroic."

Richard Spehalski

Spehalski served as Galileo project manager from 1988 to 1990, and managed Cassini since 1992. He assumed responsibility for the entire international Cassini development program when NASA Headquarters gave formal program management oversight of the mission to JPL in 1993. Cassini was launched in October 1997, and the Galileo Mission to Jupiter was launched in October 1989.

Spehalski's other responsibilities at JPL have included management of NASA's Space Infrared Telescope Facility (SIRTF) pre-project from January 1990 until January 1992. He held key engineering and management positions on Galileo and on the highly successful Voyager missions to the outer planets, launched in 1977. He served on numerous other planetary exploration missions at JPL dating back to the Mariner mission to Venus in 1962. Spehalski joined JPL in 1959 as a mechanical engineer in the Lab's Mechanical Systems Engineering and Research Division.

Spehalski has received many other awards, including the NASA Exceptional Service Medal for his contributions to the Voyager Project, the NASA Medal for Outstanding Leadership for the Galileo Project, and two Aviation Week & Space Technology Magazine Laurel Awards for his work on Galileo and Cassini.

Born in DuBois, Pa., Spehalski earned a bachelor's of mechanical engineering degree from Cornell University in 1958. He and his wife, Nancy, plan to leave their home in Altadena to travel across the country in the months following his retirement. The Spehalskis have three sons, Steve, Mark and James, all of whom are professional engineers, and three grandchildren. ❑

New managers named for Cassini, Galileo

By JANE PLATT and MARY BETH MURRILL

Robert Mitchell has been named program manager of the Cassini mission now en route to Saturn and its moon, Titan. Mitchell replaces Richard Spehalski, who retired June 5.

Mitchell had served as project manager for the Galileo Europa Mission since December 1997. James Erickson, who was deputy project manager for the Galileo Europa Mission under Mitchell, has been promoted to project manager.

Since joining JPL in 1965, Mitchell has worked on spacecraft trajectory design, mission design and navigation for such planetary exploration projects as Mariner '67, Mariner '69, Mariner '71, the Viking mission to Mars and Galileo.

When the Galileo launch was delayed from January 1982 to October 1989, Mitchell led the development of numerous redesigns of the mission, and headed the NASA-honored team that developed the innovative Venus-Earth-Earth Gravity Assist (VEEGA) trajectory that gave the spacecraft the velocity boost it needed to reach Jupiter. Mitchell also received NASA Exceptional Achievement Awards for his work on navigation for the Viking mission to Mars and the mission design of the Galileo Project.

Bob Mitchell

Jim Erickson

Erickson has been Galileo deputy project manager since January 1998. Prior to that, he managed the Galileo Science and Sequence Office, served as deputy manager of the Galileo Engineering Office, and was the Galileo sequence team chief. Since joining JPL in 1974, Erickson's assignments have included development and operations of ground systems for the Viking and Voyager projects, flight and ground telemetry system design for Galileo, and project ground data system engineer on the Mars Observer mission. ❑

Galileo finds strange interior for Callisto

By JANE PLATT

New data from JPL's Galileo spacecraft have prompted scientists to modify their concept of the interior structure of Jupiter's moon Callisto. The new findings, published in the June 5 issue of the journal Science, were presented June 8 at the American Astronomical Society meeting in San Diego.

"Previous Galileo data had indicated that Callisto's interior was totally undifferentiated," said JPL planetary scientist Dr. John Anderson. "But new information suggests Callisto has a strange interior—it's not completely uniform nor does it vary dramatically. There are signs that interior materials, most likely compressed ice and rock, have settled partially, with the percentage of rock increasing toward the center of Callisto."

The new information was collected during Galileo's third Callisto encounter in September 1997. Anderson reported on the findings along with UCLA geophysics and planetary physics professor Gerald Schubert, a Galileo gravity investigator, and Dr. William Moore, also of UCLA; and Dr. Robert Jacobson, Eunice Lau and William Sjogren of JPL.

Scientists now believe that Callisto has evolved differently than the other largest Jovian moons—Io, Ganymede and Europa, which have differentiated structures with separated layers. There is strong evidence that Ganymede is separated into a metallic core, rock mantle, and ice-rich outer shell, while Io has a metallic core and a rock mantle but no ice.

"Because Io, Ganymede and Europa are closer to Jupiter, they have been more affected by gravitational squeezing and subsequent heating," Schubert said. "Over time, the forces exerted on the three inner moons have caused different constituents such as water ice, rock and metal to separate into different layers. However, because Callisto is farther from Jupiter, it is 'half-baked' compared to the other moons, with its ingredients somewhat separated but still largely mixed together," he said.

Scientists had previously reported a differentiated interior for Europa, consisting of a metallic core surrounded by a rock mantle and a water ice-liquid outer shell. They are now refining the model by studying the newest Galileo data, including that gathered during the closest-ever Europa flyby in December 1997, at an altitude of 205 kilometers (127 miles). ❑

Badges

Continued from page 1

The badges will include a new design as well as a video-capture picture of the employee, Wells said. In addition, new technology will allow for the direct printing of pictures to the badges, eliminating the need for the laminate on current badges and creating more durability.

Badges will be read by a new access control system, or badge readers, which will no longer come in contact with the badges. Rather than inserting the badges into the machine, the new system will require badges to be placed within about four inches of the reader. Within the badge will be a passive chip that will be triggered by the reader for instantaneous identification of the employee.

For those who enter the Laboratory in a vehicle, a similar reader will be installed at each entrance. Drivers and passengers will have to place their badges within two and a half to three feet from the readers.

The new system, Wells added, will be a big improvement over the current badge readers, which search for a person's identification by accessing a mainframe computer and awaiting a response. When many employees access a badge reader in a short period of time, or when someone hasn't accessed the system in a while, the readers sometimes create delays at entrance gates.

"The new system will have about 10 times as much memory within the readers," he said.

"The projection is that long lines at the gates for both vehicles and pedestrians will be eliminated," added Joe Charles, Section 665 manager.

New badges will clearly identify whether the badge holder is an employee or has resident or nonresident status. Also indicated will be drive-on privileges and other security clearances, such as access to secure buildings and areas.

OAO Corp. will begin to install new badge readers in late August, when new badges are scheduled to be distributed. Wells said there will then be a transition period of about three months until all readers are installed and when personnel should carry both old and new badges.

New badge readers will be installed first at entrance gates, followed by those at secure buildings such as the Space Flight Operations Facility (230) and others.

Concurrent to picture taking, Wells said, will also be a requirement for staff to reapply for internal badge readers—those that allow access to secure buildings and other areas. "We want to make sure that those who need them have them and those who don't need them don't have them," he said. "We also need to confirm that the owners of badge readers are comfortable with those who have access to their areas. We are starting from ground zero with a new access control system, and want to start with clean information."

Staff members will reapply for badge reader access to secure areas via the Internet at http://jpl-facilities.jpl.nasa.gov/665/rebadge.htm.

"Once this rebadging process is over, the home page will become the standard for applying for a new badge reader," Wells said. "It will remain to replace the paper-based approval process we have now."

Another issue associated with the new badges is the fact that about 500 people at JPL now carry separate badges that allow access to other NASA centers. The new badge will have the NASA badge on the back side.

Charles said the new NASA/JPL prime contract also requires all Laboratory personnel to make their badges visible at all times by displaying them above the waist.

"We want to make a badge that is attractive enough that every employee would want to wear it, rather than putting them in their pockets," he said. ❑

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.

HIV Support Group—Meets quarterly. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 for more information.

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.

Tuesday, June 16

"Prostate Cancer: From the Perspective of a Survivor and Physician"—Occupational Health Services presents Dr. Lowell Erwin, medical director and chief executive officer of the Cancer Detection Center. At 11:30 a.m. in von Kármán Auditorium.

Wednesday, June 17

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

JPL French Club—A slide show on France's Mont St. Michel will be presented during the club's meeting at noon in Building 183-328.

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

Thursday, June 18

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

JPL Dance Club—Clogging class will be held at noon in Building 300-217.

New Timekeeping System—New Business Solutions will make this presentation from 8:30 to 10 a.m. in von Kármán Auditorium.

OAODNS Open House—Celebrate the opening of the OAODNS Desktop and Network Services Control Center, 505 W. Woodbury Rd., from 1 to 4 p.m. Light refreshments will be served.

Von Kármán Lecture Series—Dr. John Trauger, principal investigator for the Hubble Space Telescope's Wide Field and Planetary Camera-2, will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, June 19

CEC Wine and Dessert Tasting—The Child Educational Center's annual fundraiser offers desserts from local bakeries, a selection of California wines, live jazz and a casino room for gaming entertainment. Held at Caltech's Athenaeum from 7 to 11 p.m. Tickets are $30. Call ext. 4-3418.

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

Von Kármán Lecture Series—Dr. John Trauger, principal investigator for the Hubble Space Telescope's Wide Field and Planetary Camera-2, will speak at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Tuesday, June 23

Pseudorandom Numbers—Dr. Michael Mascagni, coordinator of the Ph.D. program in scientific computing and associate professor of mathematics at the University of Southern Mississippi, will discuss the Scalable PseudoRandom Number Generators (SPRNG) library. At 2:30 p.m. in the Building 167 conference room.

Wednesday, June 24

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

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

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room.

Web Publishing at JPL—Jeanne Holm of Section 174 will discuss creating effective, user-friendly home pages that satisfy all of JPL's regulations. Highlights include appropriateness of information; design for an external audience; export and copyright issues; site approval for external accessibility; and a list of contacts for help. At noon in von Kármán Auditorium.

Thursday, June 25

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

JPL Dance Club—Clogging class will be held at noon in Building 300-217.

GRACEful instrument

During a recent visit to JPL by Dr. Ghassem Asrar, the new associate administrator for NASA's Earth Sciences Enterprise (left), Charley Dunn of Section 335 describes how the Lab will test micron-level precision of the microwave ranging system that is the basis of the Gravity Recovery and Climate Experiment (GRACE) Mission. Dr. Charles Elachi, JPL's director for Earth and Space Science Programs, looks on. The twin GRACE satellites are an example of a new breed of integrated spaJcecraft that are part of the Earth System Science Pathfinder (ESSP) program. Flying 200 kilometers (124 miles) apart, the satellites together will measure changes in the Earth's gravity field every 30 days for five years starting in 2001.

NSCAT reveals new clues about El Niño's influence on west coast

By MARY HARDIN

In-depth study of satellite data obtained at the onset of the 1997-98 El Niño event has given scientists more conclusive evidence that the unusual warming of waters along the equator and the west coast of the U.S. was linked to changes in wind patterns in the Pacific ocean.

Using measurements taken by the NASA Scatterometer (NSCAT) in early 1997, scientists confirmed that an unusual weakening of the trade winds preceded an increase in sea surface temperatures along the central and eastern equatorial Pacific, according to Dr. W. Timothy Liu, the NSCAT project scientist at JPL. "With NSCAT we are able to see the whole El Niño picture, and we now know that the unusually high ocean temperatures at the equator, along the North American coast and off of Baja, Mexico are all linked together because of the winds," Liu said.

Liu presented his findings last week at the American Meteorological Society's Conference on Satellite Meteorology and Oceanography in Paris.

An El Niño condition is thought to be triggered when steady westward blowing trade winds weaken and even reverse direction. This change in the winds allows the large mass of warm water that is normally located near Australia to move eastward along the equator until it reaches the coast of South America.

"The collapse of the trade winds and the depression of the thermocline (cooler water) resulted in an increase of sea surface temperature and sea surface height in early 1997, and this interaction appears to be the typical mechanism of equatorial changes associated with an El Niño," Liu explained.

In addition to measuring the beginning of El Niño along the equator, NSCAT also revealed that, when the trade winds weakened, an unusual low-pressure system with cyclonic (counterclockwise) circulation moved toward the North American coast. NSCAT observed that winds branched off from the equator, bypassed Hawaii, and brought heat and moisture from the tropical ocean towards San Francisco via a route often called the "Pineapple Express."

"This moist and warm air from the south kept evaporation low and the ocean water warmer than normal near the North American coast," Liu suggested. "This change brought with it strong ecological changes, such as the tropical fish caught off the coast of Oregon and the deaths of sea lions on the Channel Islands in California."

Images based on El Niño observations are available at http://www.jpl.nasa.gov/elnino . ❑

SeaWinds shipped for QuikScat integration

By MARY HARDIN

A major milestone has been reached in NASA's development of "faster, better, cheaper" space missions with the delivery of the SeaWinds instrument, NASA's next generation El Nino monitoring device, to Ball Aerospace in Boulder, Colo. for integration onto the Quick Scatterometer (QuikScat) satellite.

The launch is scheduled for November 1998 from Vandenberg Air Force Base on a Titan II launch vehicle. "One of the real challenges of this mission is having to do it in a year. This delivery of the instrument to Ball Aerospace, the satellite contractor, is a major milestone that signifies that we are on schedule and headed to our one-year goal," said Jim Graf, QuikScat project manager at JPL. "This is the first major JPL Earth science mission to have a development time of approximately one year, from approval to launch, since the Explorer 1 satellite in the late 1950s. This mission certainly personifies the new NASA of 'faster, better, cheaper'—it is faster in that we are on an one-year mission development cycle, better in that the instrument will provide enhanced coverage over its predecessor, and cheaper in that we are using a commercially developed bus to reduce our development costs."

The SeaWinds instrument on the QuikScat satellite is a specialized microwave radar that measures both the speed and direction of winds near the ocean surface. Winds directly affect the turbulent exchanges of heat, moisture and greenhouse gases between the atmosphere and the ocean. Changes in the winds along the equator play a key role in the formation of the El Nino phenomenon in the Pacific Ocean. The National Oceanic and Atmospheric Administration (NOAA) is also supporting the mission and will use the data for improved weather forecasting and storm warning, especially hurricanes and typhoons.

SeaWinds on QuikScat will use a rotating dish antenna with two microwave beams and will radiate microwaves across 90 percent of the Earth's ice-free oceans every day. The instrument will collect wind-speed and wind direction data in a continuous 1,800 kilometer-wide (1,118 mile-wide) band, making approximately 400,000 measurements each day.

The QuikScat mission will restart the ocean wind data stream that was lost when the Japanese Advanced Earth Observing Satellite (ADEOS) with the NASA Scatterometer onboard ceased functioning in June 1997.

JPL's NSCAT/SeaWinds Program Office has been assigned responsibility and provides overall project management, as well as science ground processing systems and the SeaWinds instrument. NASA's Goddard Space Flight Center manages the satellite development that is being designed and fabricated by Ball Aerospace & Technologies Corp. ❑

Lab working toward ISO 9001 compliance

By MARK WHALEN

JPL management has decided to adopt the ISO 9001 standard as the basis for the Laboratory's product delivery system—a decision that will eventually impact almost every JPL employee.

All NASA centers and Headquarters are required to be ISO 9001 registered by September 1999, and JPL has scheduled its certification by April 1999.

JPL Chief Engineer John Casani is the management representative responsible for the definition, development and implementation of ISO 9001 at JPL. Richard Brace of the Office of Engineering and Mission Assurance, reporting to Casani, is leading the ISO 9001 implementation core team.

The process began this February when Det Norske Veritas (DNV) of Norway, one of the leading international ISO certification organizations, came to JPL for a preliminary visit.

DNV's pre-registration audit is scheduled for the week of Nov. 16, 1998; the audit that will certify JPL compliance with ISO 9001 will occur in late March 1999.

Some questions and answers about JPL's ISO 9001 implementation:

How will the Laboratory prepare for its certification?

Four rounds of internal assessment training sessions will be held. Each round will involve about 10 percent of JPL employees, those who would be most affected by the new standards. The first session will begin the week of June 15, while others are scheduled during one week in July, August and September.

Each of the four sessions will have a different focus, the first of which will be to impart a high-level understanding about process-based management, fundamental ISO concepts and the documentation structure to be put in place that will satisfy the above.

About 100 JPL employees have been trained to serve as assessors to familiarize others at JPL with the requirements.

What is the background of ISO 9001?

ISO is the International Standards Organization, which includes more than 90 member countries. The ISO 9000 family is a set of standards that provide guidance for the implementation of quality systems in industry; ISO 9001—Quality Systems: model for design/development, production, inspection, test, acquisition, etc.—will be the specific standard used for the JPL product delivery system. ISO 9001 is the most detailed, comprehensive set of standard requirements in the ISO 9000 family.

ISO brochures will be available for employees in section offices on Monday, June 15.

How is ISO 9001 different?

The ISO 9001 standard is new in both its breadth and depth of approach. The old NASA/JPL quality standard concentrated on ensuring that products as manufactured met their design specifications and that prescriptive (how-to) approaches were defined. ISO 9001 assumes that quality is affected by 20 specific elements, including requirements definition, design and control.

ISO 9001 does not specify how to achieve a quality product. Rather, it specifies the requirements on the processes used to produce the product. It will be left to JPL and its industrial partners to document, implement and record the specific processes and procedures that will ensure quality products. The familiar ISO mantra is:

Say what you do: Document processes, procedures and work instructions.

Do what you say: Follow processes, procedures and work instructions.

Prove it: Maintain necessary records, monitor for compliance and take corrective action.

ISO is a management philosophy; it is a way JPL will approach managing the work it does, which is managing by process, not by people.

How will employees be impacted?

JPL's implementation of ISO 9001 will apply to all processes whose product or service is important to achieving the strategic goals of the Laboratory.

The scope of compliance to ISO 9001 includes all work done at JPL—the design, production and operation of space and ground systems, related research and technology development, science activities and the institutional processes required to support them.

Initially, the focus of the effort will be in the process areas where JPL moves hardware and software deliverables to its customers.

Can ISO standards contribute to continuous improvement?

The Laboratory needs to assure that processes are documented, that the documentation is useful and helpful, and that people use it. If people don't use the documentation, the problem could be with the documentation or the process. The internal assessments will provide information and guidance on how improvements can be made.

How is ISO compliance certified?

Organizations that provide products or services to customers seek registration, whereby ISO-accredited third-party registrars, such as DNV, issue certificates of registration signifying that organizations' processes conform to ISO requirements or processes. After initial certification, the third-party registrar conducts periodic audits approximately every six months thereafter. Any non-conformance must be promptly corrected in order to maintain certification.

At least two JPL subcontractors (Lockheed Martin Astronautics and AlliedSignal Technical Services Corp.) and three NASA centers (Johnson Space Center, Kennedy Space Center and Marshall Space Flight Center) are currently ISO 9001 registered.

Where can employees learn more about JPL's ISO 9001 certification?

Go to JPL's ISO 9000 home page at http//iso or call Brace at ext. 4-7061. ❑

MGS

Continued from page 1

atmosphere at low temperatures. The material has been previously detected on Mars in more dispersed concentrations and is widely thought to be an important component of the materials that give Mars its red color. The presence of a singular deposit of hematite on Mars is intriguing, however, because it typically forms by crystal growth from hot, iron-rich fluids.

Meanwhile, the Mars Orbiter laser altimeter instrument is giving mission scientists their first three-dimensional views of the planet's north polar ice cap.

Principal Investigator Dr. David Smith of NASA's Goddard Space Flight Center, Greenbelt, Md., and his team have been using the laser altimeter to obtain more than 50,000 measurements of the topography of the polar cap in order to calculate its thickness, and learn more about related seasonal and climatic changes.

These initial profiles have revealed an often striking surface topology of canyons and spiral troughs in the water and carbon dioxide ice that can reach depths as great as 1 kilometer (3,600 feet) below the surface. Many of the larger and deeper troughs display a staircase structure, which may ultimately be correlated with seasonal layering of ice and dust observed by the Viking mission orbiters in the late 1970s.

The laser data also have shown that large areas of the ice cap are extremely smooth, with elevations that vary only a few feet over many miles. At 86.3 degrees north, the highest latitude yet sampled, the cap achieves an elevation of 2 to 2.5 kilometers (6,600 to 7,900 feet or 1.25 to 1.5 miles) over the surrounding terrain. The laser measurements are accurate to approximately one foot (30 centimeters) in the vertical dimension.

In June, the ice cap's thickness will reach a maximum during the peak of the northern winter season. Thickness measurements from April will be compared to those that will be taken in June, contributing to a greater understanding of the Martian polar cap's formation and evolution.

In addition, the Global Surveyor accelerometer team, led by Dr. Gerald Keating of George Washington University, Washington, D.C., has discovered two enormous bulges in the upper atmosphere of Mars in the northern hemisphere, on opposite sides of the planet near 90 degrees east latitude and 90 degrees west longitude. These bulges rotate with the planet, causing variations of nearly a factor of two in atmospheric pressure, and systematic variations in the altitude of a given constant pressure of about 12,000 feet (four kilometers).

For further information, see http://mars.jpl.nasa.gov/mgs. ❑

Dr. R. Rhoads "Rhody" Stephenson, deputy director, Technology and Applications Program, left; Alice Wessen, outreach specialist, Commercial Technology Program; and Arif Husain, NASA technology utilization officer, were among the attendees at the dedication of JPL's commercial technology showroom last month.

Commercial technology showroom unveiled

JPL's commercial technology showroom, located in Building 180-401, made its debut last month.

The colorful room features exhibits of products that have been successfully developed in recent years with the assistance of the Commercial Technology Program's many technology transfer activities.

"This is a wonderful way to let JPL's many constituencies know about the way that space technology can help meet American business needs," explained Wessen, who oversaw the showroom's design and production.

Products on display include a table-top model of the E-Lite system, which is designed to warn motorists of approaching police chases, fire engines or ambulances through sophisticated traffic signals linked to transponders in government vehicles. Also on view is Mattel, Inc.'s Hot Wheels Sojourner Mars Rover Action Pack Set; the Dubbs & Severino terrain mapping system to help pilots of small planes; and the Photobit "camera on a chip," needing only 1/100 the battery power of the conventional CCD video camera, among many other exhibits.

"Visitors to the Lab, including business people who are considering working with our various technology transfer programs, now have a way of seeing a broad selection of JPL's many successes first-hand," said Merle McKenzie, manager of the Commercial Tech-nology Program. "We're proud of these successes and of this showcase exemplifying the important role that the space program plays in the advancement of American industry." ❑

New timekeeping training starts later this month

By TIM SCHECK
NBS communication manager

The New Business Solutions training team has worked with liaisons in each major Lab organization to establish a training schedule for exempt and non-exempt timecard training on the new electronic timekeeping system. Timekeeping will be rolled out to the Lab over a six-week period, and where specific preferences for time slots have been indicated for an organization, the team has made every attempt to accommodate them.

Organizations will be converted to the electronic system for exempt timecards beginning the week of June 29. Organizations have been grouped by week and will be trained on Fridays in demonstrations given in von Kármán Auditorium according to the schedule below.

Subject matter experts (SMEs) within each organization will be specially trained in timekeeping procedures in advance of their respective organizations. They will be ready to coach and help with the new procedures beginning the week that their organization is trained and goes live. Thirty two individual hands-on classes will be offered over a two-week period beginning the week before timekeeping is rolled out to the first group of organizations.

Each SME will be given access to a training database to practice exempt timecard entry so that they can gain the necessary expertise before their organization is trained.

Non-exempt timekeeping will be rolled out to the Lab over the last two weeks of the timekeeping training schedule. Organizations have been divided into two major groups and will be trained in demonstrations on two Mondays in von Kármán Auditorium.

SMEs will be trained in non-exempt timekeeping during each of the weeks directly before their organizations are trained. Multiple offerings of an approximately two- to three-hour hands-on class will be available beginning the week before non-exempt timekeeping training is offered to the Lab at large.

SMEs will work in concert with Institutional Business Systems customer support and the JPL timekeeping unit to support the transition of the Lab to the new electronic timekeeping system. ❑

Timekeeping training schedule

Sequence in timekeeping rollout	Week 0 *6/22-26*	Week 1 *6/29-7/2*	Week 2 *7/6-10*	Week 3 *7/13-17*	Week 4 *7/20-24*	Week 5 *7/27-31*	Week 6 *8/3-7*
Exempt timecard training (Friday demos in von Kármán)		17x, 18x, 19x, 300x, 5x, 62x, 7x	109x, 2x, 38x, 60x, 8x	34x, 64x, 9x	10x, 107x, 31x, 390x, 393x, 394x, 4x	32x, 33x	302x, 303x, 304x, 35x, 391x, 395x, 66x
Non-exempt timecard training (Monday demos in von Kármán)						109x, 17x, 18x, 19x, 2x, 300x, 34x, 38x, 5x, 60x, 62x, 64x, 7x, 8x, 9x,	10x, 107x, 31x, 390x, 393x, 394x, 4x, 32x, 33x, 302x, 303x, 304x, 35x, 391x, 395x, 66x
Subject matter expert hands-on classroom training	Exempt timek'ping 1-2 hr. class; 20 offered (T, W, F) for Orgs. 17x, 18x, 19x, 300x, 5x, 62x, 7x plus open enrollment across orgs. for balance of slots	Exempt timek'ping 1-2 hr. class; 12 offered (T,W), open enrollment for all orgs.			Non-exempt timek'ping 2-3 hr. class; multiple offerings (T, W, Th) for Orgs. 17x, 18x, 109x, 19x, 2x, 300x, 34x, 38x, 5x, 60x, 62x, 64x, 7x, 8x, 9x	Non-exempt timek'ping 2-3 hr. class; multiple offerings (T, W, Th) for Orgs. 10x, 107x, 302x, 303x,304x, 31x, 32x, 33x, 35x, 390x, 393x, 394x, 4x	

LETTERS

Thank you to all who participated in my retirement party on June 2. It was a very special event for me and my family that I will always remember. Special thanks to Barbara Short, who organized the party; to emcee Tom Gavin; and to the many others who contributed their time and talents. The performance of the combined Galileo "Not Ready for Real Time" players and Cassini "Virtual" singers was a real hit and appreciated by all, especially me. See you in 2004.

Richard Spehalski

❑❑❑

I want to thank everyone for the wonderful party and gifts I received upon my departure from JPL. I feel very honored to have been given the opportunity to work in such an exciting and challenging environment. I have truly enjoyed working here and will miss all of you. Continue to make your dreams come true! Fondly,

Ann Marquez

FOR SALE

AIR CONDITIONERS (2), Sears Kenmore window units, each 13,000 btu (each cool up to 750 sq. ft.), 115V standard house AC, includes mtg hardware, 4 yrs. old; $200/ea. 805/296-0147, after 6 p.m.

BED FRAME, brass, white, full sz., $50; oak nightstand, $20; wicker chest, $10. 763-5550.

BEDSPREAD, double, eggshell/ivory, classic windowpane quilted, brand new; pd. $125, sell $70. 909/593-4046 (La Verne).

BICYCLE, kid's 13" Trek Mountain Lion 60, 20" x 1.95 tires, Shimano drivetrain and brakes, $105. 952-7434.

BICYCLES: specialized 1991 Allez, 24-in. carbon fiber frame, Suntour 12-spd. shifters, very light and stiff, choice of triathlon or std. drop bars, Look pedals, $420 firm; Schwinn Voyager touring bike, 20-in. frame, 27-inch alum. wheels, women's saddle, 18 speeds, bottle cage, rear rack, blue, w/choice of drop or upright handlebars, exc. cond., $175 firm; Fuji 12-spd., 23 inch frame, gd. cond. alum. wheels, Suntour shifters, $100 firm. 626/794-0886, Ted.

CANDLES, boxes of 12, 12" & 8", various colors, $6/box. 626/398-4960.

CANISTERS ceramic, for tea, sugar, coffee, two 5" diameter and two 6" diameter, white w/ blue flower designs; all four for $13/obo. 626/568-8298.

CELL PHONE ACCESSORIES, conditioning charger and 2 NiMH batteries for Audiovox models MVX401/405/406, $50. 909/393-9586.

CHAIR, leather club, burgundy, $200. 626/795-6538.

CHINA, (6) Noritake 5-piece placesettings (Rothschild design). $200. 626/403-9002.

COMPUTER CD software for Macintosh, call for list, all $25 and under. 790-3899.

CYCLE, adult, 3-wheel, 2-seater, side to side tandem, 3 spd., dual control, immac., sacrifice, pd. $1,200, sell $350/obo. 805/251-7616.

DESK, perfect for home office, new, still in box, $300. 626/403-9002.

DRESS, for flower girl, sz. 7/8, white chiffon, trimmed in white satin w/detachable peach/white flowery bow, peach/white flowery crown; white satin gloves, sz. 7/8 and white satin basket; must see to apprec., $100. 626/798-0033.

FUTON, pine, twin w/mattress, $75. 626/796-6971.

KENNEL (sky) for lg. dog, 30" high x 36" long x 24" wide, $35. 790-3299.

MEAT GRINDER/CHOPPER/GRATER/SHREDDER (prof.), orig. $500, sell $120/obo. 626/398-4960.

MOVING SALE, black (pillowed back) sofa and loveseat w/fine rose and teal lines, gd. cond., $270; matching dining table w/smoked glass and 4 chairs, vg cond., $275; entertain. ctr., black w/mirrored front, exc. cond., $300; two end tables, smoked glass tops, black and brass stands, $50; cocktail table (no glass) free with end tables; wall unit, plywood, 7 open shelves, $50. 626/858-9730.

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

PAVERS (pavement bricks), 1/2" thick, red, 4" x 8" x 0.5", perfect for walkways, quantity of 550, $0.13 ea. or $70 for the whole set/obo. 626/568-8298.

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

PRINTER, Panasonic KX-P2023, 24-pin, tractor feed, line printer, like new, w/manual and software + box of feed paper, $55. 626/398-4960.

RECORDS, approx. 225 12-in. singles in fair cond., new wave and funk dance music mostly from the '80s; $50/obo. 626/969-9276.

SOFA & LOVESEAT , light gray, gd. cond., $150. 626/403-9002.

SOFTWARE: Snappy Video 3.0, brand new, $49 (never used); Adobe Photodelux, new, $20; Microsoft Word (new, in pkg.) full version $49, upgrade $35; COLOR SCANNER, flat top, brand new, $79; LAPTOP, new, modem, 12.1" active matrix, 2.1 GB HD, 16 MB RAM, all bells/whistles, $1,200 firm, used only twice. 626/335-4409.

SPRINKER VALVE ADAPTERS, Lawn Genie automatic, model 756LG 3/4, new, $10/ea. 790-3899.

STAIR STEPPER, Quantum, w/digital display (shows calories burned, etc)., vg cond., $45; SKYLIGHT, Gordon, 4' x 4' curb-mount, new in box, $80/obo. 626/794-6860, eves.

SWEATER, Coogi, from Australia, new, $325 at Nordstrom; sell $100. 790-3899.

TABLE, round 42" dinette, w/smoked glass and 4 blue velour chairs, one chair needs work, $65/or table only $55; color TV, 13", working cond. w/gd. picture, $35. 626/357-6155.

TEACUPS, Franciscanware, desert rose pattern, $7/ea. 626/398-4960.

TELESCOPE, 4.5" equatorial reflect Meade telescope model 4500, exc. cond., rarely used, in box w/owner manual, $300/obo. 626/791-0075.

TICKETS, Dodgers, season location, 7/24, 7/26, 8/11, 8/25, 8/27, 9/16. 626/445-7443.

TIRES, new set of mounted BF Goodrich 6-lug, 16" radial longtrail t/a, for 4x4 Suburban or 4x4 Chevy pickup; retail value $2,000, sell for $800. 626/797-6196

TIRES, new set of mounted Dunlop 6-lug, 225/75, 15" GrandTrek, for Toyota 4Runner or any 6-lug, 4WD vehicle; retail value $1,000, sell for $400. 626/797-6196?????

TREADMILL, $175. 963-9969.

TV, color, Sharp brand, 13", works fine, $30. 626/795-8340.

TY BEANIE BABIES: Princess and Erin bear, $150 for the pair. 626/282-5380, Bertie, after 7p.m.

TY BEANIE BABIES: 5 bears, Princess Diana, Peace, Curly, Valentino, '97 Christmas bear, $150. 963-9969.

WASHER, family sz., $130; REFRIGERATOR, $80, DINING TABLE/CHAIRS, new, $150; COFFEE TABLE, new, $60; VACUUM CLEANER, new, $45; LOUNGES (2), vg cond., $60/ea.; visiting scientist departing JPL. 626/432-6850.

WASHER, top of the line Whirlpool (2 speeds, 4 cycles, perm. press), needs new motor, $25/obo. 626/568-8298.

WASHER/DRYER, Whirlpool washer lg. capacity, temp. sensor, Kenmore dryer lg. capacity; both 4 yrs old, $150/ea. 626/792-4553.

AUTOS / BOATS / MOTORCYCLES / RVs

'70 CHEVROLET El Camino, 350, orange, big tires, exc. interior seats, 82,400 mi., $3,500. 626/914-6083.

COLUMBIA 24 sailboat w/North Sail roller fur line, genoa, 15 hp, lower end rebuilt, built-in sink and ice chest. 909/986-1931.

'96 FORD Explorer XLT, wht., V6, full pwr., 22K mi., running brds., exc. cond., $20,500/obo. 249-0469.

'92 FORD Explorer XLT, 1 owner, lt. tan, 73K mi., a/c, auto, pwr. windows/locks/steering, tilt, cruise, clean, exc. cond., new tires, $11,500. 248-6980.

'91 GEO Storm, 73K, dark blue, 5 spd, A/C, AM/FM/cass., gd. cond., fun to drive, $3,900. 893-6084.

'89 GMC Suburban SL, a/c, ps/b, 3/4 ton, towing pkg., etc., 86,000 orig. owner mi., new tires, recent upper eng. rebuild, exc. cond., $8,200/obo; '89 BAYLINER Capri 1950 bow-rider, inboard/outboard, 4 cyl. GMC marine eng., AM/FM cass., >30 hrs. total run time, exc. cond., orig. owner, incl. skis, ropes, vests, etc., $5,800/obo; both for $13,000. 352-4102.

'95 HONDA Accord EX, gold pkg., polished alloy rims, cass. & CD player, sunroof, green, tan int., super clean, 54,000 mi., $17,500. 549-9108, Mike.

'86 HONDA Accord, 4D sedan, 115 K mi., auto, A/C, AM/FM/cass., cruise, orig. owner, recent transmission/a/c compress/wat pump/CV boots, exc. cond, $2,999. 909/592-2279.

'85 HONDA Shadow 700cc, V-Twin, shaft drive, automatic valve adj., water cooled, exc. tires, low maint., reliable, gd. cond., red and black, $1,800. 626/794-0886, Ted.

'90 JEEP Cherokee Laredo 4 x 4, exc. cond., 4.0L, new tires, am/fm cass., tow pkg., all pwr, tinted windows, a/c, org. owner, very clean; $8,700/obo. 213/257-9732.

'85 JEEP Cherokee, 4WD, 2dr., manual, air, CD, 125K mi., new brakes, rebuilt trans., $3,200/obo. 626/577-9364, Ben.

'89 MAZDA MX-6 GT turbo, gray ext./burg. int., fast, moonroof, ABS, pwr. everything, trailer hitch, AM/FM/cass/10 CD, 75,000 mi., $5,000. 213/259-8604.

MAZDA 929, 75K mi., auto, leather, moonrf., a/c, am/fm/cass., tilt wheel, cruise, pwr. windows. 352-2502.

'78 MERCEDES 450 SLC coupe, professionally rebuilt eng. (<10k mi.), new fnt rotors, rblt. calipers, recent suspension parts, bushings, etc.; white exterior, parchment interior, everything works; long list of work done by owner; extra new dash, car cover, chrome rims; $8,000/obo. 891-2099, Peter.

'95 MITSUBISHI Mirage S coupe, great cond., only 22K mi., automatic, a/c, AM/FM/cass., pwr. steering, orig. owner; Kelley Blue Book listed as $9,710, sell for $7,500/obo. 626/405-2348.

'95 TOYOTA 4-Runner SR5, black, tan int., clean, 35,000 mi., a/c, alarm; pwr: steering, locks, windows, sunroof $22,000. 805/255-8216.

'93 TOYOTA Previa van, white, exc. cond., am/fm/cass., pwr. everything, well-maint., must sell, just bought new car, $10,000 firm. 626/339-8407.

'92 TOYOTA Previa LE minivan, exc. cond., pwr. windows, dual air cond., $9,250/obo. 626/966-8218 or 818/953-6774, pgr.

'87 TOYOTA Camry, exc. cond., visiting scientist departing USA, $2,750. 626/432-6850.

FREE

BABY ITEMS: bouncer, bathtub, ledges, clothes. 626/792-4696.

CHICKENS (2), young, to gd. home only, one might be a rooster. 626/798-0329.

FILL DIRT, clean, mostly gravel-like, you haul, several cu yds., take as little or as much as you like, located 3 blks ESE of NY/Hill, Altadena. 798 5152.

KITTENS, CATS: to gd. home, healthy, used to dogs. 626/791-0809.

WANTED

BABYSITTER/HOUSEKEEPER, flexible salary, must drive. 957-0252.

CARPOOLER, Arcadia/Temple City, 7:15-4:00. Ext. 4-1024, Shary DeVore.

SLOT MACHINE, brass cash register, old firearms & other antique Americana. 991-6811, Jerry.

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

LOST & FOUND

Lost: Gold JPL pen. Ext. 3-4050.

FOR RENT

ALTADENA/N. LAKE area condo, 2 bd., 1 3/4 ba., fireplace and upgraded kitch., custom closets, custom patio, community pool, parking, and storage; built in '81; very close to JPL, $975. 626/398-1988.

GLENDALE house, charming, 2 rms. avail. in grt. neighbh'd. (nr. GCC); cent. air/heat, fireplace, hardwd. floors, lg. bkyd. w/lemon tree; avail. 7/1, $550/ea. 243-5369, Stacey.

GLENDORA, young professional looking for same to split huge home w/lg. fenced yd in very quiet cul-de-sac, gardener incl., extra rm. is a fully equipped office, 20 miles/JPL, $425 + 1/2 expenses, pets OK. 626/335-4409.

MONTEREY PARK, bright, airy, spacious rm., lots of closet space + storage, quiet, tree-lined area, 15 min./Lab, $98/wk. 626-280-7659.

N. ALHAMBRA area, lg. 1-bd. duplex in gd. residental area, 700 sq. ft., clean, carpeted, 1-car gar.,stove, window a/c, refrig.; water, trash + gardener prov., $600. 818/683-9935, eves.

PASADENA, beau. condo to share, great loc., close to Old Town/Caltech, furn. master bd. w/attached ba., f/p, pool, Jacz. & sec. prking, water, gas and trash pd., avail. 7/18, $495 +1/2 elec. 626/405-2348.

PASADENA, E. Del Mar, across/Caltech, 1 bd. in nice 3-bd., 1 ba. townhouse; furn., lndry, shrd ba., all hse privileges, nice bckyd, garage, vg garden, no pets; long term prfrd, avail. July 1; $320 + 1/3 utils. 626/795-5284.

PASADENA, 1 bd. cottage w/priv. fenced yd., nr. Walnut/Hill, small, cute, H/W floors, new paint, new ba., st. prkng. only; $625 incl. water, stove, ref. 626/797-9765, Scott.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry rm., $129,000. 909/585-9026.

LA CRESCENTA house, 2 bd., 1 ba., above Foothill, $189,000. 541-0131, Gary or Sue.

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.

NORTH HILLS house, 4 bd. 2 1/2 ba., 2,450 sq. ft, cathedral ceiling, cent. vacuum, cent. air, fireplace, 30 min./JPL, great value at $199,000/obo. 893-6084.

WALKER BASIN, 50 mi. E. of Bakersfield, 4,000' mtn. new custom home, panoramic vws., 2,200 sq ft., 3 bd., 2 ba., on 2 ½ acres, 2-car gar, 2,800 sq. ft. Dutch barn, ca/ch, wood stove, soft water, OMC $175,000. 626/446-0078.

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 nr. village, 2 bd. sleeps 8, F/P, TV/VCP, $75/night. 249-8515.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails; 2 bd., sleeps up to 6, firepl., TV, VCR, phone, microwave, BBQ and more; JPL disc price from $65/night. 909/599-5225.

BIG BEAR LAKEFRONT luxury townhome, 2 decks, slps. 6, tennis, pool, spa. 714/786-6548.

CAMBRIA, ocean-front house, exc. view, sleeps up to 4, $125/night for 2, $175/night for 4. 248-8853.

KONA, Hawaii, on 166 ft. of oceanfront on Keauhou Bay, priv. house & guest house comfortably slp. 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectac. vws., nr. restaur., golf, other attrac. 626/584-9632.

LAKE TAHOE, north shore, 2 bd., 2-1/2 ba. condo, sleeps 6-7, grt. loc., all amen., priv. beach, pool, sauna, walk to golf, fishing 150 yds. fr. front door, 2 mi./north shore casinos, JPL June rates $550/wk.; July/Aug, $650/wk. 626/355-3886.

MAMMOTH condo, 2 bd. + loft, 3 ba., slps 8, pool, spa, full kitch., TV/VCR, JPL disc. rates, walk to Canyon Lodge. 249-8088.

MAMMOTH condo, slps. 5, shuttle nearby, $50 Sun.-Thurs.; $65 Fri.-Sat.; downtown. 353-7839.

MAMMOTH condo, studio + loft, 2 ba., frplc., Jacz., sauna, game rm., color cbl. TV/VCR, full kitch. w/microwave, terrace, vw., amen., spring rates. 714/870-1872.

MAMMOTH condo in Chamonix; 2 bd., 2 full ba., slps. 6, fully equipped elec. kitchen, incl. microwave & extras, f/p & wood, color TV, VCR, FM stereo; sauna, game, & lndry. rms.; pool, sun area, & o/d Jacuzzis; play & BBQ areas; conv. to shops, hiking, summer events. 249-8524.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equipd. kitch. incl. microwave, D/W; cable, VCR, phone, balcony w/mtn vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.

MAUI condo, on beach w/ocean view, 25 ft. from surf, 1 bd. w/loft, compl. furn., incl. 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, less 10% JPL & Caltech disc. 949/348-8047.

OCEANSIDE, on the sand, charming 1 bd.+ condo, panoramic view, walk to pier/marina, pool, spa, game rm. 714/786-6548.

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

ROSARITO BEACH condo., 2 bd, 2 ba, ocean vw., pool, tennis, 20 miles south of border, priv. parking, short walk to beach. 626/794-3906.

S. LAKE TAHOE KEYS waterfront home, 4 bd./3 ba., slps. 12+; f/p on 2 levels, decks overlook priv. dock & lifts; gourmet kitch.; bikes, sail & paddle boats, 3 color TVs, VCR, stereo w/tape & disk; indoor/outdoor pools, hot tub & beach; 8 lighted tennis cts.; 10 min. to skiing, casinos, golf; 1 hr. to wine country; $995/wk. for high season (June 15-Sept. 15; Nov. 22-Mar. 1), + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

NOTICE TO ADVERTISERS

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Universe

Editor
Mark Whalen

Photos
JPL Photo Lab

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Jet Propulsion Laboratory

universe

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Airborne radar hunts clouds for climate clues

Scientists will compare data with measurements taken by satellite and ground-based sensors

By MARY HARDIN

In an effort to better understand clouds and how they affect our environment, a NASA DC-8 aircraft recently flew an airborne radar system designed to study the structure of clouds, including cloud liquid water content.

During the flights over the southern United States, NASA's Airborne Cloud Radar is looking at clouds in an attempt to better understand how clouds warm or cool Earth's atmosphere and how the presence of clouds influences the world's climate.

"Clouds represent a scientific puzzle that researchers have been trying to piece together for centuries," said Dr. Fuk Li, principal investigator for the cloud radar at JPL. "Scientists still don't know very much about the internal, vertical structures of clouds, and that leads to uncertainties in weather and climate predictions. Using the cloud radar, we will be able to study clouds in a new way that will help us understand their structure like never before. Once we have the cloud vertical structure information, atmospheric scientists will have a much better handle on long-term predictions of weather and climate change."

The cloud radar experiment was installed last month looking downward in the tail area of the DC-8, based at NASA's Dryden Flight Research Center, Edwards, Calif. The DC-8 then flew to Tinker Air Force Base near Oklahoma City, the origination point of this series of missions in which the radar collects cloud data while the plane flies above the clouds.

Scientists will compare these data with measurements taken by satellite and ground-based sensors, including the Department of Energy's Southern Great Plains Cloud and Radiation Testbed, a series of instruments spread across north central Oklahoma and south central Kansas.

The radar, taking vertical measurements of the clouds from above, operates at 94 gigahertz, making it sensitive to cloud particles. The instrument transmits radar energy, which bounces off the cloud particles and is reflected back towards the aircraft. The radar measurements will be combined with information provided by other sensors to help analyze the properties of the clouds observed.

This experiment has flown twice before aboard the DC-8 while still under development. The DC-8's unique features make it an ideal platform for examining cloud structures, according to DC-8 mission manager Chris Jennison of Dryden.

"The DC-8 was selected because it is the only aircraft that is capable of this mission in terms of altitude, speed, range and capacity for carrying scientists onboard," Jennison said. "Since scientists can fly on the aircraft, they can operate their experiments themselves."

This Airborne Cloud Radar flight series is expected to total 20 flight hours. The experiment is designed to test several hypotheses and techniques related to satellite remote sensing of extensive, long-lasting, non-precipitating layers of cloud in the middle and upper troposphere—atmosphere up to about 11 kilometers (seven miles) from Earth's surface.

It is expected that this instrument will be used in upcoming field experiments to better understand cloud-climate processes. One such planned experiment is the Tropical Cirrus Experiment—called CRYSTAL—planned for 2001. Eventually this instrument will be flown on satellite platforms designed to observe Earth's climate processes from space.

JPL developed the Airborne Cloud Radar in conjunction with the University of Massachusetts, Amherst; Colorado State University, Ft. Collins; and Pennsylvania State University, Philadelphia. ❑

New JPL technology gives early emergency warning to motorists

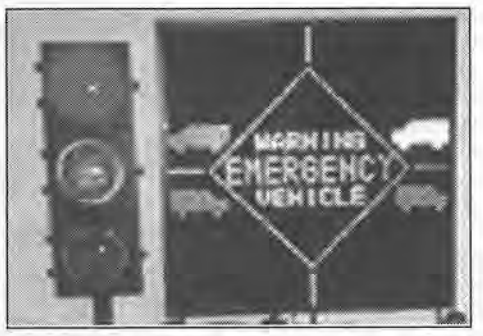
By JOHN G. WATSON

A new traffic technology can warn motorists quickly of rapidly approaching emergency vehicles and trains. The Emergency Vehicle Early Warning Safety System, or E-ViEWS, developed with the assistance of JPL's Technology Affiliates Program, is particularly timely given the increasing incidence of police chases.

The system equips emergency vehicles with transponders that communicate via microwave with receivers on large visual displays deployed on the mastarms above the centers of intersections. As the vehicles approach the intersections, signal lights turn yellow, then red, for cross-traffic, and approaching drivers also view flashing vehicle symbols on the visual displays.

These active displays, linked to the receivers, inform drivers of the direction from which emergency traffic is approaching or departing the intersection. The vehicle symbols appear to move across the displays, synchronized with the actual emergency vehicles' movements.

"More than 156,000 accidents involving emergency vehicles occurred at intersections in U.S. cities from the mid-1980s to 1995 alone," explained Jim Davidson, president and CEO of E-Lite Limited of Agoura Hills, which developed the system.



Vehicle symbols on E-ViEWS' visual screen at traffic signals appear to move across the displays, synchronized with the actual emergency vehicles' movements.

"Emergency vehicles present a serious traffic hazard to themselves, other vehicles and pedestrians while passing against cross traffic through an intersection, causing multi-million dollar lawsuits against cities and states," he added.

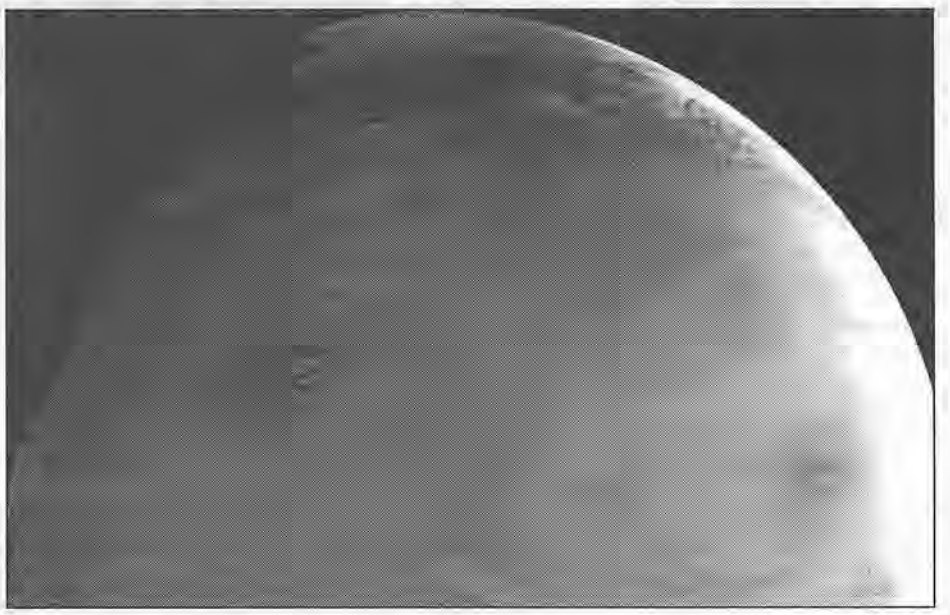
Davidson, a former marketing executive, has first-hand experience with the dangers of high-speed vehicles: He was driving his car once when it was almost broadsided by a fire truck at a Los Angeles intersection.

Through the Technology Affiliates Program, large and small businesses can work with JPL engineers to solve specific tasks. Upon joining this innovative program, E-Lite was paired with JPL engineers with specialized expertise to solve engineering design issues. These included not only E-ViEWS' customized transponders, but also comprehensive designs that blend with existing city communications infrastructures. E-ViEWS is now being further refined with an eye toward installation of demonstration models in large metropolitan areas.

The Technology Affiliates Program is just one of several JPL technology transfer programs designed to bring the benefits of the space program to American industry. For further information, visit the Commercial Technology Program's home page at http://tech-trans.jpl.nasa.gov/tu.html . ❑

Another cold winter morning on Mars

The latest images from the Mars Global Surveyor spacecraft show the onset of winter in the Martian northern hemisphere. At right is the northern Tharsis region, imaged on June 1 during Mars Global Surveyor's 339th orbit about the planet. The giant volcano Olympus Mons is at left, and one of the Tharsis Montes volcanoes, Ascraeus Mons, is at right. Another volcano, Alba Patera, is lurking under the haze and clouds at the top of the image. Olympus Mons is about 550 kilometers (340 miles) wide. Mars Global Surveyor is currently in a fixed 11.5-hour orbit around Mars, coming as close as 170 kilometers (106 miles) above the planet's surface during each looping orbit. The spacecraft will resume aerobraking to lower and circularize its orbit for the start of the mapping mission in mid-March 1999. More images are available online at http://photojournal.jpl.nasa.gov .



PIA01435

More than 200,000 names to board Stardust for ride to comet

By MARY BETH MURRILL

JPL's Stardust mission, scheduled to launch on a round-trip to a comet next February, has received messages from more than 200,000 people who want their names electronically engraved on the second of two microchips that will fly onboard the spacecraft.

Stardust's prime mission is to return a sample of comet dust to Earth in 2006.

The "Send Your Name to a Comet" effort has drawn attention around the world as people submit their names to the Stardust web page via the Internet, said Aimee Whalen, public outreach coordinator for the Stardust Project at JPL.

"People are excited at the idea of their names flying on the Stardust spacecraft," Whalen said. "By submitting their names to the microchip, participants become vicarious passengers on a space voyage that they can follow over the next seven years." The project hopes to exhibit the names in a museum after the comet sample has returned to Earth, she said.

The names are electronically etched onto a fingernail-size silicon chip at JPL's Microdevices Lab. Writing on the microchip is so small that about 80 letters would equal the width of a human hair. Once inscribed, the names can be read only with the aid of an electron microscope.

The home page and a project-sponsored network of educators across the country are two of the main efforts Stardust is using to bring information about the mission, its science plans and eventual discoveries to as broad an audience as possible.

Scientists have long sought a direct sample of a comet particle because these icy bodies are thought to be nearly pristine examples of the original material from which the sun and planets were born 4.6 billion years ago. Stardust's mission is to travel to within 150 kilometers (100 miles) of the nucleus of Comet Wild-2 (pronounced "Vilt-2"), gather comet dust particles and deliver them back to Earth. En route to the comet, Stardust will attempt to capture interstellar particles that are believed to be blowing through the solar system. In January 2006, mission plans call for the Stardust sample return capsule to parachute to a designated landing spot in the Utah desert.

The first Stardust microchip, which contained 136,000 names collected last fall, has already been installed on the spacecraft, which is being assembled at Lockheed Martin Astronautics in Denver.

Interest has heightened recently in Stardust and other NASA comet and asteroid projects with the promotion of Hollywood movies that center on fictional comet and asteroid impacts with Earth. Names are being gathered in cooperation with the National Space Society, Paramount Studios and Dreamworks Inc.

Names may only be submitted electronically and may be sent to the Stardust home page at http://stardust.jpl.nasa.gov. Those submitting their names are granting permission for the Stardust project and its partners to use the names submitted in possible future exhibits and/or publications.

Stardust, managed for NASA's Space Science Division, is a collaborative partnership between the University of Washington, Lockheed Martin Astronautics, and JPL/Caltech. Stardust is the fourth mission to be chosen under NASA's Discovery Program of low-cost solar system projects, and follows the Mars Pathfinder, Near Earth Asteroid Rendezvous (NEAR) and Lunar Prospector missions. ❑

News Briefs

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

Section 100: Adriana Wall.

Section 311: Robert Aster, Jennifer Caetta, Christine Chang, Nasser Golshan, Muthu Jeganathan, Chi-Wung Lau, Andrew Makovsky, Sakina Marvi, Annie Parkhurst, James Rucker, Keith Scott, Michael Sheha, Martin Slade III, Ilene Steen, Ramona Tung, Colleen Tyler, Victor Vilnrotter, Lee Ann Voisinet-Anderson, Angie Zevallos.

Section 344: Kenneth Crabtree, Harvey Horiuchi, Edward Kopf Jr., Brian Lau, Minnie Perry, Adrian Stoica, Antonio Ulloa-Severino, John Waters.

Section 354: Sang Chung, Gani Ganapathi, Brett Kennedy, Naresh Rohatgi, Lawrence Wade.

Section 387: Elizabeth Romo.

Section 391: Carol Scott, John Tullius.

Section 394: Yolanda Walton.

Section 395: Shakti Walia.

Section 642: Jerry Harter.

Section 910: Linda Scott.

The following employees were awarded NOVAs in June:

Section 231: Susan Egerman.

Section 311: Barbara Anderson.

Section 320: William Williamson.

Section 330: Nathan Burow.

Section 333: Philip Stanton.

Section 335: Yoaz Bar-Sever, William Bertiger, Karen Gale, Da Kuang, Ronald Muellerschoen, Donovan Spitzmesser, Jeffrey Srinivasan, Jeffrey Tien, Sien-Chong Wu, Lawrence Young.

Section 349: Sylvia Chavez.

Section 351: Edward Bailey, Patricia Barley, Herbert Blackhall, Steven Cole, James Hix, Julie Ispirian, Louis Johnson, Heidy Kelman, Paul Kresch, C. Eric Kurzweil, Robert Losey, Frank Loya, Patrick Martin, Robert Orens, Robert Sinclair, Adolfo Valerin, Paul Van Velzer, William Vialpando, Cheng-Hsiang Wan, Harley Winter.

Section 391: Joseph Hunt Jr., Frank Leppla, David Morris, Kathryn Sturdevant.

Section 393: Sandy Gutheinz, Joseph Jacob, Jason Johnson, Marian Kuri, Michael Levesque, Deborah Mahoney, Paul Ottenfeld, Judith Ryken, Florin Sixt, Wei-Min Wang, Lynn Weissman, Alvin Willems, Steve Yee.

Section 394: Sandra Buchan, Ehsanollah Hessar-Amiri, Norman Lamarra, Harold Minuskin, Richard Redden, Michael Scharf.

Section 621: Steve Ogle, Nancy Walizer, Patrick Thompson, John Davis.

Section 622: Bonnie Miller, Jane Lee, John Schofield.

Section 623: Richard Parker.

Section 642: David Klein.

Section 900: Richard Mathison, Michael Rodrigues.

Section 910: Krista Kelly, Warren Martin, Rodney Rohla, Shirley Wolff.

Section 920: Julian Breidentha, Roberta Buckmaster, Fred Mclaughlin.

Section 930: Bennie Falin, Amber Garza, Armond Salazar.

Section 940: Mark Romejko, Joseph Statman.

Section 950: Veloris Pickett.

Section 980: Andrea Angrum.

Section 990: Timothy Mata. ❑

The ERC's annual picnic on Aug. 1 will be held this year for the first time at Knott's Berry Farm in Buena Park.

The picnic will be held from 10 a.m. to 3 p.m. at the Park Pavilion area and will include food, games and entertainment. JPL employees and their guests can then venture into the amusement park for thrill rides and shows until 1 a.m.

Those who buy tickets before July 17 pay $10 for adults and $5 for children 3-11 years. After July 17, the price will be $20 for adults and $10 for children.

There is a limit of eight tickets per person, immediate family only. Tickets will be distributed at the picnic entrance. A JPL badge must be shown as ID, and the badge holder must escort his/her party into the picnic area. Parking vouchers are available for $3 (reg. $6). ❑

The Occupational Health Services Office reminds JPL personnel that NASA's annual Fitness Challenge, which has been in progress for three months, is still open.

The program, free of entry fees, runs through Aug. 31 and is intended to motivate all Americans to become more physically active throughout life, emphasizing regular exercise rather than outstanding performance.

NASA's Healthy People Fitness Goal seeks to have 30 percent of its employees exercising regularly by the year 2000.

The gymnasium in Building 180 has been designed to encourage physical fitness at JPL, and can be used by JPL employees as a vehicle for participation in the Fitness Challenge.

To enter, pick up a "Presidential Sports Award" brochure from Occupational Health Services, Building 263. The brochure contains a Personal Fitness Log, along with a list of categories for competition in areas such as walking, running, weight training, swimming, etc., and the distance required for the participant to meet each day.

Participants are able to go at their own pace and keep track of their exercise routine or distances achieved either weekly or monthly. Completed logs are to be mailed to Occupational Health Services by Sept. 4.

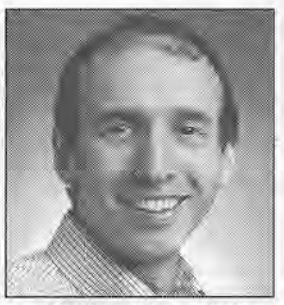
For more information, call Occupational Health Services at ext. 4-3320. ❑

The JPL and Caltech Amateur Radio Clubs will be participating in a yearly emergency preparedness exercise called Field Day June 27 and 28 atop Mount Gleason, located about 48 kilometers (30 miles) north of JPL.

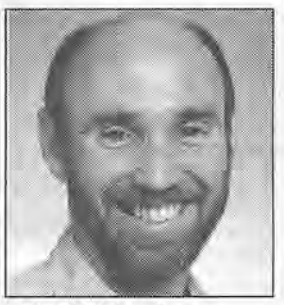
The event, which will begin at 11 a.m. on June 27 and continue for 24 hours, attracts radio enthusiasts nationwide. The JPL/Caltech club has historically placed high in the "top 10" list nationwide in the annual competition, according to club member **Bob Polansky**.

He said the club plans to field six stations utilizing voice, Morse code and digital communications.

For more information, contact Polansky at ext. 4-4940 or **Jay Holladay** at ext. 4-7758. ❑

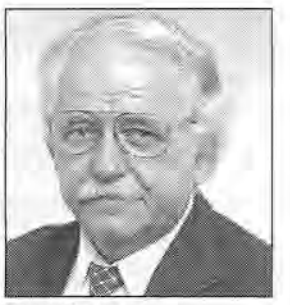


Dr. Matthew Golombek



Brian Muirhead

Donna Shirley



Tony Spear

Pathfinder leaders take their place among the stars

By DIANE AINSWORTH

Four asteroids have been named in honor of key team members of the Mars Pathfinder mission that landed on the red planet a year ago on July 4.

The new asteroid names were announced by JPL asteroid hunter Eleanor Helin.

Mars Pathfinder team members Dr. Matthew Golombek, Brian Muirhead, Donna Shirley and Tony Spear were awarded their very own "stars" in the sky by Helin, an astronomer who has dedicated her career to the discovery and tracking of near-Earth asteroids. The recipients received honorary plaques in a ceremony hosted by JPL Director Dr. Edward Stone.

"After exploring and studying an incredible number of Mars rocks and naming them, we felt it appropriate to name some neighboring Mars rocks for these four Pathfinder Marsketeers," Helin said.

Asteroid Donna Shirley, dubbed 5649 Shirley, was discovered Nov. 18, 1990 at Palomar Observatory near San Diego. The rock, measuring about 6 to 13 kilometers (3 to 8 miles) in diameter, crosses the orbit of Mars in its orbit inclined 21.7 degrees to the ecliptic plane on which the planets orbit the sun. It was named in Shirley's honor for her efforts in designing the first roving vehicle on another planet, Helin said. The asteroid is currently setting in the west at about magnitude 17.5.

Asteroid Tony Spear is a fast-moving body, about 5 to 12 kilometers (3 to 7 miles) in diameter, or roughly the same size as the Chixculub asteroid which is believed to have plummeted to Earth and wiped out the dinosaurs 65 million years ago. In a highly

See Pathfinder, page 3

NASA HONORS SPEAR

X2000 project manager and former Mars Pathfinder project manager Tony Spear was recently selected to receive and accept NASA's Group Achievement Award on behalf of the Pathfinder Management and Support Team. Spear, who has announced his retirement from JPL, was also selected to receive the agency's Distinguished Service Medal. ❑

Helin honored for asteroid work

Eleanor Helin, principal investigator for the Near-Earth Asteroid Tracking Program (NEAT), has been inducted into the Women in Science and Technology Hall of Fame.

The premiere award for women in science and technology worldwide, the Hall of Fame was launched in 1996 to recognize, honor and promote outstanding contributions women make to the scientific and technological communities and society at large.

Helin has been active in planetary science and astronomy for more than three decades at JPL and Caltech. In the early 1970s, Helin initiated the Palomar Planet-Crossing Asteroid Survey (PCAS) from Palomar Observatory, and that program has been responsible for the discovery of thousands of asteroids of all types, including 100 near-Earth asteroids and 17 comets. One of the most significant discoveries was that of asteroid (2026) Aten, the first asteroid found to have an orbit smaller than the Earth.

Eleanor Helin

With a powerful new real-time analysis system, development of two new charge-coupled device (CCD) cameras and longer observational runs each month, NEAT will be able to double the amount of nightly sky coverage and number of discoveries in the near future.

Helin was one of five women to be named the Women in Science and Technology Hall of Fame this year during June 25 ceremonies at the organization's 1998 technology summit in Santa Clara, Calif. Previous inductees include Donna Shirley, manager of JPL's Mars Exploration Program, and JPL Distinguished Visiting Scientist Marcia Neugebauer. ❑

Special Events Calendar

Ongoing

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

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

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

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

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

Friday, June 26

Dodgers Baseball—*Last day to purchase tickets at the ERC* for the July 10, 7:05 p.m. game against the San Diego Padres. Tickets are $12.

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

Tuesday, June 30

"Asset Allocation and How to Estimate Future Income"—Presented by the Benefits Office at 10 a.m and 2 p.m in the Building 167 cafeteria, northeast corner. Seating will be limited. Call Patrice Houlemard at ext.4-2549 for information.

Wednesday, July 1

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

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

Thursday, July 2

Dodgers Baseball—*Last day to purchase tickets at the ERC* for the July 14, 7:05 p.m. game against the San Francisco Giants. Tickets are $12.

JPL Dance Club—Clogging class will be held at noon in Building 300-217.

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

Tuesday, July 7

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

Wednesday, July 8

"The Age of Opportunity: America at the Millennium"—Pulitzer Prize–winning journalist, best-selling author and television commentator Haynes Johnson will discuss his current research into the influences of technology, science and politics on the American character. At 4:45 p.m. in von Kármán Auditorium.

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.

SESPD Lecture Series—Dr. Tom Luchik will discuss the Wide-Field Infrared Explorer (WIRE) Project at 11 a.m. in von Kármán Auditorium.

Thursday, July 9

JPL Dance Club—Clogging class will be held at noon in Building 300-217.

Friday, July 10

Bastille Day—The JPL French Club will celebrate the event with a dinner at Caltech's Athenaeum. For information and reservations, call Nicole Petrens at ext. 4-9189 or (626) 284-7592.

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

Santana/Los Lobos—*Last day to purchase tickets at the ERC* for a night of rock and roll, jazz and traditional music of Mexico to be performed at the Greek Theatre Aug. 16 at 7 p.m. Tickets are $38.25.

"The Greatest Show on Earth"—*Last day to purchase tickets at the ERC* for Ringling Brothers and Barnum & Bailey Circus, to be held at the Los Angeles Sports Arena on Saturday, July 25 at 11 a.m. or at the Arrowhead Pond of Anaheim on Wednesday, July 29 at 7:30 p.m. Tickets for the L.A. performance are $16 (reg. $18.50) and tickets for Anaheim are $15 (reg. $18.50).

Integrated space microelectronics center debuts

By JOHN G. WATSON

Dedication ceremonies were held June 5 for JPL's new Center for Integrated Space Microelectronics.

The 465-square-meter (5,000-square-foot) facility in Building 303-313 will be used for the design, development, rapid prototyping and integration of autonomous microsystems.

The NASA budget request issued in February has allocated $10 million to the center for this fiscal year and $15 million per year for the next several fiscal years.

"The center will lead the way in the development of what could be called 'thinking' micro-spacecraft of the future," said Dr. Leon Alkalai, who heads up the center. "The work that goes on at the center will be at the very heart of space exploration for the 21st century."

The center's goal is leadership in integrated microsystems, advanced space avionics and computing technologies for future deep space missions. Its primary focus is the development of highly miniaturized, integrated and autonomous space microsystems. These include such technologies as "systems on a chip," advanced nanodevices and nanostructures, reconfigurable and evolvable hardware, modular software and revolutionary computing technologies for spacecraft control.

Cutting ribbon to dedicate the Center for Integrated Space Microelectronics are, from left, Dr. Les Deutsch of the Space and Earth Science Programs Directorate's Program Planning Office; Dr. Bill Weber, director, Engineering and Science Directorate; Dr. Leon Alkalai, manager of the new center; and Dr. Charles Elachi, director, Space and Earth Science Programs Directorate. Below, Alkalai shows visitors the X2000 Distributed Avionics Testbed. In foreground, Application Specific Integrated Circuit designer Ryan Fukuhara runs a testbed demonstration.

PHOTOS COURTESY OF HEIDI LUU

The center is part of JPL's Advanced Deep Space System Development Program, also known as X2000, whose mandate is the delivery of new generations of modular, multi-mission spacecraft buses to diverse NASA programs. These include the New Millennium Program's Deep Space 4/Champollion mission and the Outer Planets Project's Europa Orbiter, Pluto-Kuiper Express and Solar Probe.

The center's contributions will enable X2000's integrated, miniaturized, autonomous spacecraft systems for deep space and Earth-orbiting missions.

The center will deliver X2000's avionics systems, with the goal of developing breakthrough technologies for "avionics on a chip" by integrating computer, telecommunications, navigation, power management and sensor technologies into a single micro-unit by 2006.

The center will also contribute to each subsequent generation of X2000 spacecraft design, addressing such challenges as science payload accommodation, avionics scalability, temperature control, power constraints, propulsive capability and spacecraft autonomy.

Further information is available at http://cism.jpl.nasa.gov . ❑

Dr. Cheick Diarra

Diarra named UNESCO ambassador

Dr. Cheick Diarra, manager of the Mars Exploration Directorate's Education and Public Outreach Office, has been inaugurated the 19th goodwill ambassador of the United Nations Educational, Scientific and Cultural Organization (UNESCO) to the continent of Africa.

His appointment was announced May 12 by UNESCO Director General Federico Mayor and represents several firsts in this organization's 50-year history of promoting collaboration among nations through education, science, culture and communication. Diarra, who was born in Mali, West Africa, is the first ambassador originally from Africa, the first from the sciences and the first American citizen to hold the post.

In his role as an ambassador for science and technology education, Diarra, who holds a doctorate in mechanical engineering from Howard University, Washington, D.C., will be working toward establishing a university in Africa with a strong science curriculum. He also will be involved in efforts to raise public awareness of the importance of science and mathematics to global peace and technological advancement as society moves into a new millennium.

Diarra joins other UNESCO ambassadors such as actress Catherine Deneuve, Brazilian soccer star Pele and French musician Jean-Michel Jarre in their efforts to enrich the educational, scientific and cultural fabric of the global community.

He joined JPL in 1988 as a mission designer. He has calculated the spacecraft trajectories of such flight projects as the Magellan mission to Venus, the Ulysses mission to the poles of the Sun, the Galileo mission to Jupiter and the Mars Observer mission. Diarra also worked as navigator on the Mars Pathfinder mission design team. Currently he is working on international collaboration for future missions to Mars. ❑

New SFOF 'darkroom' dedicated

The Laboratory has dedicated the Space Flight Operations Facility's new Deep Space Operations Center.

Also known as the "darkroom," the facility on the first floor of Building 230 links more than 800 computer workstations worldwide that communicate through the Deep Space Network.

Telecommunications and Mission Operations Directorate lead engineer Joe Gleason spearheaded the effort, which will result in more efficient operations due to the collocation of five mission-critical teams—for mission control, data system operations, multimission data management, communications control and network operation control—into the darkroom. Teams were previously scattered, having once been housed on different floors in Building 230 as well as in Building 525 off-Lab.

He said another difference in the facility is that it is now operated under contract to AlliedSignal and OAO Corp.

At the dedication ceremony in late May, JPL Director Dr. Edward Stone noted he was pleased that the consolidation of mission operations support teams was accomplished without any service interruptions to flight projects. ❑

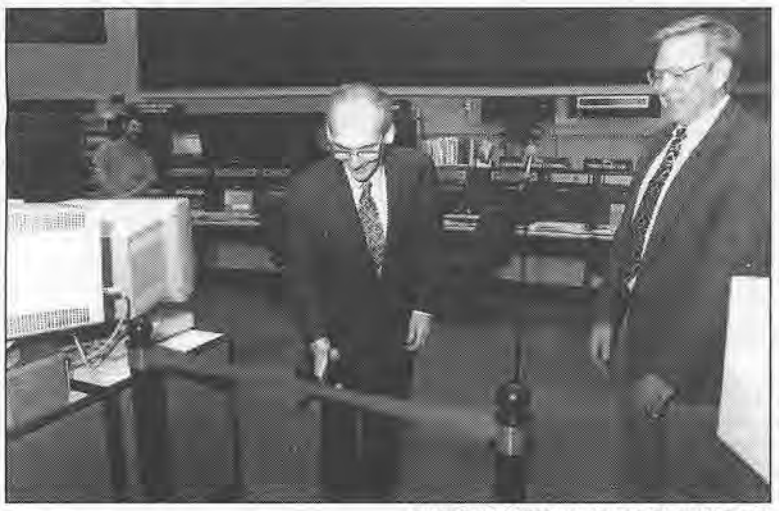


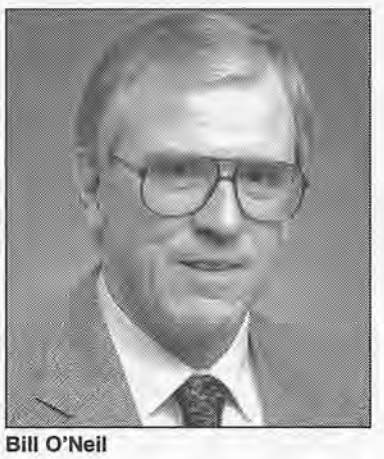
PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

JPL Director Dr. Edward Stone cuts ribbon to dedicate the new Space Flight Operations Facility's Deep Space Operations Center as Telecommunications and Mission Operations Director Gael Squibb looks on.

Galileo manager O'Neil honored by Space Society

Bill O'Neil, project manager for JPL's eight-year Galileo primary mission that was successfully completed in December 1997, has been honored with the first annual Lunar Gateway Award by a chapter of the National Space Society. The award, presented by the Lunar Reclamation Society, cites

See O'Neil, page 4



Bill O'Neil

AROUND THE LABORATORY

It's JPL's fault

By TOM FARR
Earth and Space Sciences Division

One of JPL's faults is once again visible, after being buried for many years.

This fault is of the geological variety and is named the Sierra Madre fault. It is located in the Arroyo Seco, just north of the bridge to the east parking lot. It's visible because the recent heavy rains have eroded about 2 meters of sediment from the streambed, exposing the fault plane.

The best way to see the fault close-up is to scramble down the embankment at the JPL end of the bridge and go under the bridge along the stream for about 10 meters north of the bridge. The fault is in the streambank and appears as a sharp contact between greenish, altered granitic rocks to the north and dark reddish gravel deposits to the south.

The fault plane tilts down to the north and has a thin clay layer right at the contact. If you continue north along the stream, the granitic rocks gradually lose their greenish color and become the more familiar gray of the mountains behind.

The Sierra Madre fault is the place where the San Gabriel Mountains behind JPL push up and south over the valley below. Earthquakes on this fault over tens of thousands of years have created the mountains. Unfortunately, geologists have been unable to determine when the fault last moved in this area. A date for the gravel unit over which the granitic rocks have been thrust would help, but dating gravel deposits is notoriously difficult.

Geologists have been digging trenches across the fault for a number of years around Pasadena in the hope of learning more about this important feature. Now we have a great natural exposure to observe.

If you visit the fault, please take care with the loose footing. Also, please disturb the exposure as little as possible so others will be able to see what you have seen. The fault is also visible from the bridge, especially in morning light. Be careful of traffic, as there is no sidewalk on the north side of the bridge. ❑

PHOTO COURTESY OF TOM FARR

This is a view of the Sierra Madre fault from the east bank of the Arroyo Seco stream, looking back toward JPL. The fault is the slanting contact between the cemented gravel on the left and the light material (altered granitic rock) on the right. The stream recently eroded down about 2 meters (6 feet), revealing this rocky bank and exposing the fault.

Pathfinder

Continued from page 2

inclined orbit of 21.2 degrees to the ecliptic plane, Spear's namesake asteroid "gives us good reason to pray that it doesn't come too close to Earth in the near future," Helin said.

Golombek's stellar keepsake, 6456 Golombek, is 2 to 4 kilometers (1 to 2.5 miles) in diameter, traveling in a 3.2-year orbit around the sun. With a brightness at a current magnitude of 15.9, this chunk of rock is one of the larger near-Earth asteroids in the list of known Earth-approaching bodies. Its closest approach is well inside the orbit of Mars. Eventually, it could possibly cross the path of Earth's orbit.

Asteroid Muirhead is another Mars-crossing asteroid, a mountain-sized, 5- to 9-kilometer-diameter (about 3- to 6-mile) body that travels in a highly inclined, eccentric orbit.

JPL's asteroid tracking project, known as the Near-Earth Asteroid Tracking (NEAT) system, has stepped up work in the field of near-Earth object detection and cataloging with additional funding from its NASA sponsor within the Office of Space Science. ❑

Lab firefighters collect funds to aid burn victims

A caravan of firefighting vehicles rolled into JPL the morning of June 12. There was no emergency, but there was still an important mission at hand.

Members of the JPL fire department joined firefighters from several local fire agencies during the Firefighters Quest for Burn Survivors' travels throughout Southern California that day. The organization made JPL one of its many stops in collecting funds donated and collected by firefighters and others to help those injured in fires.

JPL firefighter Keith Knipschild presented the organization with a check for $600. Among those on hand for the dedication was Glendale firefighter Bill Jensen, who was severely burned during the 1996 Calabasas/Malibu wildfires.

The organization's executive director, Tom Propst, a Glendale firefighter, said that this year's goal of $75,000 was almost halfway to its target by the time the caravan reached JPL. In all, 74 fire departments in six Southern California counties were visited during the weeklong fundraiser, including Arcadia, Glendale, Monrovia, Sierra Madre, San Gabriel, San Marino and South Pasadena. That total was more than double the 32 departments visited last year.

Propst said that funds are donated directly to burn centers, foundations, burn survivors and their families. ❑

PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

JPL firefighters present a $600 check to the Quest for Burn Survivors fundraiser during the organization's visit to JPL June 12. From left are Glendale firefighter Bill Jensen, JPL Fire Captain Gary Edmonds, JPL firefighters Chris Munro and Keith Knipschild, KNBC anchorwoman Kelly Mack, JPL firefighters Steve Cueto, Peter Leong and Michael Tyler.

Passings

Chester Nussey, 67, a retired senior instrument specialist in Section 351, died of cancer April 30 at his home in Texas.

Nussey joined JPL in 1967 and retired in 1984. He is survived by his daughter Bonnie and son Gary.

Memorial services were held in his hometown of Snyder, Texas. ❑

Jacques Pirotton, 69, a retired maintenance electrician in Section 662, died of heart failure May 28 at his home in Huntington Park.

Pirotton worked at the Laboratory from 1984–96. He is survived by his wife, Liliane, son Daniel, daughters Cecelia Hardy and Isabelle Gray, and seven grandchildren.

Burial was at Rose Hills Memorial Park in Whittier. ❑

Lennor Gresham, 49, supervisor of the Precision Motion Control Group within the Avionic Equipment Section 344, died of cancer June 1 at her home in Bradbury.

Gresham had been with JPL since 1988. She is survived by her husband, Malcolm Calhoun.

Memorial services were held June 3 at Douglas & Zook Mortuary in Monrovia. ❑

John Walsh, 70, a retired member of the technical staff in Section 351, died of cancer June 3 at his home in Camas Valley, Ore.

Walsh worked at JPL from 1979–89. He is survived by his son John.

Services were held in his hometown. ❑

Martha Schmoe-Henopp, 45, a technical staff aid in Section 323, died of cancer June 5 at her home in Wrightwood.

Schmoe-Henopp had been with JPL since 1987. She is survived by her husband, Wayne, son Michael, daughters Heidi Lahn, Amy Duffy and Beverly Livermore, and five grandchildren.

Cremation services were held June 8. ❑

Retirees

The following employees retired in June:

Herbert Phillips, 41 years, Section 313; **James Bryant**, 37 years, Section 350; **Paula Jacka**, 36 years, Section 640; **Warren Moore**, 35 years, Section 313; **Vladimir Petrov**, 35 years, Section 643; **John Weidner**, 32 years, Section 395; **Ronald Baisley**, 31 years, Section 313; **Terry Cole**, 18 years, Section 800; **Jerome Hines**, 18 years, Section 662; **Marlew Cooper**, 15 years, Section 345. ❑

O'Neil

Continued from page 3

O'Neil for his "outstanding service to all mankind for taking us along to Jupiter and its moons: Io, Ganymede, Callisto and especially Europa."

A JPL employee since 1963, O'Neil also served as navigation team chief for Mariner 1971 and the Viking Project.

The award was presented May 24 in Milwaukee during the National Space Society's 17th International Space Development Conference. The Lunar Reclamation Society, one of the oldest chapters of the NSS, has a history of supporting robotic missions, particularly those that study Earth's moon. In the case of the Galileo mission, the award recognizes work in studying the moons of Jupiter.

At the May 24 awards ceremony, other honorees included U.S. Representative James Sensenbrenner (R-Wis.) and Dr. Carl Sagan, who was honored posthumously with the Robert A. Heinlein Memorial Award. ❑

Correction

A recent article in *Universe* about NASA's George M. Low awards incorrectly stated contractor and awardee BST Systems Inc.'s contribution to the Mars Pathfinder mission. BST developed the battery for the Pathfinder lander. ❑

LETTERS

I would like to thank all the people who planned, attended or otherwise sent good wishes on the occasion of my retirement party. Special thanks to Pat Warmer, who coordinated the party, and to those who made kind remarks regarding my years at JPL. I'll miss all of you.

Paula Jacka

❑❑❑

The family of Lucille Peralta wishes to thank all the JPL and cafeteria friends who were so kind during her illness and in her passing. Your prayers, thoughts and flowers have meant a great deal to us all. Thank you.

The Peralta family

❑❑❑

Thanks to all my wonderful friends at JPL for their cards, flowers and expressions of sympathy on the passing of my brother. Your thoughtfulness is what makes JPL a very special place.

Jerry Copeland

❑❑❑

I would like to thank my friends and coworkers for the cards, condolences and prayers upon the passing of my stepfather. A special thanks to ERC for the beautiful plant. Your kind thoughts were very comforting.

Yvonne Barraza and family

❑❑❑

I want to thank everyone who attended my retirement party on May 27th for a great send off. Special thanks to Jackie Akers (organizing), Mike Carney (plaque), Bob Conover (MC) and other speakers and presenters for a wonderful party. I also want to thank all of the JPLers past and present who have helped me over the years and have made working at JPL such an enjoyable experience. My family and I can look back on the spacecraft programs, the trips to Florida and the close friendships with fond memories.

Warren Moore

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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.

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For change of address, contact your section office or the HRS Help Desk at ext. 4-9559 (on-Lab personnel) or Xerox Business Services at (626) 844-4102 (for JPL retirees and others).

FOR SALE

AMPLIFIER, bass, KMD, 130 watts, w/speaker; fine cond.; you pick up in Riverside. 909/369-3742, Eric.
AQUARIUM, 60-gal. hexagon w/stand, canister filter, lamp, many access., $150/obo. 733-8933.
BED, qn. sz., adjustable, w/remote cont., exc. cond., $900/obo. 249-0453.
BED, queen, w/frame, vg cond., $100; DRESSER, 5-drawer, exc. cond., $125; END TABLE, $30; MICROWAVE TABLE, $25. 626/355-3886.
BEDROOM SET, white w/gold trim, gd. cond., desk, nightstand, chair, bureau w/mirror, $250/obo. 626/797-6453.
BICYCLE, Univega sport touring, chrome moly frame, Shimano component set, exc. cond., $349. 626/446-0165.
CAMERA, 3D, complete gift pkg., Nishika N8000, 35mm, 3010 twin flashlight, leather case and video instruction; whole package for $120. Send inquiry to: aslai@hotmail.com.
CHINA CABINET, antique 1930s, beautiful walnut w/inlaid wood and casters, $375; walnut carved pie-shaped end table, $75; 1900s oak armchair w/leather seat, $125. 957-4722.
COMPUTER CD software for Macintosh, call for list, all $25 and under. 790-3899.
COMPUTER: Pentium 166 processor, Asus TX97-E motherboard (can upgrade to 233 MMX), 64 MB memory, ATI Pro Turbo graphics card/8MB RAM, Sound Blaster 16 sound card, 12X Toshiba CD ROM, 3.2 GB Western Digital HD, NE 2000 PCI combo card, SCSI card, 3 ½ in. TEAC floppy drive, Focus keybrd., Logitech 2-button mouse, $600, 213/667-1960, 626/932-3269, pgr., Zack Stromberg.
CRIB, wood frame, white, w/mattress & toys (like new, hardly used), $125/obo. 562/860-9140, eves., Gene.
DRUM SET, classic Rogers full 5 piece, plus hi-hat and crash, outstanding cond., $500. 957-5382.
EXERCISE MACHINE, Soloflex, w/all attachments, $350. 626/447-6423.
EXERCISE/WEIGHT MACHINE, from Germany, mounts on wall w/fold out bench, ~200# for arm/leg exercises, w/accessories, $85. 626/797-6824.
FURNITURE: 2 walnut armoire, $450/obo (big), $375/obo (sm.); VANITY, $400/obo. 626/915-4978.
FURNITURE: oriental rosewood dining table w/4 chairs, $800; Barcaloinger, $250; bedroom chests, $350/ea. 626/441-2412 wknd/eve.
GARAGE SALE, Sat., 6/27, 9 a.m.-4 p.m.; air cond., men's bike, clothes, toys and more; 1250 Hastings Ranch, Pasadena; 626/351-0348.
GUITAR AMPLIFIER, Peavey 5150, Eddie van Halen model, half stack w/slant cab, exc. cond., $899. 626/446-0165.
MOVING SALE: king-sz. bed, exc. cond., $200/obo; matching white wicker headbd., $75/obo; deluxe exercise bike (Easyrider), $75/obo; tennis ball machine, $150/obo; twin bd. w/mattr, $35/obo. 626/449-7564.
ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifc. for $3,000. 790-3899.
PERSONAL INFORMATION MANAGER, Seiko "Phone-Pal", $25. 790-3899.
POOL TABLE, "Golden West," beaut. oak finish, exc. cond., will include cue rack/cue sticks, cover, hanging lamp; $1,550/obo. 805/288-2235.
SNOWBOARD, $100/obo. 310/886-2621.
SOFA/LOVESEAT, light soft colors, $200/obo; DINING CHAIRS (6) SET, $30; ENTERTAINMENT CENTERS (2), whitewash, $400/obo. 626/915-4978.
SOFTWARE: Snappy Video 3.0, brand new, $49 (never used); Adobe Photodelux, new, $20; Microsoft Word (new, in pkg.) full version $49, upgrade $35; COLOR SCANNER, flat top, brand new, $79; LAPTOP, new, modem, 12.1" active matrix, 2.1 GB HD, 16 MB RAM, all bells/whistles, $1,200 firm, used only twice. 626/335-4409.
SPRINKLER VALVE ACTUATORS, Lawn Genie model 756LG3/4, new, $10 ea. 790-3899.
SWEATER, Coogi, from Australia, new, sells in Nordstrom for $325, sell $100. 790-3899.
TABLE, dining rm., oak-veneer top & solid oak frame and legs; seats 4 comfortably, and 8 w/pull out leaf; exc. cond., $80. 626/796-6971.
TABLE, round, 36" across, convertbl. to 36" x 20" w/sides folded down, 2 chairs w/padded seats and rattan backs, all three $55. 353-5402.
TOY, Barbie Jeep for girl, never used, $100. 213/313-0136.
TRAILER, '82 Komfort fifth wheel, 17.5' "Lite" model; fully self-contained; stove, oven, refrig., water heater, shower, toilet, awning, A/C, stereo; new roof vents & water pump; exc. cond.; includes slide-in hitch; tows easily with mini- or mid-size truck; $1,900/obo. 805/296-5769.
TREADMILL, compact, foldable for storage, barely used, $60. 626/794-5349.

AUTOS / RVs

'92 ACURA Legend, taupe ext. and int., loaded, 88K mi., exc. cond., $12,950. 909/598-0065.
'97 AUDI A6 wagon, 4D, V6, auto, <10,000 mi., A/C, PS, PW, tilt wheel, cruise, AM/FM stereo/cass, dual airbags, ABS, leather, dual pwr. seats, third seat, flip-up sunroof, exc. cond., $30,950. 790-4965.
'90 BOUNDER motorhome, 31', 454 EFI Chevy, loaded, jacks, 2 awnings, dash and dual-roof air, twin beds, micro, 2 TVs, VCR, inverter, mint cond., low mileage, $30,000/obo. 909/350-9218.
'77 CADILLAC Fleetwood Brougham, lux. edition, a beautiful classic, beige leather and teak wood custom interior, deep brown exterior w/leather trim, garaged & driven locally, only 50K orig. mi., exc. cond., $4,580/obo. 626/794-5196.
'97 CHEVY Tahoe, 2d/4wd/z-71 pkg., loaded, dark cherry met, leather, stereo/cd/cass, 350 V8, full pwr., only 20k mi., $27,900. 909/596-2848, Mike.
'70 CHEVY El Camino, orig. owner, 350, big tires, orange interior & exterior, mint cond., 82,400 mi., $3,500. 626/914-6083.
'51 CHEVY ½-ton pickup, off frame restoration, exc. running cond. 248-0610, Randy.
'93 FORD Ranger Supercab, 4.0L, 4WD auto, CD, ultra prem sound, air, ps, pw, pdl, cruise, sliding rear window, bed liner & camper shell, exc. cond., $9,900 (wbb). 626/357-3230.
'91 GEO Storm, 73K, dark blue, 5 spd, A/C, AM/FM/cass. stereo, gd. cond., fun to drive, $3,900. 893-6084.
'95 MAZDA Miata, red ext., black int., loaded, 49K mi., exc. cond., $12,950. 909/598-0065.
'89 MAZDA 929 sedan, all pwr., digital display, leather seats, sun/moon roof, cruise cont., premium sound w/CD, 98K fwy. mi., $5,800/obo. 909/593-7004.
'87 MAZDA RX7, GXL model, full equip'd, leather int., Kenwood AM/FM/CD stereo, lo blu. bk., $2,900/obo. 626/797-6824.
'90 MITSUBISHI Mirage, silver/black, 2-dr. hatchback, 71k, gd. cond., 1.5L eng., 4 speed, gd. interior, no problems, am/fm cass., clean, must see, $2,600/obo. 626/303-0845, Evora.
'93 NISSAN 300 ZX, 2-seater, T-top, chrome whls., Bose system, leather seats, air, many extras, exc. cond., $16,500/obo. 714/761-2783.
'84 PLYMOUTH Voyager SE, exc. shape, new trans., new brakes, $4,400. 562/945-4323.
'79 PORSCHE 924, 38,000 mi., been in storage, still smells new, exc. cond., $4,000. 360-6154.
'93 TOYOTA Camry LE, single owner, exc. cond., auto, pwr windows, A/C, AM/FM/cass/CD, leather seats, 80k mi., $10,500. 626/357-1423.
'88 TOYOTA Tercel, hatchback, white, auto, exc. maintenance, all records, 150K mi., $2,300/obo. 626/791-0366.
'88 VOLVO 240 DL, 4 dr., 5-spd., 110K, gray, exc. cond., orig. owner, gd. tires & battery, needs paint, $5,499/obo. 626/446-0165.
'95 VW Cabrio convertible, 2D, 4 cyl, 2.0L, auto, A/C, PS, PW, dual airbags, tilt wheel, cruise, ABS, AM/FM stereo/cass, leather, low mi., must sell, $14,500. 790-4965.

LOST & FOUND

Found: man's silver chain bracelet, in east parking lot. Ext. 4-2231, Rafi.

WANTED

HOUSESITTING or reasonable rental opportunity for JPL postdoc et al. (spouse, ~4 yr-old, cats); seek 1 yr., 2 + bd., safe yd., nice neighborhood, start Sept. or Oct. '98. 619/284-0207 or e-mail kbrinton@ucsd.edu.
PICKUP TRUCK, Toyota or Nissan, '90 or newer. 626/446-6437 or 626/237-2324, pgr.
RADIOS, 1920s and '30s table models; technical radio magazines; '20s radio vacuum tubes. 242-8961, Floyd.
RENTAL apt. or house within 20-min. radius of JPL, at least 2 bd./1 ba., approx. $1,000/mo., from Aug. '98. 310/207-7702, Albert or Sue.
SPACE INFORMATION & memorabilia from U.S. & other countries from past & present. 790-8523, Marc Rayman.
STORAGE SPACE, approx. 150 cu. ft., nr. JPL, for 6 mo. starting July '98, $25/mo/obo. 310/207-7702, Albert.
VANPOOL RIDER, full-time for vanpool # 20, stops in Northridge and Granada Hills; Marilyn, ext. 4-0307.
VOLLEYBALL PLAYERS, coed, all levels of play, every Tues. nt. 8-10 at Eagle Rock High School, $4/night. 956-1744, Barbara.

FREE

CAT, beautiful, pregnant, olive-brown short hair, small body, abandoned after neighbor moved out; other neighbors adopted its adorable kittens last year, but can't afford to do it again; needs loving home. 398-3681 evening, Branislav.
DOG, male Chow Chow, 2 yrs. old, well-behaved, needs loving, caring home. 626/917-2663, Thelma.
DOG, 4-yr.-old, 35-lb. beagle-lab mix needs good home. 626/793-3894.
DOGS, 6-yr.-old female chocolate Lab, 4-yr.-old male black Lab; both very loving and great with children. 626/798-9247.
KITTENS (2), 1 Russian blue, 1 reddish-black, litter-trained, shots, hand-fed since 2 wks. old, very friendly; COCKER SPANIEL-mix puppy, left behind when owners moved. 626/796-3466.
MAGAZINES, National Geographic, complete set. 790-2010.
PLEXIGLAS, 2-x-4 ft., frosted, double pane, used for 1 year. 352-6778.

FOR RENT

2 houses: 2 +1 + bonus, picket fence, flowers, air, appliances, hdwd. flrs., lg. yd., garage, patio, mtn.vu, quiet, $1,150 unfurn. or $1,250. furn.; new house 2 +1, gar. w/workshp., BR, blt.-in kitch., microwv., appliances, crpt., lg. fncd. yd., mtn. vu, quiet, $1,250. 353-4705.
ALTADENA, nr. E. gate, walk to Lab, Spanish hacienda for lease, furn. 3 + bd., all appliances, pool, sauna, cyn. vw., avail. July, no pets, $1,800, deposit & references req. 790-6241 or beep 420-0848.
GLENDALE, roommate wanted for charming 3-bd., 2-ba. house in grt. neighbh'd. (nr. GCC); cent. air/heat, fireplace, hardwd. floors, lg. bkyd. w/lemon tree; avail. 7/1, $550/ea. 243-5369, Stacey.
GLENDORA, young professional looking for same to split huge home w/lg. fenced yd. in a quiet cul-de-sac, gardener incl., extra rm. is a fully equipped office; 25 min./JPL; pets OK; $425 + 1/2 expenses. 626/335-4409.
LA CRESCENTA, 3 bd., 2 ba., liv. rm., fam. rm., lg. lot, 15 min./JPL. 626/296-6827.
MONTEREY PARK, bright, airy, spacious rm., lots of closet space & storage, quiet tree-lined st., 15 min./Lab, $98/wk. 626/280-7659.
MONTROSE apt., 1 bd., 1 ba., a/c, garden, off-st. pkng., lndry., charming, trash/wtr./grdnr. pd., 10 min./JPL, walking dist. to Montrose Mall, $625. 818/248-4637.
N. GLENDALE, rm. in big Spanish house, near college; kitch. privileges, priv. ba.; must not be allergic to cats; non-smoking only, female preferred; $450 + $100 sec. dep. 242-3633, eves., Sheila.
NORTH HILLS house, 4 bd., 2 1/2 ba., 2,450 sq ft, cathedral ceiling, cent. vacuum, cent. air, fireplace, 30 min./JPL, reduced to $189,000. 893-6084.
PASADENA garden apt., (Altadena Drive), 1 bd., $600 + $600 security dep. 248-8853.
PASADENA house, 2 bd., 2 ba., F/P, hardwd. floors, FDR, 3 walk-in closets, DW, LR, A/C, 1 cat OK, 76 N. San Marino Ave., drive by then call for appt., $1,125. 240-4246.
PASADENA, rm. w/2 others; 3 bd. apt w/washer/dryer in unit, pool, sauna, parking; $385 +1/3 util. 626/564-1078.
SIERRA MADRE apt., 2 bd., 1 ba., small, quiet bldg., $700. 626/355-7318.
SIERRA MADRE, exc. loc., 2 bd., 1 ba., $425 + ½ util. 626/355-1903.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry rm., $129,000. 909/585-9026
L.A./GLENDALE-adjacent, 2 bd., 1 ba., detached bonus rm., dining rm., indoor/outdoor fireplaces, 2 patios, lg. enclosed yd., laundry rm., vw, close to JPL, & Caltech, $174,900. 549-4140, Debi.
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.
GREEN VALLEY LAKE, a secluded village in the San Bernardino Mtns., custom 3-story log home and buildable adjacent lot; beautiful 180-deg. vw w/lg. decks, shade trees, walk to lake and skiing; cabin $149,000, adjacent lot $19,900. 303-1927.

VACATION RENTALS

BIG BEAR cabin, quiet area nr. village, 2 bd., sleeps 8, F/P, TV/VCP, $75/nt. 249-8515.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ & more; JPL disc price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT luxury townhome, 2 decks, slps. 6, tennis, pool, spa. 714/786-6548.
BIG BEAR, 7 mi from slopes, full kitch., f/p, 2 bd., 1 ba. sleeps 6, reasonable rates; 2-nt. min., no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
CAMBRIA, ocean front house, exc view, sleeps up to 4, $125/night for 2, $175/night for 4. 248-8853.
KONA, HAWAII: on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, nr. restaur., golf and other attractions. 626/584-9632.
LAKE TAHOE, N. Shore, 2-bd., 2 ½-ba. condo, sleeps 6-7, grt. loc., all amen., priv. sandy bch., pool, sauna; walk to golf, fishing 150 yds. from front dr., 2 miles/casinos; spec. JPL rates July/Aug, $650/wk.; reduced rates after Labor Day. 626/355-3886, Rosemary or Ed.
MAMMOTH condo, studio + loft, 2 ba., fireplace, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitch. w/microwave, terrace, view, amen., low rates. 714/870-1872.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, pool, full kitch., TV/VCR, JPL disc. rates; walk to Canyon Lodge. 249-8088.
MAMMOTH condo in Chamonix; 2 bd., 2 full ba., slps. 6, fully equipped elec. kitchen, incl. microwave & extras, f/p & wood, color TV, VCR, FM stereo; sauna, game, & lndry. rms.; pool, sun area, & o/d Jacuzzis; play & BBQ areas; walk to Warming Hut and lifts; conv. for hiking, shops, summer events. 249-8524.
MAMMOTH at Snowcreek, 2 bd., 2 ba., + loft., slps. 6-8; fully equipped kitchen incl. microwave, d/w; cable TV, VCR, phone, balcony w/view to mtns.; Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek; JPL disc. 626/798-9222 or 626/794-0455.
MAUI condo, on beach w/ocean view, 25 ft. from surf, 1 bd. w/loft, compl. furn., incl. 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, less 10% JPL & Caltech disc. 949/348-8047.
OCEANSIDE, on the sand, charming 1 bd.+ condo, panoramic view, walk to pier/marina, pool, spa, game rm. 714/786-6548.
PACIFIC GROVE hse, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kitch. w/microwv, beaut. furn, close to golf, bches, 17 Mile Dr., Aquarium, Cannery Row, JPL discnt. 626/441-3265.
PALM SPRINGS, 1-bd. condo, avail. July 4, slps. 4, pool, spa, tennis, cable TV/VCR, all furn., rugs, paint & cooking utensils new. 626/445-0884.
ROSARITO BEACH condo, 2 bd., 2 ba., pool, ocean vw., tennis on roof, short walk to bch. on priv. rd., 5 mi. to golf, 20 min. S. of border, security, parking. 626/794-3906.