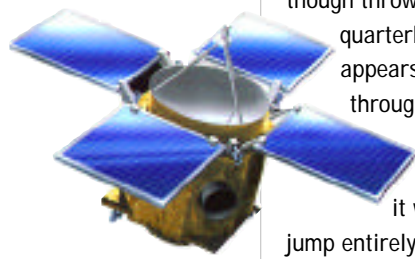


News Briefs 2	Inflatable antenna demo 3
Special Events Calendar 2	Letters, Passings, Retirees . . . 4
Education in exotic locales 3	Classifieds 4

NEAR studies Eros up close

By Martha Heil

Eros, right, is being studied by the Near Earth Asteroid Rendezvous-Shoemaker spacecraft, below.



Eros, the chunky asteroid named after the god of love, is slowly revealing to scientists the mysteries of its size, rotation and other properties.

Eros has been studied by the Near Earth Asteroid Rendezvous (NEAR)-Shoemaker spacecraft since last Valentine's Day, when a careful maneuver put the spacecraft in orbit around the asteroid to determine its properties. Some of those findings, such as Eros' mass and bulk density, appear in the Sept. 22 edition of the journal *Science* in a paper by principal author Dr. Don Yeomans of JPL. Yeomans is the radio science team chief for NEAR-Shoemaker. The journal also features three other research reports on Eros.

Scientists have learned that Eros is most likely made of rocky material with a uniform density throughout. The asteroid's bulk density is similar to that of Earth's crust. Like Earth, the surface of Eros is covered with a layer of looser rock and soil.

Though it is about 6,700 trillion kilograms (14,700 trillion pounds) in mass, Eros is a fragment from the breakup of a once larger asteroid. "It's a chip off a larger block from millions of years ago," said Yeomans.

Eros is rotating around its shortest axis, making one revolution every 5 hours and 16 minutes. As though thrown in a tight spiral pass by some cosmic quarterback, Eros' rotation axis appears to remain steady on its journey through space. Because the asteroid is so much smaller with much less gravity than Earth, it wouldn't take an Olympic athlete to jump entirely off the surface into space.

Scientists were able to study Eros' rotation, mass distribution and structure based on a series of observations taken onboard the spacecraft. By photographing the asteroid and measuring infrared light reflected from it, scientists could determine its mass, detect minerals and record its motion. As the craft edged into closer and closer orbits around the



Johns Hopkins University Applied Physics Laboratory

asteroid, it took fresh data that helped determine the asteroid's size, shape and mass distribution. These activities were critical for navigating the spacecraft into tighter orbits about Eros so that close-up images could be taken.

"If we didn't know the precise size, shape and mass distribution of the asteroid ahead of time, it would not have been safe to send the spacecraft to within a few kilometers of the asteroid's surface," said Yeomans.

By the mission's end in February 2001, the total surface of the asteroid will have been imaged and measured.

Johns Hopkins University manages the NEAR mission for NASA, and JPL is performing navigation support. Dr. Bobby G. Williams of the Navigation and Flight Mechanics Section, also an author on the paper, is the navigation team leader.

For the latest images and announcements of mission progress and discoveries, visit the NEAR web site at <http://near.jhuapl.edu>.

Entangled photons could promise lightning-speed computers

By Gia Scafidi

Defying traditional laws of physics, researchers may have found a way to blast through imminent roadblocks on the highway to faster and smaller computers.

Using modern quantum physics, a research team from JPL and the University of Wales in the United Kingdom has discovered that entangled pairs of light particles, called photons, can act as a single unit, but perform with twice the efficiency.

Using a process called "entanglement," the research team proposes that existing sources of laser light could be used to produce smaller and faster computer chips than current technology allows. Their paper appears in the Sept. 25 issue of the journal *Physical Review Letters*.

"Our economy constantly depends on faster and faster computers," said JPL researcher Dr. Jonathan Dowling, a co-author of the paper. "This research potentially could enable us to continue upgrading computers even after traditional manufacturing procedures have been exhausted."

Currently, in a process known as optical lithography, manufacturers use a stream of light particles to sculpt computer chips. A chip is basically a grid of interconnected on-off switches, called transistors, through which electric current flows and enables computers to calculate. As companies crowd millions of transistors into tinier chips, electric current travels shorter distances, resulting in speedier processes.

Chipmakers shine a laser light onto photosensitive material to create a stencil-like mask, which is used to carve silicon into the components of transistors. However, the producers can only provide transistors with dimensions as small as those of the masks.

Today's state-of-the-art chips have transistors measuring between 180 and 220 nanometers, approximately 400 times narrower than the width of a human hair. While traditional computers have the ability to perform with transistors as small as 25 nanometers,

Continued on page 2

Pluto mission reconfigured

Earliest launch date would be 2009

By Mark Whalen

JPL has been directed by NASA to reconfigure a planned mission to Pluto, which will result in a deferment of the launch.

Dr. Ed Weiler, NASA's associate administrator for space science, said that for programmatic and technical reasons it is not feasible to implement Pluto-Kuiper Express as currently conceived. Escalating cost was among the reasons he cited in congressional testimony.

Doug Stetson, manager of JPL's Solar System Exploration Office, said the earliest launch date now under consideration would be either 2009 or 2010. Such a mission would not include a gravity assist at Jupiter, as did the 2004 launch plan. A launch at the end of the decade might include an advanced propulsion system—most likely either solar electric propulsion or solar sails—with a planned arrival at Pluto no later than 2020.

Another Pluto option under consideration, Stetson said, is the next available gravity assist

at Jupiter, which would call for a launch in 2014 or 2015 with a projected eight-year flight.

Pluto, the farthest planet from the sun and the only planet never explored by a NASA spacecraft, has an orbit of almost 250 years around the sun. It came closest to the sun in 1989. Stetson said some scientific models indicate that the planet's atmosphere will condense, freeze and collapse onto the surface of the planet, "but there's not a clear understanding of when that would happen." Even if the atmosphere freezes, planetary scientists say that the mission would still be scientifically compelling for studies of the planet and Kuiper Belt objects related to the origin of the solar system.

A strategic planning process for the next Pluto mission will involve the findings of NASA's Solar System Exploration Subcommittee, which will be assessing options and making a recommendation to NASA Headquarters within the next two

years, Stetson said.

In that regard, Dr. Earle Huckins, deputy associate administrator for NASA's Office of Space Science, led a team meeting at JPL Sept. 22 to begin replanning the outer solar system program. Dr. Jay Bergstralh, the acting solar system exploration director, has been leading a team looking at science objectives for outer solar system exploration.

"A better understanding for when we can launch a Pluto mission will be forthcoming in the context of the overall outer planets program," Stetson said. "NASA has asked us to give them a plan that would allow a Europa orbiter launch in 2006 plus a plan for the technology developments that would allow arrival of a Pluto spacecraft no later than 2020. In the meantime, we're developing technology for other missions we're considering for the program, including a comet nucleus sample return, a Europa lander and an atmospheric mobility mission at Saturn's moon Titan."

News Briefs



The Ulysses Project will celebrate its 10th anniversary Oct. 9.

Ulysses celebrates 10th anniversary

Guest speakers, a new video production and telescopic views of the sun will highlight the Oct. 9 celebration of the 10th anniversary of the launch of the Ulysses spacecraft.

From noon to 1 p.m. in von Kármán Auditorium, Project Manager ED MASSEY will discuss the mission's first solar orbit. Other speakers include WILLIS MEEKS, who managed the project from launch through its first five years, and deputy project scientist DR. BRUCE GOLDSTEIN.

In the mall, staff can view the sun through telescopes provided by the Telescopes in Education Project.

Mars needs antioxidants for life

JPL researchers have shown that intense ultraviolet radiation piercing Mars' thin atmosphere produces an abundance of oxygen ions at the Martian surface that destroys organic molecules—the building blocks of life.

Scientists have been puzzled since the mid-1970s when NASA's Viking landers failed to find any organic materials, not even traces delivered to Mars by meteorites. Scientists then recognized that there were oxidants in the Martian soil capable of destroying organic molecules. It has taken until now for a team to come up with a comprehensive idea of what those oxidizing chemicals are and how they form.

"We simulated the Martian surface environment in our laboratory and found that the combination of ultraviolet radiation, mineral grain surfaces, atmospheric oxygen and extremely dry conditions produce superoxide ions," said DR. ALBERT YEN, a JPL planetary scientist and lead author of the study published in *Science* magazine on Sept. 15. "This is all that is necessary to make the reactive component of soil."

This combination of surface conditions exists on Mars today and the superoxides are generated during day-time exposures to ultraviolet radiation.

"Our research does not address whether life ever formed on Mars, but it does give us more information about where to look for life or evidence of past life," Yen said. "Evidence of life might exist beneath the surface or in the interiors of rocks that are protected from the superoxide ions. What we don't know is how far below the surface we would need to look."

The research team plans to study the movement of these oxygen radicals under simulated Martian conditions to estimate how deep they may be distributed. Future experiments to search for subsurface organic molecules could be carried out by penetrators and/or by drilling from a surface lander.

Geospatial workshop draws 250

More than 250 people attended a JPL-supported workshop in mid-September that focused on opportunities for applications of remote sensing, global positioning system and

geographic information system technologies in urban planning and infrastructure, environmental remediation, agriculture and resource management, and disaster response.

DAVID TRALLI, manager of JPL's Commercialization Services Office, organized the four-day Applications of Geospatial Information workshop, held in Sacramento. A number of technical and program management personnel from JPL also attended. Tralli said the workshop helped "provide direct input to a program that will have significant impact on how we work with users and developers towards transferring NASA-developed geospatial technologies for the benefit of the largest recognized remote sensing end-user market segment—government users."

The best technology opportunities, Tralli said, lie in algorithm and model development, integration of various sensor data types, visualization and interpretation. He added that several companies are interested in working with JPL on radar, lidar, hyperspectral algorithm development and integration in various application sectors.

Workshop attendees included representatives of national agencies, private-sector firms, and government agencies from 14 western states.

Director's art competition open

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

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

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

NASA supports depression screening

As a part of NASA's efforts to ensure the health and safety of employees, the agency has joined with the National Mental Health Association to offer an employee access program to screen for potential depression.

The screening is an anonymous, short phone survey and is available through the end of this year to employees and their families. Each survey gives immediate feedback and some resources available for help. On Lab, help is available through the Employee Assistance Program at ext. 4-3680. The phone number of the screening project for JPL is (800) 390-7302. The National Mental Health Association's Web site is at www.nmha.org.

The EAP says that depression is an illness that involves body, mood, thoughts and behavior. It is a serious medical illness that can interfere with concentration, energy levels, outlook, work performance and family life, and may become chronic if left untreated.

Special Events Calendar

Ongoing Support Groups

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

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

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

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

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

Monday, October 2

"TIAA-CREF: Yesterday, Today and Tomorrow"—TIAA-CREF president, chairman and CEO John Biggs will speak at 10 a.m. in von Kármán Auditorium.

Tuesday, October 3

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

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

Wednesday, October 4

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

"Combined-Value Markets"—Dr. John Ledyard, Caltech professor of economics and social science, will give this free lecture at 8 p.m. in Beckman Auditorium. Call (626) 395-4652.

Health and Safety Faire—Three insurance carriers and more than 25 health care agencies will be on hand from 10 a.m. to 1:30 p.m. on the mall and in von Kármán Auditorium. Planned activities include detection and screening of blood sugar, blood pressure, cholesterol and oral cancer. In the event of inclement weather, the Faire will be held on Oct. 11.

Thursday, October 5

EAP Lecture—Dr. Joseph Haraszti, medical director at Los Encinas Hospital in Pasadena, will present "Depression from Mid-Life into Old Age: The Relationship Between Aging and Depression" at noon in von Kármán Auditorium. The program will be hosted by JPL's Employee Assistance Program, part of the Occupational Health Services Office.

For more information, call ext. 4-3680 or visit their Web site at <http://eis.jpl.nasa.gov/medical>.

Investment Strategies—Fidelity will present a workshop from noon to 1 p.m. in Building 180-101. The focus will be on employees not currently participating in JPL's voluntary tax-deferred accounts. Topics include the benefits of enrolling in a tax-deferred savings plan, compounding and investment basics. A Fidelity representative will be also available on for one-on-one counseling in Trailer 1720. Call (800) 642-7131 to schedule an appointment.

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

"Search for the Chimera"—Magician, critical thinker and author James Randi will speak at 4:45 in von Kármán Auditorium. Sponsored by the Caltech Management Association, Center for Space Mission Information and Software Systems, and Institutional Computing and Information Services.

Friday, October 6

Travel Film—"Alaskan RV Adventure: The Last Great Road Trip" will be shown at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. Call (626) 395-4652.

Tuesday, October 10

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

Investment Workshops—TIAA/CREF will present two workshops. From noon to 1 p.m. in Trailer 1720-137, employees who will soon be or have recently become eligible to participate in Caltech's retirement plan can discuss investment options and complete applications. The session from 2 to 3 p.m. in Building 180-101 is for current participants with 10 or more years to retirement and will include topics such as organizing financial information, net worth, cash flow analysis, budgeting, allocations and investment strategies.

Wednesday, October 11

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

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

Thursday, October 12

JPL's New Intranet Home Page—Knowledge Navigation team lead Jayne Dutra of Section 389 will discuss the development of a new strategy for the JPL intranet called a portal, a single-entry page that will organize information and serve as a gateway to the information you use every day. To be held at noon in von Kármán Auditorium.

COMPUTERS *continued from page 1*

or 3,000 times narrower than a human hair, this presents manufacturing obstacles.

The light manufacturers use to produce today's transistors has a wavelength of 248 nanometers. It becomes increasingly difficult to use light with shorter wavelengths to produce transistors with smaller dimensions. In fact, according to a central principle of optics called the "Rayleigh criterion," 248-nanometer light can't create features smaller than 124 nanometers.

However, this new research, still in its theoretical stage, could provide a bypass of the Rayleigh criterion. The research team proposes that entanglement would allow the use of existing sources of laser light of 248 nanometers to produce computer chips with dimensions of a fourth of the wavelength (62 nanometers) or smaller compared to today's limits (124 nanometers).

Entanglement would allow researchers to use

the intermingled properties of two or more photons to obtain subwavelength spatial resolutions. Albert Einstein called this intermingling of photons process "spooky action at a distance" because the particles can immediately influence each other over huge distances, even halfway across the galaxy.

Here on Earth, entangled photons can be produced by passing a light beam through a special crystal. In this quantum lithography proposal, a pair of entangled photons enters a setup with two paths. While the two particles travel together and act as a single unit, it is impossible to determine which of the two paths the pair has taken. In a strange effect of quantum mechanics, however, each photon actually travels down both paths.

On each path, the photons act like a rippling wave with peaks and valleys. After traveling on their own paths for a while, the two photons

converge on a surface. Because the light particles making up each wave were originally entangled, the result of adding the photon waves together is to create patterns on the surface equivalent to those made by a single photon with half the wavelength.

This process, in essence, enables the entangled photon pair to produce patterns twice as small on each side of a chip's surface as can be created by the single photons in the conventional optical lithography procedures. Entangling more than two photons would improve results even further.

While a number of technical challenges remain, researchers are already working on developing materials that would be required or quantum lithography.

This research is part of the Revolutionary Computing Technology Project in the NASA/JPL Center for Integrated Space Microsystems.

Education efforts extend to exotic locales

By Gabrielle Birchak-Birkman

Imagine traveling to exotic places around the world,

like Midway Atoll in the Pacific, Hawaii and Alaska, and studying

under the guidance of leading scientists and researchers. Has Caltech relocated to the Bahamas? Not quite. Rather, college teachers are going to places like this to learn about recent findings in science. Made possible through the National Science Foundation's Chautauqua Short Course Program, JPL's program relies on the volunteered help of nationwide eminent scientists and JPL employees.

David Seidel, JPL's pre-college programs administrator, helped to teach a course on the similarities and differences between Earth and Mars. Donating his vacation time at the Royal Kona Resort on Kona, Hawaii, Seidel spoke about the surface of Mars to a class of 25 college teachers. "It's a chance for teachers to take advantage of their summer," he said. "The whole objective is to do professional development specifically with teachers from community colleges and high schools. This last summer we had experts in geology interact with class participants, which was followed by a chance to go out and see what we were learning; we then hiked out across old lava to see where the fresh lava was going. So this



is experiential as well as academic." This course was dovetailed with another one on the big island of Hawaii that studied modern astronomy. Top experts from the world's leading observatories spoke to the group over a period of several days, including a tour atop Mauna Kea at almost 4,200 meters (14,000 feet).

One stop on the program's world tour includes JPL, where college teachers learn from our own intelligentsia. "We don't realize the draw that we have at JPL," said Dr. Gilbert Yanow, outreach coordinator for the Genesis mission and director of the California field station for the national Chautauqua program. "By getting our JPL experts to work with Chautauqua, we have found a way to put the most recent scientific findings into the academic community and then into the information

"By getting our JPL experts to work with Chautauqua, we have found a way to put the most recent scientific findings into the academic community"

presented to students at universities, community colleges and high schools throughout the country."

Under Yanow's recent coordinated efforts, JPL, through the National Chautauqua Center, offers many three- to four-day detailed programs. There are 10 centers and directors nationally, but JPL is the only center that is not a leading university campus.

College teachers' benefits from the programs include keeping up to date on science and technological issues, mastering the skill of teaching science and getting involved in peer-led team teaching. In a course conducted at JPL this summer, Yanow and several other scientists discussed recent findings from exploration of the planets and their satellites. By learning about the Genesis mission—which will return samples of the solar wind to Earth—teachers better understood original building blocks of the solar nebula.

For next year's program, the Chautauqua Center will offer 18 courses. The center plans to go to Tahiti to teach archeo-astronomy of the Polynesian Islands, where teachers will observe ancient astronomical monuments and their interaction with the stars on the solstice. In addition, next year the program will work in partnership with the outreach program of Keck Observatory in Hawaii, teaching instructors how to use software tools to develop their materials. Classes on astronomy and geology will also be held in Hawaii. Closer to home, classes on marine biology and ecology will be held in Washington state. Next March, working in cooperation with the University of Alaska, the program will offer a course in Fairbanks devoted to observing the aurora and studying upper atmosphere science.

With application costs at only \$40, teachers truly find that they are enlightened and up to date in the world of science. For more information, visit their Web site at <http://davinci.csun.edu/~scnet/chaut.html>.



Left: College teachers from the National Chautauqua Program study the Laysan albatross ("gooney birds") on Midway Atoll. Here the teachers are standing on the aged runway of the now-closed Naval Air Facility. Above: Teachers climb trees on the north beach to take pictures of the coast in order to study the island's geology.

Students help demonstrate lightweight inflatable antenna

A group of Los Angeles-area college students recently worked alongside JPL engineers to demonstrate components of a prototype antenna that would weigh about one-tenth as much as the main antennas on current interplanetary spacecraft.

The booms to support the flat-sheet antenna are made of ultralight materials resembling aluminum foil. The entire structure can be stored as a rolled-up cylinder, then unfurled into an antenna membrane 3 meters (10 feet) wide.

One engineering challenge has been to keep the structure rigid after its initial inflation, so that the antenna surface remains taut without continued air pressure. In space, it would have to stay deployed long after the active flow of air stops and micrometeorites punch pinholes in the inflated components.

Principal engineer and electrical design leader Dr. John Huang of the Spacecraft Telecommunications Equipment Section 336 led the task.



View this and previous issues of Universe online

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

Universe

Editor

Mark Whalen

Design & Layout

Adriane Jach
Audrey Riethle/
Design Services

Chief Photographer

Bob Brown/Photo Lab

Universe is published every other Friday by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

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

Notice to Advertisers

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

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

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

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

Letters

My family and I are grateful to co-workers on Cassini, Section 341 and the ERC for their thoughtfulness and generosity at the time of my father-in-law's passing this past June. The lovely card and nice plant were very much appreciated. Sincerely,
David M. Myers

My family and I would like to thank our friends at JPL for their expressions of sympathy in the loss of our daughter Jennifer. We also thank ERC for the beautiful plant delivered to our home.
Jerry and Carrie Humphrey

My family and I would like to thank our friends at JPL for their kind words and sympathy when my grandmother went to be with the Lord on Sunday, Sept. 10. The beautiful plant from the ERC was deeply appreciated during this time.
Sherri Rowe-Lopez

My family and I would like to thank the JPL community for their warmth and sympathy regarding the passing of my grandfather. I would also like to thank Section 352 and the ERC for the lovely plant which brightened our home during a difficult time. Best wishes,
Jason Suchman, Kate Alson and family

I sincerely appreciate the kindness extended to me following the sudden-passing of my beloved father. During a difficult time, the Lord Jesus Christ blessed me with the support of friends and co-workers at JPL. I thank the ATPO for the comforting potted plant and kind words of expression, Tom and Beth Gindorf for the delightfully beautiful orchid plant, and ERC for the lovely plant.
Peggy Borzage

To all my friends at JPL, sincere thanks for the great "send off" on the occasion of my retirement. I truly enjoyed seeing each of you as well as hearing from those who were unable to attend the party. Thanks to each of you, not just for the party, but for the friendship and the pleasure of working with you for the last 40 years.
Eric Suggs

Passings

INEZ WICKLAND, 76, a retired secretary in Section 388, died of heart failure Aug. 12.

Wickland joined JPL in 1971 and retired in 1995. She is survived by her husband, Norman, and son Christopher.

Cremation services were held at Mountain View Mausoleum in Altadena.

JAMES MILLS, 48, a heating, ventilation and air conditioning mechanic in Section 662, died of cancer Sept. 13.

Mills had worked at JPL since 1990. He is survived by his wife, Pam, and son Joel.

Services were private. Mills' family has requested that donations in his name be made to the American Cancer Society.

Retirees

The following employees retired in September: Edward Caro, 43 years, Section 334; John Hunter, 36 years, Section 306; Mervin Parker, 33 years, Section 349; William Hoffman, 31 years, Section 303; Robert Edelson, 29 years, Section 360; Robert Lane, 25 years, Section 375; Peter Perius, 21 years, Section 349; Gil Dawson, 20 years, Section 368; James McGregor, 20 years, Section 351; Michael Leeds, 12 years, Section 353.

Classifieds

For Sale

AIR CONDITIONER, White-Westinghouse, 9950 BTU window A/C, perfect condition, 3 mo. old, in original box with manuals, 5 yr. warranty, \$275/obo. 842-6445.
BACKSAVER, Zero-Gravity foam wedge system; new; never used; in original packaging; retail value \$159, \$100/obo. 584-9669, Kim West.

BARBECUE, electric, 1500 W; grill indoors or out, \$75; **PRINTER**, color, Lexmark 3200, like new, ultra hi-res, \$50; **TREADMILL**, Jane Fonda, simple, rugged design, fits under bed, \$100. 626/254-1550.

BATTERIES, for Nokia 5100/6100 series (save \$40, \$20), Sony camcorder (\$10); new Mavica InfoLithium (save \$40, \$25); New 4:1 Belkin autoswitch (orig \$100, now \$35); Sealed Civil Action DVD (\$19); others avail at 30% off. 366-6134.

BEDSTEAD & mattress, twin, modern style, white, nightstand, dresser and bookcase, \$175/obo. 626/355-5662.

BICYCLE, Huff, \$35; **DESK**, exec., all wood, good cond., \$75; **PRINTER STAND**, \$25; **COPIER STAND**, \$35; **STUDENT DESK**, \$25; **CABINET**, 4-drawer (steel w/lock), \$25 ea. 626/793-3228.

BICYCLE, road, Cannondale R600, Shimano 105 components, super light, few extras include extended handlebars, clipless pedals, excellent cond., fits small to medium person, best offer rides this blue beauty. 626/795-1318.

BICYCLES, full size matched pair of 10-spd. men and women Peugeots, green, exc. cond., \$50/ea. or \$90/both. 909/624-6970.
CD JEWEL CASES 50 ea., \$10; **DIET TAPES**, Jenny Craig, set of 14, \$50; **POWER CONTROL CENTER** for computer, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, \$20; **SPRINKLER VALVE ADAPTERS**, Lawn Genie, automatic, model 756LG 3/4, new, \$10 ea; **ORGAN**, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd., \$7,500, sacrifice for \$3,000. 790-3899.

CLAY POTS, round, large (2-ft and 3-ft diameter), \$50 each 2' / obo, \$60 ea. 3' / obo. 626/398-3480.

BLOCKS, Duplo, approximately 200 pieces, several sets including motorized train set, \$60. 352-2036.

EXERCISE BIKE, Schwinn, good condition, w/gel seat pad, \$35/obo. 367-0969.

EXERCISE MACHINE, NordicTrack Pro, hardwood skis, speedometer, good condition, \$200/obo. 952-2581.

FURNITURE, bedroom, dresser w/mirror and 2 matching nightstands; dresser 70" W x 30" H w/9 drawers; nightstands are 26" wide by 23" high with 2 drawers, all, \$325/obo. 626/914-7853.

FURNITURE, oak: 1) computer desk, 2-piece L-shape w/butcher block top, keyboard drawer, 5 drawers (2 for files, 1 w/lock) 2) file cabinet, vertical, 4 drawers (1 w/lock) 3) shelf unit w/8 shelves 50w x 60h x 12d., all vg condition, \$500/obo. 626/791-6101.

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

MOVING SALE, plants, furniture, misc. items, 4 mi. from JPL. 957-8169.

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

PUPPIES, beagles, 3 male 15" tri-color, born Aug. 26, will be ready for happy homes on Oct 14., \$250/ea. 661/722-6067, Debi.

REFRIGERATOR, small, \$50. 626/355-9733.
SCOOTER, Mioto, foldable, brand new, chrome with red wheels, pd. \$90, sell \$75. 626/287-7600, eves.

SOFA, blk leather, 85", \$285; **LOVE SEAT**, blk leather, 63", \$185; **BUREAU**, rock maple, 5-drawer, 50 x 33 x 19, \$115; **CART**, w/wheels, white 2 dwr. + 4" opening, 15 1/2 x 17 x 19 1/2, \$25; **COMFORTER**, qn sz., Sheridan, duvet cover w/2 mtchnng lg. pillows/shams, \$135; **BED SKIRTS**, 2 twm., ecru, \$25. 626/793-3561.

SPA, blk 4-prsn portable Softtub, with hard-top and locking cover & supplies, requires only elect., 6 ft dia., 3 ft tall, mint condition, used only 8 mo., pd. \$2,100 sell \$1,500. 310/824-5688.

TABLE, dinette, square glass top, 5'x5' w/metal feet and 4 matching chairs, \$800/obo; **BAR STOOLS**, 4 matching, metal frame, all in exc. condition, \$400/obo. 626/398-3480.

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

TOYS, Fisher-Price, outdoor playhouse, \$80; **BASKETBALL HOOP**, free-standing, 4-6', \$25; lots of other boy toys. 626/355-9733.

TUXEDO, Cruise, for a 6' man, burgundy/black applique formal dinner, jacket, size 40 long, pants 34W, 32L, excellent cond., \$35. 626/793-1895.

TYPEWRITER, IBM Selectric III, w/cover and stand, exc. cond., \$175 complete. 626/284-9664.

WASHER/DRYER, GE, excellent cond., \$380/obo. 626/836-9278.

Vehicles / Accessories

'93 ACURA Vigor GS sedan, white w/black leather int., auto, sunroof, heated seats, exc. cond., reduced, \$8,000. 626/793-3561.

'83 ALFA ROMEO Spider Veloce, black, 90K mi., gd condition but needs replacement rear window, includes shop manual and some parts, \$2,000/obo. 626/584-6518.

'98 BMW F650 motorcycle, Funduro, red, BMW topcase, new rear tire, exc. cond., no scratches, never off road or on ground, 10k mi., all records, see at <http://Home.earthlink.net/~peterschmitz/F650>, \$4,500. 626/797-6573, after 6 pm.

'99 CHEVROLET Blazer LS, 4x4, 2 dr., ZR2, off-road pkg., exc. cond, 4.3L V-6, auto, power everything, pewter gray w/charcoal int., 39k fwy mi., \$20,000. 248-1857.

'95 DODGE Neon, Highline sedan, 5 sp., a/c, cruise, Pioneer CD/Infinity speakers, 67k mi., original owner, \$4,950. 626/355-4376, lv msg.

'97 FORD F150 XLT supercab, exc. cond., white, 4.8L V8, 41K miles, automatic, power steering, A/C, power locks and windows, cruise control, towing package and bed liner, \$17,900. 626/458-5426.

'96 FORD Explorer XLT, 4D/2WD, brn w/leather int., all power, am/fm/cass., vg. cond., 71k miles, orig owner, \$12,500/obo. 591-9732.

'93 FORD Thunderbird LX, midnight blue metallic with black interior, 3.8 EFI V6, a/c, stereo, spd cntl, remote alarm, p/s, p/b, p/ant., pwr locks, elect. remote mirrors, cast alum. wheels, full console, elect. temp control + more, 20 mpg city, 103k miles, \$4,500. 661/424-9348.

'91 FORD Explorer XLT, 4x4, blue/grey leather, am/fm/cass, full power, air, tinted windows, V-6, auto, 4-dr., 94k mi., runs very good, \$5,800. 661/269-8002.

'86 FORD Bronco II XLT, V6 2.9 liter, 4-wheel drive, towing package, off-road tires, \$3,500. 248-4537.

'67 FORD Mustang coupe, V8, auto, engine in good cond., orig. owner, \$3,900/obo. 626/797-5768.

'90 HONDA Accord LX, white, 4-dr., clean, loaded, orig. owners, beautifully maintained, sacrifice, \$5,500. 626/796-6327.

'88 HONDA Civic DX, silver, one owner, regularly serviced, well-maintained 182k mi., a/c, \$2,900. 626/577-7625.

'91 HYUNDAI Excel GLS 4D, white, 4-cyl. 1.5L, auto, fwd, a/c, p/s, am/fm stereo, cassette, sliding sunroof, 60/40 access to trunk, orig. owner, all maint. done reg., good cond., 120K mi., \$1,995/obo. 323/887-0102, eves.

'88 ISUZU Imark, 4 dr., air, 5 spd., sunroof, 112k mi., good cond., \$1,600. 626/345-9821.

'95 MAZDA Miata M series, conv., burgundy, 5 spd., a/c, CD, power, spoiler, wheels, 75k mi., exc. cond., 100k mi. warranty, \$11,275. 310/315-1075.

'94 MAZDA MX6, drk grn/tan, airbags, A/C, pw, pdl, cruise, Kenwood CD, sunroof, spoiler, orig owner, service records, great condition, -35mpg, \$6,000/obo. 362-7542, Tina or Robert.

'94 MAZDA 626 ES sedan 4D, V6, silver w/ grey leather int., auto, a/c, pwr s/w/d/l, cc, AM/FM stereo/cass, 10 CD changer, ABS, moonroof, alloy wheels, exc cond, \$6,800/obo. 389-8979.

'91 MAZDA B2600I LE P/U, xlnt cond., cab plus, 5spd., a/c, am/fm/cass., bed-liner, chrome bump., \$4,500. 626/398-9836.

'93 PONTIAC Sunbird convertible, 134 K mi., new top, VG cond., 3.1L V6, blue, runs great, \$4,100. 248-0236.

'95 MERCEDES-BENZ E320, auto, 92K mi, am/fm/ cass, a/c, alarm, alloy wheels, anti-lock brakes, cruise control, dual air bags, heated power mirrors, leather seats, leather steering wheel, power brakes/door locks/drivers & passenger seats/steering/sunroof/windows/ telescopic steering whl., tinted glass, cellular phone, trunk cd changer, metallic paint, premium sound, \$21K. 626/744-1296

'95 SUBARU Legacy, 56K mi., AWD, ABS, auto, sunroof/locks, a/c, am/fm/cass., cc, alloy wheels, \$9,500/obo. 626/355-5662.

'98 TOYOTA Tacoma, reg. cab, 2WD, 4-cyl 2.4 L engine, exc. cond., 49K mi., black ext., beige int., AM/FM/cass., alarm, bedliner, A/C, dual airbags, 5-spd manual, 1 owner, \$10,500, flexible. 626/403-7786, jspl00@gte.net, Audrey.

'89 TOYOTA Corolla DX, automatic, 28-30 mpg, great commuter car, \$1,700. 661/424-9348.

'87 TOYOTA Celica GT-S, sport liftback, vg cond., pwr/win/locks/sunroof, very clean, well maint., all service records, very dependable, \$2,500/obo. 626/303-3719.

'86 VOLKSWAGEN Jetta Wolfsburg, dark blue, 87k mi., automatic, am/fm/cass, good cond., \$3,600. 790-3149.

Wanted
BELMONT HIGH SCHOOL (L.A.) GRADUATES from years 1957-62. 956-1744, Barbara.
COMPUTER PC, in working shape with CD-ROM drive, for 3-yr-old to learn basics. 323/935-3432, Allan.
CERAMICS PAINTER to paint ornaments for charity boutique; will provide ceramics, paint, brushes and some compensation. 626/573-2564, Mary, nights.
PIANO KEYBOARD, electronic, full size keys; and Yamaha Clavinova. 626/441-6848.
SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
TUTOR, calculus and physics, for a high school student. 626/793-3228.
VOLLEYBALL PLAYERS, coed, all levels of play, Tues. nights 8-10 at Eagle Rock High School, \$3/nt. 956-1744, Barbara.

Lost & Found
Lost: SOLITAIRE BLACK PEARL NECKLACE, on Tuesday, Sept. 19, possibly in Building 301; chain is very thin, 10K gold; call Suzanne Sinclair, ext. 3-0031.

Free
DOG, rescued beautiful black lab/chow mix, 3 yr old male, trained, healthy/shots, needs loving family, great companion. 661/257-5817.

For Rent
ALTADENA, share charming 2-bd. house in quiet neighbhd., Altadena Estate area, near NY Dr. & Allen, yard, patio, off-st. pkg., gar.,

storage, all privileges, \$600, all util. pd. 626/797-3354.
ALTADENA, room in lg house, kitchen and laundry privilage, shared bath, must be clean/non-smkr./like dogs; unfurn. \$425, furn. \$475; + half util. 626/797-5570.
GLENDALE, 2+2 plus condo, convenient location, all appliances furnished, designer closets, new carpeting, \$1,225 + deposit. 510/632-6341.

GLENDALE condo, nr. Montrose, 1 bd., gated area, view, lovely pool, covered car space with storage, \$750. 661/259-6390.

LA CANADA guesthouse, 1 bd., 3/4 ba., right around the corner from JPL, \$800, all util. pd. 790-9020.

PASADENA, 1 bd., 3/4 bath in charming 1907 bungalow, share house with JPL engineer, laundry, central A/C, quiet neighborhood, off-street parking, all privileges, 10 minutes/JPL, \$600 incl. util. 626/792-2056.

Real Estate

ALTADENA, 2 bd., 2 ba., custom closets, h/w floors, f/p, dining room, garage, new roof, plumbing, hot water heater, orange trees, located on cul-de-sac near JPL, by owner, \$219,000 . 626/798-4021.

ALTADENA, lovely 3 bd, 2 ba, new c/a, new paint, 1996 roof, 2-car garage with 220V, hardwood floors, fireplace, quiet street, see www.realtor.com, Altadena, CA, MLS ID=P206775, 1261 Sunny Oaks Cir, Altadena, \$375,000. 626/639-1677, Lynwen Hughes, Jim Dickson Realtors.

LA CANADA/FLINTRIDGE, view home, 4 bd, 2.5 ba., c/a, 2,778 sq ft, two-car garage, large driveway, 15-foot swim spa, LC schools, very quiet street and neighborhood, 53,954 sq. ft. on 2 lots with oak forest and creek, 2.5 mi. to JPL, see www.realtor.com, La Canada, Ca, MLS ID=G202353. \$849,500. 952-9654.

PASADENA, executive condo, totally remodeled 2 bd., 1.75 ba., 1,200 sq.ft., nice kitchen, large liv. rm., formal din., rm. w/ h/w floor, new carpet & paint; top floor (3rd) level unit in park-like setting, walk to Caltech/Lake Ave, nice pool and spa; \$219K. 626/585-9048.

TOWNHOUSE, 4 mi./JPL, built in '92, 2 bd., 2 1/2 ba., 2 balconies, exc. cond., prime location, some furn. avail., \$225K firm. 957-8169.

Vacation Rentals
BIG BEAR cabin, walk to village, quiet area, 2 bdrm., sleeps 8, completely furnished, TV/VCR, \$75/night. 249-8515.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails; 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more; JPL disc price from \$65 per night. 909/210-9182.
BIG BEAR LAKEFRONT lux. townhome, 2 decks, tennis, pool/spa, beaut. master bd., suite, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-8853.
HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house comfortably sleep 6, 3 bd., 2 ba., rustic, re-laxing & beaut., swim/snorkel/fish, spectacular views, near restaurants/golf/other attractions. 626/584-9632.
HAWAII, Maui condo, NW coast, on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, mcroww., d/w, pool, priv. lanai, slps. 4, 4/15-12/14, \$100/nt./2, 12/15-4/14, \$115/nt./2, \$10/nt. add'l. person. 949/348-8047.
LAGUNA BEACH ocean front condo, sleeps 4, steps to sand/ocean, Oct 13-20, 2000, \$1,000. 790-6185, Tim Scheck.
LAKE TAHOE, North Shore. 2 bd., 2.5 ba., sleeps 6, private beach, pool, great location, all amenities, hiking, golfing, fishing, 2 miles to casinos, Sept. thru Nov. 8, \$85/day or \$500/week + cleaning fee, 3-night minimum. 626/355-3886, Rosemary or Ed.
LAKE TAHOE, West shore @ Homewood, close to northern ski areas: Squaw, Alpine Meadows, Homewood, etc.; 3 bd. + loft, 2 ba., slps. 8, linens provided, full kitch. & laundry, TV/VCR, wood stove; 2-day min., JPL disc., \$75 cleaning fee. 626/585-0321, Bob or Nicole.
MAMMOTH, Chamonix condo, 2 bd., 2 full ba., sleeps 6, fully equip. elec. kitch., microw & extras, f/p & wood, color TV, vcr, cable, FM stereo, pool & sun area, old Jacuzzi, sauna, game/rec./laundry rms., walk to shops, lifts, warming hut, hiking, daily/weekly rates, summer rates thru Oct. 249-8524.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equip. kitch. incl. mcroww., 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.
OCEANSIDE, on the sand, charming 1-bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., slps. 4. 949/786-6548.
PACIFIC GROVE, hse, 3bd, 2 ba, fp, cable tv/vcr, stereo/CD, well-egpd., kit w/microw, beaut. furn, close to golf, bches, 17 Mile Dr, Aquarium, Cannery Row, JPL discont. 626/441-3265
ROSARITO BEACH condo, 2 bd., 2 ba., ocean view pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
SAN FRANCISCO, Nob Hill honeymoon suite, sleeps 2 max, full kitchen, maid service, concierge. \$125/nite; \$750/wk. Reserve early. 626/254-1550.
SOUTH LAKE TAHOE KEYS waterfront, 4 bd., 3 ba., 1 bd. & liv. rm. upstairs, hcp. access fair, slps. 12+, f/p's, decks, gourmet kitch., boats, TV's, VCR, stereo, assn. pools, beach, tennis/ski/casinos/golf, 3-day min., \$1,195/wk. [1 June-15 Sept; 22 Nov-1 April], \$595/wk. low seas., + \$90 clean fee. 949/515-5812.