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Inside

News Briefs 2
Special Events Calendar . . . 2
Benefits enrollment 2
coming up
Faster, Smaller, Smarter 3
Letters, Passings, Retirees . . 4
Classified ads 4

Likely cause of orbiter loss identified

Photo by Dutch Slager

Photo above: Mars Surveyor Operations Project Manager Richard Cook, center, makes a point at last week's briefing immediately following the loss of Mars Climate Orbiter. At left is Dr. Carl Pilcher, science director for solar system exploration at NASA Headquarters; at right is Dr. John McNamee, project manager responsible for development of the spacecraft.

A failure to recognize and correct an error in a transfer of information between the Mars Climate Orbiter spacecraft team in Colorado and the mission navigation team in California led to the loss of the spacecraft last week.

That preliminary finding from JPL internal peer review was announced by NASA Thursday.

"People sometimes make errors," said Dr. Edward Weiler, associate administrator for space science at NASA Headquarters in Washington, D.C. "The problem here was not the error, it was the failure of NASA's systems engineering, and the checks and balances in our processes to detect the error. That's why we lost the spacecraft."

The peer review preliminary findings indicate that one team used imperial units—inches, feet and pounds—while the other used metric units for a key spacecraft operation. This information was critical to the maneuvers required to place the spacecraft in the proper Mars orbit.

"Our inability to recognize and correct this simple error has had major implications," said JPL Director Dr. Edward Stone. "We have under way a thorough investigation to understand this issue."

Two groups have been established by JPL to assist in determining the cause of the accident. A special review board chaired by John Casani, retired JPL chief engineer, includes current and retired employees as well as outside participants.

In addition, an internal peer review group headed by Frank Jordan is meeting twice a week, and will serve as a principal source of data and technical information to JPL's special review board.

NASA is also expected to appoint an independent review board shortly. The JPL board is directed to support the activities of the NASA panel through open disclosure of findings and assistance as requested.

On Thursday, Sept. 23, Mars Climate Orbiter correctly began its engine burn to enter orbit around the planet, and passed behind Mars out of contact with Earth as planned. No radio signal was detected, however, when the spacecraft was expected to reemerge about 20 minutes later. Analysis showed that the orbiter apparently passed much closer to Mars than planned—within 57 kilometers (35 miles) instead of about 140 kilometers (87 miles)—and likely malfunctioned as it heated up in the atmosphere.

"NASA's Mars program is flexible enough to allow us to recover the science return of Mars Climate Orbiter on a future mission," said Dr. Carl Pilcher, science director for solar system exploration at NASA Headquarters. "This is not necessarily science lost; it is science delayed."

"We have a robust program to explore Mars that involves launching on average one mission per year for at least a decade," Pilcher added. "In fact, Mars Polar Lander will arrive in just over two months and its mission is completely independent of Mars Climate Orbiter. The science return of the lander won't be affected."

The project has begun an aggressive effort replanning how to return data from Mars Polar Lander when it arrives in December, chiefly using the lander's X-band transmitter for direct transmissions to Earth. The lander may also send some transmissions through Mars Global Surveyor, which is currently orbiting the planet. Mars Polar Lander was designed with a "triple-redundant" communications system so that it could send data through either orbiter or directly to Earth.

Public shows support following Orbiter loss

In the wake of last week's loss of Mars Climate Orbiter, dozens of letters and e-mails of sorrow and public support have been received by the project office.

Coming from throughout the United States and Canada and from as far away as the United Kingdom and New Zealand, supporters passed along their condolences about the mission in terms of mourning, astonishment and sadness, while at the same time encouraging team members and the Laboratory to keep their chins up and continue forward.

"It may look difficult today, but from this experience, I think you all will face far greater triumphs in the future," wrote one supporter. "Though we are disappointed, our faith in NASA is not shaken," wrote another. "We know that you will try again and we shall all celebrate success one day."

A citizen who described himself as an avid supporter and interested follower of Mars exploration said he is "saddened by the unexpected loss; I feel as though I have lost a close friend. My best regards go out to the scientists and staff at JPL/NASA for their continuing efforts at expanding our knowledge of the solar system."

One supporter summed up the sentiments of many with this message: "In spite of the loss of Mars Climate Orbiter, NASA and JPL continue to make me extremely proud to be an American."

PBS documentary to spotlight JPL

By Betty Shultz

Journalist Walter Cronkite, left, chats with JPL Director Dr. Edward Stone during interviews for PBS documentary.

Photo by George Shultz

Former CBS news anchor Walter Cronkite interviewed Laboratory Director Dr. Edward Stone and others at JPL last week as part of a one-hour Public Broadcasting System documentary on robotic space exploration.

The hour-long program, "Beyond the Moon," is produced by Cronkite Productions Inc., headed by Walter's son Chip Cronkite. It will present the history of solar system exploration as well as plans for future robotic space flight and will include contributions by other institutions, including NASA's Goddard Space Flight Center and Ames Research Center.

Cronkite interviewed Ken Jewett, lead mechanical engineer for the 2001 Mars rover, in the clean room of Building 198, where Jewett described the design and function of the Sojourner rover's look-alike, Marie Curie. Cronkite was also filmed in the Mars Yard, with "Rocky 7" demonstrating its ability to traverse Mars-like terrain.

Cronkite interviewed Stone in the director's office and in von Karman Auditorium, where the two discussed the early days of Voyager, JPL's achievements in technology development, and the Lab's plans for "faster, better, cheaper" projects.

The documentary is scheduled to be aired on PBS next spring.

News Briefs

Dr. Charles Elachi

Gael Squibb

Space and Earth Sciences Programs Director DR. CHARLES ELACHI and Telecommunications and Mission Operations Director GAEL SQUIBB have been elected to the International Academy of Astronautics. Elachi was chosen for his work in basic sciences, while Squibb was selected for his work in engineering sciences.

The academy's goals include fostering development of astronautics for peaceful purposes and recognizing individuals who have distinguished themselves in a related branch of science or technology. Its roster includes 1,100 members and corresponding members from 60 countries.

Elachi, a 28-year JPL veteran, and Squibb, who has worked at JPL for 35 years, will be inducted into the academy Oct. 3 in Amsterdam.

JPL Director DR. EDWARD STONE has appointed four JPL employees to the position of senior research scientist.

DR. DAVID CRISP of Element 3233 was recognized for his research specialty in atmospheric science and leadership in atmospheric radiative transfer modeling.

DR. DARIUSH DIVSALAR of Section 331 was selected for his international work in the development and application of error-correcting codes and modulation systems for telecommunications and significant contributions to deep-space telemetry and mobile data communications.

DR. JOAN FEYNMAN of Element 3239 was named for her research in space physics and producing a new model for high-energy proton fluences that has become the world standard in spacecraft design.

DR. WILLIAM MCGRATH of Section 386 was recognized for his world leadership in the field of cryogenic coherent detectors and the development of the superconducting hot-electron bolometer.

The senior research scientist grade was established in 1979 to give special recognition and promotion to outstanding individual research achievers. In addition to demonstrated research leadership, appointment also depends on the individual's active participation in programs related to JPL's institutional goals.

JON ADAMS of Section 336 and PETER GLUCK of Section 345 have been chosen for JPL's System Architect Development Program.

Administered by the Engineering and Science Directorate's Center for Space Mission Architecture and Design, the program is in its fourth year. Opportunities for system architects include working on mission proposal responses to announcements of opportunity, working with JPL's Advanced Projects Design Team, industrial partners and other NASA centers.

Program administrator DR. CLIFF ANDERSON said candidates are chosen based on their strong technical and problem-solving skills, leadership in technical innovation, an ability to be an effective team builder and facilitator, and skills in leading mentoring and helping others succeed. Flight systems experience, as well as broad-based experience in design and development, is also required.

JPL and several other NASA centers will co-host the Gossamer Spacecraft Initiative Workshop Oct. 12 and 13 in Oxnard's Mandalay Beach Hotel.

The workshop will include an overview of the Gossamer spacecraft initiative, a new NASA program to begin long-range development of enabling technologies for very large, ultra-lightweight structures and apertures. Topics will cover user needs for Gossamer technology, a review of preliminary technology roadmaps, and advanced concepts for Gossamer spacecraft, which includes giant telescopes and antennas, solar sails and highly integrated membrane spacecraft.

The workshop will be co-hosted by the Langley Research Center, Goddard Space Flight Center and Marshall Space Flight Center.

For technical information, call ARTUR CHMIELEWSKI, manager of the Gossamer Spacecraft Technology Program, at ext. 4-0255. For conference administration, contact PAT MCLANE at ext. 4-5556. For general information, call ANNA CHAVEZ at ext. 4-2090.

NASA's Occupational Health and Employee Assistance Office is providing all NASA centers an opportunity to participate in the National Depression Screening Project as part of an education program to prevent mental illness and help employees cope with potentially stressful situations.

All JPL employees, retirees and their families are eligible to participate by calling (800) 390-7302 through Dec. 31, 1999. All calls are confidential and anonymous.

Annual benefits enrollment begins Oct. 11

JPL's annual benefits enrollment period will be held from Monday, Oct. 11 through Monday, Nov. 1.

This is employees' opportunity to review their benefits and make changes for the upcoming year. Changes made during the enrollment will be effective Jan. 1, 2000. As an added bonus, JPL's Benefits Office has made the process easier than ever this year through the creation of an Oracle applications web site, the same system used for timekeeping.

If you don't wish to change any of your plans and you are not enrolled in a Health Care or Dependent Care Spending Account, there's no need to do anything during the enrollment period. Those who utilize the Health Care and/or Dependent Care Spending Accounts must re-enroll to continue coverage in 2000, since enrollment is not automatic year-to-year.

Detailed information on annual enrollment via the web site will be sent to all eligible employees the week of Oct. 4.

If you will be out of the area during the enrollment period, contact the Benefits Office at ext. 4-3760 or e-mail to *benefits@mail1.jpl.nasa.gov* to make special enrollment arrangements.

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. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

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

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

Friday, October 1

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

JPL Perl Users Group—Meeting at noon in Building 301-127.

Tuesday, October 5

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

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

TMOD Lecture Series—Dr. Chad Edwards, manager of the Mars Network Project Office, will present "Mars Network: First Step on the Planetary Internet" at noon in von Karman Auditorium.

Wednesday, October 6

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

"Grocery Bags to Baseball Bats: Polymers and Us"—Caltech chemistry professor Dr. Robert Grubbs will discuss the role of catalysts in making new plastics and polymers. At 8 p.m. in the campus' Beckman Auditorium. Admission is free. Call (626) 395-4652.

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

Thursday, October 7

"Is There A Link Between Perfectionism and Depression?"—Dr. Charles Barr will present this talk at noon in von Kármán Auditorium. Sponsored by JPL's Employee Assistance Program, Occupational Health Services. For information, call ext. 4-3680.

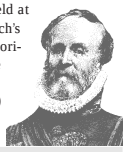
JPL Gun Club—Meeting at noon in Building 183-328.

Friday, October 8

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

Friday, Oct. 8–Sat., Oct. 9

"Reduced Shakespeare Company"—This ensemble takes a satirical and condensed looked at the last 1,000 years in its new musical "The Complete Millennium Musical (abridged)." Held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are $29, $25 and $21. Call (626) 395-4652.



Tuesday, October 12

Improved Use of Online Information: A New Internet Standard—Jim U'Ren of Section 350 will speak about JPL's Knowledge Management Project's proposal for a JPL core metadata specification that promises significant improvement in searching, retrieving and reusing online information. At noon in von Karman Auditorium.

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

Wednesday, October 13

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

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

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

SESPD Lecture Series—Stardust Mission Director John Pensinger & Fengchuan Liu will discuss "Low Temperature Microgravity Physics Experiments on the International Space Station" at 11 a.m. in Building 180-101.

Thursday, October 14

"Breast Wellness and Wisdom"—JPL Occupational Health Services, in conjunction with the American Cancer Society, hosts this presentation at noon in von Kármán Auditorium by Dr. Christy Russell, chief of medicine at Norris Comprehensive Center, and director of the USC Norris Breast Center.

Friday, October 15

"The Emperor Jones"—A mixed company presents its production of Eugene O'Neill's play about a Pullman porter who catapults himself into the position of emperor of a small West Indies island. At 8 p.m. in Caltech's Beckman Auditorium. Tickets are $22, $18 and $14. Call (626) 395-4652.

JPL Perl Users Group—Meeting at noon in Building 301-127.

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

ONE IN AN OCCASIONAL SERIES

FASTER, SMALLER, SMARTER

Can studying the brain structure of animals help make a better Mars rover? Can an entire flight computer that runs navigation, power and other systems be shrunk onto a chip the size of a dime? Those are among many questions that technologists are asking themselves as they strive to make intelligent spacecraft of the future smaller and lighter.

By Mark Whalen

At JPL, much of this work is going on at the Lab's Center for Integrated Space Microsystems, which develops highly miniaturized advanced avionics and computer systems for future deep-space applications. Dr. Leon Alkalai leads this JPL Center of Excellence, one of six areas of specialty on Lab designated by NASA.

QUESTION How did the center get started?

A Three years ago, NASA Administrator Daniel Goldin requested a series of briefings about the agency's role in the development of advanced microelectronics technologies for future missions. At that time, I was the co-lead for the New Millennium Program's microelectronics integrated product development team.

Initially, we presented a somewhat conservative vision; I told Mr. Goldin that the best NASA could do is to follow industry's lead, that it could not compete with companies that put billions of dollars into microelectronics products.

Fortunately for us, it turns out he didn't like what he heard. He responded in no uncertain terms that NASA and JPL should not follow, but indeed must lead, future development of these areas. Goldin asked to meet with us again in one month for a much more future-looking vision.

With the support of my JPL colleagues, I presented a new, forward-looking vision of NASA as a technology leader in microelectronics. We told the administrator about JPL's desire to develop highly intelligent, autonomous and miniaturized spacecraft systems, including how to use elements of biology to do computing.

QUESTION Was Goldin impressed?

A Yes; in fact, our second presentation really blew him away. He told Ed Stone, Charles Elachi and myself, "You don't understand how important this meeting really was. This is going to change NASA." And that has been happening. I believe Goldin's push for excellence in technical development, and JPL's response to it, was the driver for the creation of the Deep Space Systems Technology Program (also known by the nickname "X2000"). And this in turn was responsible for the creation of our center.

QUESTION What are the center's areas of focus?

A One of the center's virtues is that it holds JPL's vision for technology development within three time frames—near-, mid- and long-term. This approach allows lessons learned and valuable engineering experience to go from near-term to future technologies.

QUESTION How does the center's work fit in with X2000? What is the center working on for the near term?

A With its newly designed facilities, the center supports advanced design engineering, avionics integration and test, and chip-level testing for X2000's first-delivery project, a first-generation avionics system based on single-board computers connected in a network for distributed, highly reliable systems. The first user of this architecture is the Europa Orbiter mission, set to launch in 2003.

QUESTION What will these advanced flight computers be like?

A The Europa mission will carry the highest-performing radiation-hardened PowerPC processor chip set ever flown, with an order of magnitude (10 times) more capability than the computer flown on Mars Pathfinder. This computer can later be used by numerous flight projects—not only within NASA, but in the Department of Defense as well. Also, a radiation-hardened Pentium computer that is fully compatible with the PowerPC computer will also be available as a backup technology in the same time frame.

QUESTION What other technologies for the Europa mission are under development now?

A Actually, there are at least 15 advanced avionics technologies for deep-space exploration that are currently baselined for the Europa orbiter and will be delivered in the 2001-2001 timeframe.

One of the major technology developments here is that all of the interfaces between subsystems and components are based on commercial, off-the-shelf standards. This will result in huge cost savings, and will allow more efficient integration and test of these systems.

It's the first time JPL has procured these interfaces as intellectual properties and built them on radiation-hardened platforms. They have been adapted to survive Europa's high-radiation environment.

QUESTION What are the goals for the center's mid-term technology planning?

A Within three to five years, we are looking to develop "systems on a chip," which will miniaturize all spacecraft requirements for power, communications, computer and memory, and guidance and navigation from computer boards to single chips smaller than a dime. This technology development, led by Dr. Elizabeth Kolawa, is a new approach to building smaller systems and allows us to use them more frequently. For example, multiple systems on a chip might be applied to the skin of a spacecraft as environmental sensors. We might put thousands of them on the space station, where they could communicate with each other to track the flow of gases and other hazards onboard.

QUESTION What more would a system this small allow you to do?

A A huge part of any spacecraft is electronics, and the ability to make this somewhat transparent would give us much more capability than we have today. We could have, let's say, a "sensor web" on Mars, where we would sprinkle sensors throughout. The chips would be able to sense, communicate and process information.

QUESTION What's the time frame for your long-term goals?

A For the long term, which we think will take between five and 10 years, the goal is the development of revolutionary computing technologies. Dr. Benny Toomarian manages this program.

QUESTION Does this mean developing even smaller technologies than systems on a chip?

A Yes. The studies will attempt to develop technologies as small as the nano-level, or a billionth of a meter. An example is a collaboration we've recently begun with the National Cancer Institute to develop sensor systems that would identify biological signatures at the molecular scale for detecting cancerous cells in living organisms.

QUESTION Why would a system designed to study cancer help us with spacecraft?

A These systems could be used for identifying evidence of life in-situ on Mars or on an asteroid or comet. They could also aid "bioastronautics," where future astronauts, going months or years without getting help or supplies from Earth, might be monitored to detect health problems way in advance.

QUESTION You mentioned studying biology to develop microsystems. How is that seen as part of the long-term vision?

A We're going back to nature to study how living organisms, over billions of years of evolution, have solved very complex problems. By mimicking biology, we are looking at how to solve control functions in robotics, like navigation and mobility. Neurobiologist Chris Assad, a postdoctoral scholar at JPL, is studying how the cerebel-

Continued on page 4

Photo by Richard Hasegawa

"We're going back to nature to study how living organisms, over billions of years of evolution, have solved very complex problems."

Dr. Leon Alkalai, center leader

Feedback sought on future of ads

Today's issue of Universe debuts a new format as designed by JPL's Design Services team in Section 644.

Under consideration for future issues of the newspaper is the relocation of classified advertising to an online system, where advertising deadlines would not be a factor for advertisers or readers.

An August survey on a new ad format received scant response, so readers again are offered an opportunity to provide Universe with feedback on the subject. Send comments to feedback@universe.jpl.nasa.gov.

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

Universe

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Notice to Advertisers

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

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

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

SMALLER *continued from page 3*

lum of fish controls complex motor functions and how that knowledge might be used to design, for example, better rovers for Mars.

QUESTION What is the center doing for the long term for new paradigms of computing?

A Researcher Adrian Stoica has pioneered "evolvable hardware," silicon hardware chips that can change over time based on genetic algorithms, which simulate evolution for the purpose of surviving failures due to extreme environments. It's an attempt to derive solutions over generations by developing systems that have redundancies built in at the material, device and circuit levels so that if certain elements fail, the chip would evolve and reconfigure around faulty areas.

We envision these types of technologies for missions such as interstellar exploration, where we need systems to adapt and survive for as much as a century. A few years ago, this was unimaginable.

QUESTION How does your center operate?

A We operate in a "soft project" mode—nobody changes organizational boundaries to do our work. As a research and development project, the center receives funding and facilities support from JPL's technical infrastructure burden. I report to Dr. Bill Weber, director for the Office of Engineering and Science.

QUESTION What do you consider your greatest accomplishments so far?

A This is our second year as a center, and I am proud that we've developed the right environment and culture to innovate and transfer advanced technologies into future flight projects. This year, center members have contributed more than 50 peer-reviewed publications and more than two dozen new technology reports, and about a half-dozen patents have been awarded and filed.

QUESTION What are your greatest challenges right now?

A The biggest challenge we face is to have new technologies inserted into flight projects in a timely manner. Often, flight projects are resistant to flying new technologies. I believe if we fly our missions with older technologies, we stand to lose. If we lead the world in technology-based space exploration, we will have a bright future. That's JPL's winning ticket, in my opinion.

Letters

I would like to thank the many friends here at JPL who expressed condolences after the recent death of my mother. Your warm expressions of sympathy were a welcome source of support.

Larry Dumas

My family and I would like to thank all of my friends at JPL and OAO for your expressions of sympathy in the loss of my brother. I am truly overwhelmed at your thoughtfulness and kindness during this difficult time. Also, thank you to the ERC and OAO for the beautiful plants we received.

Cozette Parker

Passings

JESSE CUNNINGHAM, 91, a retired senior administrative assistant in the former Section 292, died of stroke Aug. 5. Cunningham, who worked at the Lab from 1953-76, is survived by daughters Katherine James and Mariam Cunningham, and stepson Robert Brown.

Services were held at Ivy Lawn Memorial Park in Ventura.

JOSEPH SHAFFER JR., 73, retired group supervisor for propulsion launch vehicle integration, guidance and control design, died Aug. 10 of complications resulting from heart surgery.

Shaffer, who joined JPL in 1959, served as launch vehicle engineer on several missions, and was launch vehicle manager for the TOPEX/Poseidon mission. He retired in 1993. He is survived by his wife, Dolores; daughter Carolyn; sons Ronald, James, Michael, Patrick and Timothy; and 14 grandchildren.

Burial services were held Aug. 12 at San Fernando Mission.

Retirees

The following employees retired in September: Robert Niedzialek, 44 years, Section 644; John Casani, 43 years, Section 100; Joseph Plamondon, 40 years, Section 515; William Tyler, 38 years, Section 506; Steven Burks, 37 years, Section 334; William Peters, 36 years, Section 224; Ronald Wichelman, 23 years, Section 644; Mattie Green, 18 years, Section 335; Bert McKenna, 17 years, Section 387; Charles Crawford, 16 years, Section 215; George Alexander, 12 years, Section 180; Randy Ashway, 12 years, Section 223.

Classifieds

For Sale

AIRLINE TICKET, American Airlines, r/t, anywhere in the contiguous US, must be used by Feb. 2000, $450/obo. 714/903-8888.
APPLIANCES: vac. cleaner, Hoover, upright, w/attachments, gd cond., $50; steam iron, GEc Power Spray, vg cond., $20; floor lamp, black base & pole, off-white shade, gd cond., $15; indoor TV antenna (rabbit ears), rotating type, RCA, vg cond., $10. 626/577-8107.
BOMB HOIST, WWII vintage, portable, 1/2-ton capacity, gd. size for mounting in a truck bed, $60. 626/302-1927.
CAMERA, Nikon FE, fully auto. except focus, Nikon F 1.4.50mm, Kiron 28-70mm zoom, Kiron 70-150mm zoom electronic flashgun, exc. cond., instruction manual, $290. 626/351-6141.
CD WRITER, HP external SureStore, $139; Iomega SCSI Zip drive, $89; Iomega Zip SCSI card, $35; SOFTWARE: Jeopardy, $10; new '99 Yellow pg. USA, 14M listings, $5; Photo Studio, spec. ed., $7; Macafee anti-virus sec. suite, free updates, $19, orig. $79; Compton encyc., $5; Analyze Your Dreams CD, $5; X-men Apocalypse CD, $4; Bruderbund Applic. Bible CD, $10, orig. $59; Greeting Card Creator, $5; Premier Ed. Draw Print Studio, $15, orig. $49; You Don't Know Jack CDs, $15. 366-6134.
CHINA SET, 60 pc, $70/obo. 909/592-0780, Ana.
COMPUTER KEYBOARD, Microsoft Windows95 Natural, $15. 362-2003, Derek.
DICTATION/TRANSCRIBING MACHINE, Sony prof. model BM75 w/ft. pedal, $75. 323/221-8620, Richard.
DINING ROOM FURNITURE: cherry wood server from Ethan Allen (Georgian Court collection), 40" x 21" x 34", exc. cond., $800; matching wall-mounted shelf, $40. 626/577-8107.
DISHWASHER, portable, runs well, wooden top, will deliver locally for $5, $30. 626/457-8435.
EXERCISE EQUIPMENT, bicycle exerciser, Huffy $45; Back Revolution exerciser, never used, $350 new, sell $200. 909/594-4180, Ron.
EXERCISE EQUIPMENT, Nordic Track Pro, new, w/pulse monitor, $250. 626/798-8970.
EXERCISE EQUIPMENT, Voit SCX230P electronic aerobic stepper, picture in owner's manual, gd cond., 4 yrs. old, $50. 805/527-6834.
FOOTBALL CARD, 1 autographed Randy Moss 8" X 10", '98 rookie of yr. w/cert. of authenticity, $60; BASEBALL/FOOTBALL CARDS, assorted, 200 count w/major stars, rookies, inserts, favorite teams/players incl., $20. 626/914-6083.
FREEZER, 18.5 cu. ft., chest, Montgomery Wards signature, used 2 yrs., otherwise stored, good cond., $75. 626/798-8970.
FURNITURE, 3-pc. set, 7 ft. sofa, 5 ft. love seat, wingback chair, pur. 1 1/2 yrs. ago at Rob-May for $3,500, like new, beaut. hunter grn./beige plaid, accent pillows, $500. 701-0061.
GUITARS, Epiphone Dot 335, black, list $870, ask $325; Epiphone Riviera, cherry, both new w/hard case, list $1,200, sell $495. 249-2357.
GUITARS: '66 Fender super reverb, black face, no mods., grill cloth & spkrs. not orig., gone thru, new tubes, filter caps, great tone, $975; '66 Gibson EX-335, cherry red, trapeze bridge, all orig. w/orig. hse., $1,850; '64 Gretsch Chet Atkins 6120, orange, dbl. cutaway, bigsby, mute, thumbnail markes, $1850; '61 Gibson Les Paul/SG cherry red, great cond., great tone, $3,300; '57 Fender Telecaster, neck refinished, pots changed, body paint & pick-ups original, $3,500/obo; '55 Fender P-bass, blonde, bakelite pickguard, contour body, $3,750. 626/798-7339.
PHOTOGRAPHS, 40" x 30", color, framed; 2 tall-ship pics by prof. photog., vg cond., 1 of Span. ship in SF bay, one of German ship nr Puerto Rico, $70/each, $120/both obo. 626/568-8298.
PIANO, '62 Wurlitzer console w/bench, vg cond., $780/obo. 323/550-8139.
PIANO, Wurlitzer Spinet, w/bench, $875; SPEAKERS, Advent utility w/stands, gd cond., $80/pr.; BIKE, BMX-style, 20" tires, vg overall cond., $40. 952-8455.
PICTURE FRAMES, 3 made of brass, 22" x 28"; $6 each, $15 for all 3/obo. 626/568-8296.
POOL, Doughboy, 16-ft. diam. by 4 ft. deep, exc. cond., incl. ladder, pump, DE filter, accessories, $2,000. 249-9534.
PRINTER, Xerox Diablo 630 daisywheel w/print wheels/ribbons, exc. cond., works great, $10/obo. 626/568-8298.
PUPPIES: purebred Eng. Springer Spaniels, grt. hunters, championship bloodlines, $400/ea., see http://www.gundog.nu for info/pictures.
RABBIT HUTCH, lg. 4'. x 4'., $90; two smaller cages (1.5 x 2), $15/ea. 626/797-4758.
SKI MACHINE, NordicTrack, $200. 626/358-7480.
SOFA SLEEPER, 7', multi-colored, qn. sz., used once, pd. $655, sell $500/obo. 241-9232.
TABLES, glass, four 2-shelf tables w/brass ft., 3 make up a coffee table (1 round 2.5 ft. dia., 2 "half-moon"); 4th is a round end table, 2.5 ft. dia.; $125/obo. 909/592-0780, Ana.
TICKETS, 2, Bruce Springsteen, Oct. 17, sec 317, row 6, $100 ea. 323/259-8604.
TV CART, holds up to 27" TV, space for VCR & storage below, $50/obo. 626/398-4960.
TY BEANIE BABIES, current & retired, good prices, 626/963-0685, Lupe Medina, after 5:30.
TYPEWRITER, Underwood elect., portable, hardshell carry case, like new, $75/obo. 626/284-9664.
WATERBED FRAME, Cal. king firm mattr., 6-drwr underdresser, $150/obo. 818/249-4536, Steve.
WEDDING DRESS, exc. cond, used once, in garment bag, white, straight, long sleeves, bow in back, $40/obo. 626/568-8298.
WEIGHT BENCH SET, Competitor 1500 bench w/bench press bar & 330 lbs., std. weights, vg cond., $175. 626/798-8970.

Vehicles/Accessories

'95 ACURA Legend LS coupe, 2D, black, auto, 104,000 mi., mint cond., leather, sunroof, heated seats, alloy wheels, CD, remote keyless entry, $22,000/obo. 213/253-9279.
CAR KIT, Pinto Gazelle, compl., need Pinto only, was $7,000, sell $2,000. 909/594-4180, Ron.
'88 CHAMPION RV, 19 foot, Chev truck, self-contained, less than 30,000 miles, need paint, $14,000. 626/444-6691, Forrest Janes.
'96 FORD Escort LX, 4-dr., a/c, fm/cass., alarm, 5-spd., extended warr., $6,800/obo. 353-4725.
'97 GMC Safari van, exc. cond.; 32k mi., still under GMC 7-yr. 100,000- mi. warr., $19,000. 661/252-9183.
'90 HONDA 100 CR, exc. cond., runs great, current regist. 2001, $1,000. 661/251-7738.
'86 HONDA Accord shop manual; i70 DATSUN 240Z service manual. 952-8455.
'82 MERCEDES 300TD wagon, leather, sheepskins, gold color, sunroof, window tint, 157k miles, $4,500/obo. 626/584-4645.
'80 MECERDES BENZ 280 SL, gray mkt., black w/hard top & soft new top, 196K mi., recent engine work, exc. cond., $4,500. 626/301-9487.
'95 SATURN SL-2, 4-dr. sedan, a/c, AM/FM/tape, cruise, 5-spd., exc. shape, low mi. (28K), $8,900. 626/797-3310 eves./weekends.
'86 TOYOTA Camry, orig. owner, vg cond. clean in/out, air, auto alarm, 133M, $1,800. 626/305-6666.
'90 TOYOTA Corolla, good cond., 283K mi, $2,100; '85 TOYOTA Camry, new motor & smog, slight damage on rear door, otherwise mint, $2,800. 562/464-0446.
'90 VW Fox, gd. cond., great 1st car, low miles, CD, a/c, $2,950/obo. 542-4128.
'91 YAMAHA Virago 1100, black w/gray accent, lots of chrome, Jardine pipes & foot controls, $3,550/obo. 616/355-6350, Paul.
'86 YAMAHA Fz750, 37k mi., new tires, brakes, & chain, original owner, vg cond., runs great, many extras, see photo on ERC board, $1,600. 626/345-0079, Ron.
'71 YAMAHA Enduro motorcycle, 175cc CT3, needs TLC, $100/obo. 626/798-8970.

Wanted

CHIPPER/SHREDDER to rent (or buy) for garden cleaning and compost shredding. 626/794-8616.
GRADUATES, Belmont High School (LA) from 1957-62. 956-1744, Barbara.
SAILBOAT PARTNERS in a Santana 27 berthed in San Pedro. 626/797-6982.
SNOWBOARD w/bindings, snowboard boots, gloves for child abt. 54" tall, shoe sz. 3. 952-8455.
SPACE INFO/memorabilia from U.S./other countries, past & present. 790-8523, Marc Rayman.
TREADMILL exerciser, variable speed, gd working cond. 661/296-6260.
T-SHIRT, Cassini-Huygens Earth swingby, XL, flyby date is my birthday, so your sacrifice would mean a lot. 626/351-6964, Guy.
VACATION RENTAL in San Diego for Dec. 26 '99-Jan. 3, 2000. 626/683-9177, Laurence.
VOLLEYBALL PLAYERS, coed, all levels of play, every Tues. night 8-10, Eagle Rock High School, $3/nt. 956-1744, Barbara.

Free

DOG, beautiful female American mix, brown w/black tiger stripes, spayed & shots current, med. dog, a little over 2 yrs. old, indoor/outdoor, loves people, great friend. 909/396-0471.
DRAWERS from remodeled kitchen, several sizes. 341-1798.
EXERCISE BICYCLE, DP-1250, gd. cond. 626/798-8970.
FOAM PACKING PEANUTS, approx. 16 cu. ft., enough for full house move. 626/799-4478, Al.

For Rent

ALTADENA, spacious 2+1 home, prime neighbood, c/a, 2-car gar., hardwood floors, fenced yd. w/gardener, remodeled kitch., f/p, $1,500 + security. 949-5206.
EAGLE ROCK, furn. rm in single-fam. house, nice area, 10 min./JPL, priv. entr. and ba., share kitch./laundry privileges, $350 incl. util. 323/256-1785.
GLENDALE house, prime location, full privlgs, cent. courtyd. w/ftn., deck w/gazebo, util./cable incl., for 1 person to share w/1 other, no smoking/drinking. 246-4750.
LA CANADA, 1 bd., 1 ba., upstairs, $700. 790-7445.
LA CRESCENTA, 2 bd., high above Foothill, incl. pool w/service and gardener, $1,450. 952-6007.
PASADENA, rm. in 3-bd. apt. to share w/2 others, pool, parking, a/c, washer/dryer, $460. + 1/3 util. 626/564-1078.
WEST PASADENA, 2 bd., 1 ba, 2-car gar., detached studio. 626/441-3171, Tom Markey.

Real Estate

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry rm, $129,000. 909/585-9026.
MONROVIA, 3 bd., 1.75 ba., w/guest house, cnt. heat/air, cathedral ceilings, FP, updated kitch., cedar-lined closets, 2-car carport, detached laundry/utility rm., covered patio, $288,000. 626/358-7480.
MONROVIA panoramic vw. home, 3 bd., 1 3/4 ba., little bit of paradise, 2 f/p, walls of glass, 3 decks, recent updated gourm. kitch. w/prof. stove, c/a & forced air/heat, spa & bar on middle deck, 2-car garage, 64' X 200' lot, $319,000. 626/357-3230.
NORTHRIDGE townhouse in gated community, appx. 1,300 sq. ft., 2 bd., 2.5 ba., 2-car att. garage, immac. unit w/many upgrades, beautiful backyd., complex has pools, Jacuzzis, 2 tennis courts; 25 min./JPL, $205,000. 360-5235.
PASADENA, 1 bd. apt., exc. loc., furn., refrig., stove, wall installed a/c & heating units, easy access to public transport. & shops, nr. Victory Pk, 994 North Altadena Dr., $600. 242-3017, Armond.
PASADENA townhome, built '98, nr Rose Bowl, 3.5 mi/JPL, gated community, 1,450 sq. ft., 3 bd./2.5 ba, cent. heat/air, 2-car att. gar., prof. organized closets, tiled FP, alarm, ceiling fans w/lights in all bd., covered balcony off master, Pergo maple flrs, all Corian counters, lg enclosed backyd fully landscaped w/auto sprinklers, palm/fruit trees, pool, Jacz, basketball court, $255,000/obo. 626/568-8298.
SIERRA MADRE CANYON, beautiful home surrounded by oaks, peaceful escape from the ordinary, spectacular view, 3 bd., 2 ba., lg. kitch., formal din. rm., $440,000. 626/355-7177.

Vacation Rentals

BIG BEAR cabin, quiet area near village, 2 bd., sleeps 8, completely furnished, F/P, TV/VCP, $75/night, 249-8515.
BIG BEAR, 7 mi./slopes, full kitchen, f/p, 2 bd., 1-ba., sleeps 6, reasonable rates, 2-night min., no smokers, no pets, exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2-bd., sleeps up to 6, f/p, TV, VCR, phone, microwave, BBQ and more, JPL discount price from $65/night. 909/522-9874.
BIG BEAR LAKEFRONT, 1 bd., 1 ba., condo., sleeps 4, full kitch., gym, indoor pool, Jacz., BBQ areas, Oct. 22-29, $75/night. 323/296-6641.
BIG BEAR LAKEFRONT, lux. townhome, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, sleeps up to 4, excellent view. 248-8853.
DAYTONA BEACH, FL for Y2K, priv. beach access, 1 bd., 2 ba., cable TV/VCR, FM ster., full kitch. w/dishwasher & microwave, laundry w&d in-rm, veranda overlooking ocean, Jacz., sauna, pool, game rm, indoor garage; easy access to shopping, nightlife; JPL discount, 5-day min., sleeps 4; avail. 12/17/99-1/7/00. 909/981-7492.
HAWAII, Kona, priv. house & guest house on 166 ft. of ocean front on Keauhou Bay, restaur., golf courses, other attractions. 626/584-9632.
HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwv., dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate $95/nite/2, 12/15-4/14 rate $110/nite/2, $10/nite add'l person. 949/348-8047.
HAWAII, Maui luxury condo. on west Maui beach w/ocean-front location, fully furnished lv. rm., 2 bd., kitchen, $140/day/2. 805/646-0810.
LAKE TAHOE, N. shore, 2 bd., 2 ba., sleeps 6-7, private sandy beach, pool, great location, all amenities, hiking, kayaking, river rafting, bike trails, 2 mi./casinos, JPL discount, 3-day min. 626/355-3886, Rosemary or Ed.
MAMMOTH, Chamonix condo, 2 bd., 2 ba., sleeps 6, fully equip. elec. kitch., microwave & extras, fireplace, cable TV, VCR, FM stereo, pool & sun area, o/d Jacuzzi, sauna, game, rec. & laundry rms, BBQ area, conv. to lifts, hiking, shops & summer events, daily/weekly rates, summer rates thru Oct. 249-8524.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equipped kitch. incl., microwave, D/W, cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455.
OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier or harbor, pool, spa, game rm., sleeps 4. 949/786-6548.
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.
SOUTH LAKE TAHOE KEYS, waterfront, 4 bd., 3 ba., handicap access fair, sleeps 12+, frplc. on 2 levels, decks overlook priv. dock, & ski lifts, gourmet kitch., bikes, 20' sail/paddle boats, 3 color TVs, VCR, stereo, assn. indoor/outdoor pools, hot tub, beach, lighted tennis, 10 min./skiing, casinos, golf, 1 hr./wine country, 3-day min.; $1,095/wk for high seas., 15 June to 15 Sept., 22 Nov. to 1 March; $495/wk low season, + $90 cleaning fee. 949/515-5812, Jim Douglas.

Universe

Jet Propulsion Laboratory

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Inside

New educator center 2
News Briefs 2
Special Events Calendar ... 2
Polar Lander approaches ... 3
Letters, Passings 4
Classifieds 4

Galileo completes daring Io flyby

By Jane Platt

For the men and women of the Galileo project, Sunday, Oct. 10 began as a real nail-biter, but ended with immense pride and relief as the spacecraft successfully completed its daring flyby of Jupiter's moon Io.

A plume of gas and particles is ejected some 100 kilometers (about 60 miles) above the surface of Jupiter's volcanic moon Io in image recently taken by Galileo.

An unexpected 3:09 a.m. wakeup call on Sunday sent Galileo team members scrambling into action. Three hours after entering the intense radiation zone near Jupiter and Io, Galileo went into safing when an error popped up in the memory of the onboard computer. The team was faced with a daunting task—to get the spacecraft out of safing and back to normal operations in time for the flyby at 10:06 p.m. (Earth receipt time).

"It was a heroic effort to pull this off," said Galileo Project Manager Jim Erickson. "The team diagnosed and corrected a problem we'd never come across before, and they put things back on track."

"We waited four years for this encounter and we would do everything in our power to make it happen," said Eilene Theilig, spacecraft and sequence team chief. "Each person in this talented, dedicated and professional group knew what he or she had to do."

"Before every encounter, we go through various contingency scenarios, including a possible safing," said Nagin Cox, spacecraft and sequence team deputy team chief. "That preparation paid off and the anomaly resolution team swung into action quickly."

"It was poetry in motion," said Olen Adams, lead for Galileo's command and data subsystem. "People were traveling around these aisles like it was a relay race. Every single person had to perform perfectly. We could not afford one single 'gotcha.' If one person got sick, or one PC crashed, or one command didn't make it to the spacecraft, it wouldn't have worked."

"I knew that if the radiation had triggered one memory fault, there was a good chance it could trigger another," said Tal Brady, who designed the command and data subsystem flight software. "I was very relieved when we got the spacecraft out of safing and later when the flyby data was recorded successfully."

The team saved the day by first pinpointing the location of the computer memory error. They did this by analyzing telemetry and memory readouts and looking at the timeline of spacecraft activities. They changed the encounter sequence to avoid activities that use the faulty portion of the memory. By late Sunday afternoon, Galileo engineers uplinked a new command sequence to the spacecraft. That posed another risk, since the transmission took place while Galileo was in the deepest portion of the radiation zone near Io. Against all odds, Galileo resumed full operations at 8 p.m., just two hours before the Io flyby.

The spacecraft and sequence team did much of the hands-on work, in conjunction with the science and mission control teams. Erickson pointed out, "We were able to meet this enormous challenge because the other teams did their work and assured us that we were free to focus on the crisis at hand."

During the flyby, Galileo's science instruments studied the surface chemistry, heat, gravity and magnetic properties of Io, the most volcanic body in our solar system, from an altitude of only 611 kilometers (380 miles). This was the closest look at Io by any spacecraft. The data, including close-up images, will be transmitted to Earth in coming weeks.

"We want to learn more about the differences and similarities between volcanoes on Io and volcanoes on Earth," said Dr. Duane Bindschadler, Galileo manager of science operations and planning.

A second, closer flyby of Io by Galileo is planned for Nov. 25 at an altitude of 300 kilometers (186 miles).

Battery acid chemical found on Europa

By Jane Platt

Frozen sulfuric acid on Jupiter's moon Europa is depicted in this image produced from Galileo data.

Sulfuric acid—a corrosive chemical found on Earth in car batteries—exists on the frozen surface of Jupiter's icy moon Europa.

"This demonstrates once again that Europa is a really bizarre place," said Dr. Robert Carlson of JPL. "Sulfuric acid occurs in nature, but it isn't plentiful. You're not likely to find sulfuric acid on Earth's beaches, but on Europa, it covers large portions of the surface."

The new Galileo findings were reported in the Oct. 1 issue of the journal Science. Carlson, principal investigator for the near-infrared mapping spectrometer aboard Galileo, is the lead author of the paper. The instrument works like a prism to break up infrared light. Scientists can study the resulting light patterns to determine what chemicals are present, since different chemicals absorb infrared light differently.

Pictures and other information gathered by Galileo indicate Europa may have a liquid ocean. Water is one key ingredient essential for life.

At first, Carlson thought the findings of sulfuric acid on Europa would quash any talk that life might exist there. Those thoughts were negated by a colleague, Dr. Kenneth Nealson, head of JPL's astrobiology unit.

"The presence of sulfuric acid on Europa in no way rules out the possibility of life," Nealson said. ""In fact, to make energy, which is essential to life, you need fuel and something with which to burn it. Sulfur and sulfuric acid are known oxidants, or energy sources, for living things on Earth. These new findings encourage us to hunt for possible links between the sulfur oxidants on Europa's surface, and natural fuels produced from Europa's hot interior."

Carlson proposes the theory that the sulfur atoms originate with the volcanoes on Io, with the material being ejected into the magnetic environment around Jupiter and eventually whirled toward Europa. Another idea is that sulfuric acid comes from Europa's interior, beneath the icy crust, ejected by sulfuric acid geysers or oozing up through cracks in the ice. Yet another theory is that sodium and magnesium sulfates may have leached onto Europa's surface from underground oceans and then were altered by the intense radiation field, producing frozen sulfuric acid and other sulfur compounds.

Carlson and one of his co-authors, Mark Anderson, a chemist in JPL's Analytical Chemistry Laboratory, hope to determine whether Jupiter's largest moon, Ganymede, also contains sulfuric acid.

Good news for NASA, JPL budgets

By Mark Whalen

Last week's House/Senate conference committee recommendation for a NASA fiscal year 2000 space science budget of $2.198 billion, representing President Clinton's full request for the agency's funding next year, comes as "excellent news for JPL," according to Dr. Richard O'Toole, manager of the Lab's Legislative and International Affairs Office.

However, he said, the allocation may be reduced somewhat depending on how NASA allocates a general funding reduction of $30 million for science, aeronautics and technology.

In addition to the modest cut in space science funding, Earth science programs are due to be cut by only about $4 million next year as part of NASA's overall budget increase of $75 million above the president's request.

NASA's budget bill is expected to be approved by both houses of Congress this week and Clinton is expected to sign the bill before the current continuing resolution to operate the agency expires on Oct. 21, O'Toole said.

Local congressional representatives David Dreier (R-Glendora) and James Rogan (R-Glendale) "really went to bat for us, helping restore space science funding above what it was in both the House and Senate bills," O'Toole noted. "We faced cuts of $240 million in the House and $120 million in the Senate, and it came out at the president's requested level, pending the allocation of the general funding reduction. That's very positive."

California senators Dianne Feinstein and Barbara Boxer also helped NASA's cause, he said, with a joint letter of support to conference committee chair Christopher Bond (R-Mo.) and Barbara Mikulski (D-Md.), the ranking minority senator on the conference committee.

The exact effect on JPL programs will not be known until Dr. Ed Weiler, NASA's associate administrator of space science, decides where to make specific funding adjustments for next year. That could be decided in the next few weeks.

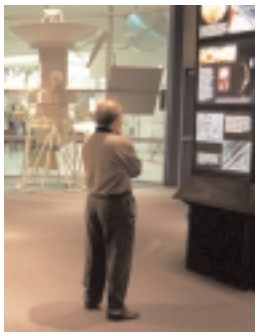
Still, O'Toole said, "I wouldn't expect significant dislocations to our programs."

New JPL facility will help space educators

By John G. Watson

Southern California educators seeking innovative ways to integrate space exploration into their classrooms now have an exciting, new resource with last month's opening of JPL's Educator Resource Center and Applied Technology Classroom in Pomona.

Developed as a result of a new partnership between JPL and the Pomona Unified School District, the state-of-the-art facilities will provide materials and strategies for teachers at all levels who wish to include the space program in their curricula.



Bob Brown/JPL Photo

A visitor center exhibiting spacecraft models, artifacts and JPL space exploration is part of the new Educator Resource Center and Applied Technology Classroom.

"We are excited about the capabilities of these beautiful facilities and about the new relationship with the district," said site administrator Gene Vosicky of JPL's Communications and Education Office.

The center is a focal point for educators to become acquainted with NASA/JPL educational materials and resources. The classroom is designed to increase students' knowledge of technology and science through scientific investigations, and also serves as a model for educators on how to utilize computers and other technologies in the instructional process.

The facility is located in the district-owned Village at Indian Hill educational mall, 1460 E. Holt Ave., Suite 20. For information, call (909) 397-4420.

News Briefs

ABOUT 3,500 PEOPLE attended the Lab's annual Family Day Oct. 2.

Family members of JPL employees and contractors enjoyed music, children's activities, tours of various Lab facilities and a complimentary lunch.

"A big thank you to all those at JPL who volunteered to make the day a success," said NANCY KAPELL of the Reward and Recognition and Employee Services Group.

INFLUENZA VACCINES will be offered to employees and affiliates twice weekly from Oct. 26 to Nov. 18.

The vaccine will be available in a series of clinics on Tuesdays and Thursdays at Occupational Health Services, Building 310-202, on the corner of Surveyor and Explorer roads. On each of those days, 125 vaccinations will be administered. Occupational Health Services will open at 1:30 p.m. and give out tickets for that day. Appointments will not be given, and shots will be administered on a first-come, first-served basis.

Influenza vaccine is strongly recommended for people over 65, residents of nursing homes and other chronic care facilities, adults and children with disorders of the pulmonary or cardiovascular systems, and those with chronic metabolic diseases. This year, the target population includes women in the second and third trimester of pregnancy and women in any trimester of pregnancy with a high-risk condition. The vaccine does not affect the safety of breastfeeding.

Immunization is also recommended for household members of high-risk persons.

Weekly schedules, including exceptions and changes, will be advertised on JPL monitors and posted to JPL forum. For more information, see Occupational Health Services' home page at http://eis/medical.

A KICKOFF CELEBRATION for this year's United Way campaign, "Make A Smile Last A While," will be held Oct. 29 at noon in the mall, in conjunction with the ERC's Halloween Fashion show. Displays by various community service agencies supported by United Way will be featured.

A $5 lunch special will be offered, of which 50 cents per meal will be donated to United Way by Eurest Dining Services, JPL's cafeteria contractor.

In addition, JPL's United Way food drive begins Oct. 25 and continues for three weeks. Last year, JPL staff donated enough food to help feed more than 1,000 families.

Through Nov. 12, food donations can be placed into barrels at the following locations: Building 114 (ERC); Building 167 cafeteria; Building 180 lobby; Building 190 cafeteria; Building 230 lobby; Building 264 (repro); Building 301, second floor; Building 302, second floor; Building 303 cafeteria; and Building 601 (Woodbury). Suggested items for food donations include canned stew, pork and beans, soup, chili and dried foods such as cereal, coffee, flour and sugar.

Last year, United Way of Greater Los Angeles raised $62 million, including $433,000 from JPL's campaign.

Campaign representatives in each JPL organization will begin contacting employees Oct. 29 for participation. Awards will be given to the top campaigners in each organization.

For more information, go online to http://hr/unitedway or contact NANCY KAPELL at ext. 4-9432.

WITH ANNUAL BENEFITS ENROLLMENT under way through Nov. 1, the Benefits Office urges employees to consider several factors before enrolling.

How well did your choices work for you last year? Do you need to add or delete dependents from coverage? Do you need to increase or decrease life insurance for yourself or dependents? Did you defer too much or too little from health care or depending care spending accounts?

To assist employees with coverage options and other questions, representatives from the Benefits Office and each of JPL's medical and dental insurance carriers will be on Lab from 9 a.m. to 3 p.m. on Oct. 21 (167 cafeteria) and Oct. 26 (303 cafeteria).

In addition, training sessions have been scheduled to show employees how to use the Oracle Web Applications system—the same web site used for timekeeping—to make benefit changes. Remaining dates and times are Oct. 20, 3 to 4 p.m., Building 167 conference room, and Oct. 28, 1 to 2 p.m., Building 180-101.

Updates on benefits enrollment will appear in "This Week." For more information, call the Benefits Office at ext. 4-3760. For questions about web application training, call ext. 4-1268.

Top photo: astronaut candidates and former JPLers Drs. John Olivas (left) and Stan Love sign autographs at Family Day. Bottom: Roger Gibbs shows visitors the Mars Yard.

Special Events Calendar

Ongoing

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

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

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

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

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

Friday, October 15

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

JPL Perl Users Group—Meeting at noon in Building 301-127.

Saturday, October 16

SURF Seminar—Registration for the Summer Undergraduate Research Fellowship begins at 9 a.m. at Caltech's San Pasqual Mall. Student presentations will be held from 10 to 11:40 a.m. and 1 to 4 p.m., followed by a poster session and reception. Admission is free; a $10 lunch will be available between noon and 1 p.m. Call 395-2885 or e-mail to sfp@cco. caltech.edu.

Monday, October 18

Caltech Ballroom Dance Club—Beginning east coast swing will be held from 7:30 to 9 p.m. in Caltech's Winnett Lounge. $1 per lesson. See www.caltech.edu/~ballroom or call 626/791-3103.

Galileo's 10th Anniversary—A new video celebrating the mission and its science contributions will be shown at 12:30 p.m. in von Kármán Auditorium.

Tuesday, October 19

Virtual Private Network—Bill Vlahos of Section 366 will describe this new remote access service, which supports secure dial-up Internet service providers and other connections. At noon in von Kármán Auditorium.

Wednesday, October 20

AFS Quick Start Session—Jeff Sachs of Section 366 will provide an overview of the benefits of this distributed file system to manage computer files, change passwords and protect data. At noon in von Kármán Auditorium.

Caltech Ballroom Dance Club—Beginning salsa will be held from 7:30 to 9 p.m. in Caltech's Winnett Lounge. Cost: $30. See www.caltech.edu/~ballroom or call 626/791-3103.

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

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

Thursday, October 21

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

Von Kármán Lecture Series—Mars '98 Project Scientist Dr. Richard Zurek and Deep Space 2 lead scientist Dr. Susan Smrekar will present "Return to Mars" at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, October 22

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

Von Kármán Lecture Series—Mars '98 Project Scientist Dr. Richard Zurek and Deep Space 2 lead scientist Dr. Susan Smrekar will present "Return to Mars" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Saturday, October 23

Beakman—The zany scientist from CBS' Beakman's World will present an interactive show on scientific principles at 2 p.m. in Caltech's Beckman Auditorium. Tickets are $10 for adults, $5 for children. Prior to the show, Family Day activities featuring scientific demonstrations, face painting and food will be presented beginning at 11:30 a.m. next to the auditorium. Call (626) 395-4652.

Sunday, October 24

Chamber Music—The Emerson String Quartet will appear at 3:30 p.m. in Caltech's Beckman Auditorium. Tickets: $25, $21, $17 and $13. Call (626) 395-4652.

Monday, October 25

Caltech Ballroom Dance Club—Beginning east coast swing will be held from 7:30 to 9 p.m. in Caltech's Winnett Lounge. $1 per lesson. See www.caltech.edu/~ballroom or call (626) 791-3103.

Wednesday, October 27

Caltech Ballroom Dance Club—Beginning salsa will be held from 7:30 to 9 p.m. in Caltech's Winnett Lounge. Cost: $30. See www. caltech.edu/~ballroom or call (626) 791-3103.

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.Call Mary Sue O'Brien at ext. 4-5090.

Thursday, October 28

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

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

Y2K Readiness—Kimberly Simpson will moderate a panel comprising members of JPL's Y2K Project and JPL Security and which will discuss the Lab's Y2K compliance efforts and what employees should know about the year 2000 transition. At noon in in von Kármán Auditorium.

Friday, October 29

JPL Perl Users Group—Meeting at noon in Building 301-127.

POLAR LANDER APPROACHES

In December, JPL's next Mars adventure will begin

By Mark Whalen

Members of the Mars '98 operations team who worked on Mars Climate Orbiter are now gearing up for the upcoming landing of Mars Polar Lander on Dec. 3. JPL Director Dr. Edward Stone and Mars Surveyor Operations Project Manager Richard Cook discussed with Universe the preparations under way for the mission.

Q: *Dr. Stone, following the loss of Mars Climate Orbiter, what do you believe is the most important thing for employees to keep in mind?*

Stone: The primary objective for the Laboratory now is not to look back, but to focus on Dec. 3. That's the key. All of our energies need to be focused on whatever needs to be done to assure a successful landing for Mars Polar Lander.

Q: *As landing day approaches, how is the morale of the Mars team?*

Cook: Obviously, the team was extremely disappointed by the loss of the orbiter. Yet, in a sense, having Mars Polar Lander coming up in less than two months is really the best thing for them. Everybody is moving on as rapidly as they can and focusing on what needs to be done.

Q: *Can the loss of the orbiter in some way help the team ensure success on the lander mission?*

Cook: Yes. We're using this opportunity to take a bottoms-up look at the risks we're taking and make sure we're doing all the right things. It allows us to see that everything really does work. Personally, I'm optimistic because I know the caliber of the people working on the flight team. To a person, they are committed to ensuring the success of Mars Polar Lander. I'm also extremely proud of the way they are handling adversity while staying focused on MPL.

Q: *Review teams within JPL and from NASA are probing the causes of the loss of Climate Orbiter. How can their findings be used to help Polar Lander?*

Cook: These reviews should help us identify process improvements that we can immediately apply to help the lander mission. We had already identified some improvements, but additional recommendations from the boards should be very helpful. One change that we are making is to improve our quality assurance, to make it as sound and as all-encompassing as possible. We are also increasing the fidelity of our operations testing to exercise more contingency paths. We are going back and taking a look at what we call an end-to-end risk tree or failure tree, and see where we might have holes. So we're updating our assessment of risk. We've also brought in other external organizations to help us with our processes and to provide us with another double-check.

Q: *How are these external organizations helping you with Polar Lander?*

Cook: A particularly good example is a team from Langley Research Center, which is helping us go over all the simulations we've done to validate the lander's entry, descent and landing system. They are uniquely qualified to do this work and will help us to verify all of the atmospheric entry and terminal guidance simulations that are performed.

Q: *So the checks that are going on are not just in reaction to Climate Orbiter's loss?*

Stone: Most of these activities are, in fact, not in reaction to the orbiter. We'll know very shortly what the orbiter's problems were, but we are not limiting what's being done to just addressing those issues.

Cook: I can say right now that the specific problem that led to the loss of Climate Orbiter—one team providing thruster activity information in imperial units with another using the metric system—will not occur with the lander. We're already done assessing that.

Stone: That isn't the main issue, however; the main issue is the process that should have recognized that situation. But rather than just focus on that process, we're taking a second look at all the processes, all of the critical elements and the hard parts of landing on Mars.

Q: *Can you address recent concerns about the state of the lander mission, particularly a potential problem with the spacecraft's flight aeroshell?*

Cook: This is a good opportunity to put some of those rumors to bed. During final inspections at Kennedy Space Center before launch, a very small pinhole was detected in the substrate, the structural backing behind the aeroshell. At the time, there was no real concern about it. But since the launch in January, some on the project suggested we make sure it's not a problem.

So just last week, we completed a set of tests using what's called an arc jet—like a giant blowtorch—at Ames Research Center, which effectively tests the heating environment we expect for the spacecraft's entry to Mars. The tests were completed with that small pinhole, and everything looked fine—the aeroshell worked exactly as planned.

Q: *What is the plan for direct-to-Earth communication with the lander and the use of Mars Global Surveyor as a relay?*

Cook: The Deep Space 2 mission, which will last for about about a week, will rely solely on Mars Global Surveyor for Earth communication. So for the first week or so of the lander mission, we will primarily depend on the lander for direct-to-Earth communication. After that, we'll be able to use Mars Global Surveyor for the relay of the lander data.

We will soon do end-to-end validation testing of our engineering unit copy of the Mars relay hardware at Lockheed Martin. We did that before launch, but we think it's useful to repeat those tests.

We've sharpened our pencils about how we might use direct-to-Earth; it would only extend the amount of time it will take to do things at the beginning of the mission. We're probably not going to get color panoramas within the first couple of days, like Pathfinder did; it will probably take three or four days this time. But we will get enough data to do a really successful science mission.

Q: *Dr. Stone, do you feel that the reviews and extra attention to detail on Polar Lander will help lead to a successful mission?*

Stone: I'm confident that we will have a successful landing, and the processes and additional checks we're going through will help us make sure we've got it exactly right. Our internal activities already in place are looking at all the critical areas, and the JPL review team led by John Casani, as well as the external NASA review team, will make independent assessments of what can be done to assure a safe landing on Mars.

Q: *On another subject, Galileo's flyby of Jupiter's moon Io this week has given JPL another shot in the arm, hasn't it?*

Stone: Yes. The successful Io flyby is a very important milestone. The team did a tremendous job in recovering the spacecraft from "safe mode," identifying the problem with the computer's memory and restoring the sequence, all during the day of encounter. It's a testimony to the skill the Laboratory has in dealing with complicated missions in difficult environments.

Learning from the occasional setback is critical to honing those skills in the new era of going often, landing and bringing samples back.

"Personally, I'm optimistic because I know the caliber of the people working on the flight team. To a person, they are committed to ensuring the success of Mars Polar Lander. I'm also extremely proud of the way they are handling adversity while staying focused on MPL."

Richard Cook
MARS SURVEYOR OPERATIONS PROJECT MANAGER

Bob Brown/JPL Photo

READERS NOTE

Two ads per person limit

Due to the large volume of classified ads submitted to Universe and space limitations, restrictions have been put in place to limit the number and size of ads.

Effective with the Oct. 29 issue, no more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission.

The ad deadline for the Oct. 29 Universe is Monday, Oct. 18 at 2 p.m.

For questions, call ext. 4-6089.

http://universe.jpl.nasa.gov

Universe

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Notice to Advertisers

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

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

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

Letters

Thanks to the ERC for the plant received on notification of my father's death. And thanks to the many co-workers expressing support at this difficult time for our family. Thanks.

Albert Whittlesey

Your kindness, thoughts and prayers helped tremendously, and I want to thank my friends and co-workers for all the caring words, hugs and cards that received on the passing of my mom on July 12. Also, a special thank you to the ERC for the beautiful plant.

Pat Rollins

My family and I would like to thank all my friends at JPL who have expressed condolences after the recent death of my mother. Also, we would like to thank the ERC for the beautiful plant we received.

Kamesh Mantha

Passings

NORMAN MORGAN, 68, retired supervisor of the Mechanical Engineering Group, Mechanical Systems Development Section 352, died of liver failure Aug. 30.

Morgan worked at JPL for 29 years, retiring in 1991. He is survived by his wife, Margaret, daughter Lisa, sons Kurt and Brad, and six grandchildren.

Memorial services were held Sept. 11 in Hahamongna Park. Donations are requested to Tree-People, 12601 Mulholland Dr., Beverly Hills, CA 90210.

KATHRYN MIKA, 50, a customer service representative in Engineering Documentation Services, Section 644, died of heart failure Sept. 3 at her home in Rosamond.

Mika had worked at JPL since 1992. She is survived by her parents, Frank and Mary Kofahl, sister Lorraine Schwarz and brothers Steve and Kurt Kofahl.

Services were private.

Classifieds

For Sale

AIRLINE TICKET, R/T, anywhere Southwest flies, travel must be completed by Nov. 17, $150/obo. 626/355-3886.

BABY ITEMS, cradle, includes sheet & mattress, $40; exersaucer $35; infant car seat, infant snugli, assorted infant clothes, blankets, shoes, all in gd. cond. and reasonably priced. 626/796–6248.

BAR STOOLS, unfinished heavy duty wooden set w/arms and swivel seats, $200/obo. 957-3022, eves.

BASEBALL CARDS, '99 Bowman series, 2 unopened boxes, 24 packs, major stars, rookies, $50; 200 assorted baseball/football cards, inserts, favorite teams/players included, $20; Randy Moss autographed 8 x 10 w/certif. of auth., $50. 626/914-6083.

BICYCLES, 26," $80. 805/582-9494.

BOA, red-tail, almost 1 year old, likes to be held, nice coloring, $100. 952-8455.

BOMB HOIST, WWII vintage, portable, 1/2-ton capacity, gd. size for mounting in a truck bed, $60. 626/303-1927.

BOOK, "Mars and Its Canals" by Percival Lowell, 1906; plus related clippings 1907, vg cond., $300. 626/445-6320.

BOOKCASE, oak, 4'w x 6'h, 10 adjust. shelves, $100.; TREADMILL, Sears ProForm Crosswalk Plus, like new, incline, folds for storage, calorie counter, pulse/distance sensor, arm exercisor, paid $500, sell $375/obo. 626/358-1228.

BRICKS, lg., 4 1/2 W x 9 L x 3 1/2 D, installed as walk, remove and haul away, $100. 790-5593.

CHINA CABINET, walnut 4 panel contemp. style w/lights, 42"H x 58"W x 13"D, call for pictures, $275/obo. 323/550-8139 eves.

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

COMPUTER, Mac Power PC 7100 AV, 104mb ram, 500MB HD, AV model, does video capture, w/13" Trinitron mon., $500; Mac Quadra 650, 68040 processsor, 32 MB RAM, 105mb HD, $200; Mac Syquest, 200MB removable media storage, SCSI, w/cartridge, $100, more cartridges avail. 353-2103, Bill.

COMPUTER, Gateway laptop, Solo 9100 SE, 14.1" active matrix screen, 233MHz Pentium II, 2GB hard drive, 64MB SDRAM, 4MB SGRAM, 2 USB, 33.6k modem, 20x CDROM, Windows98, Office 97, plus much more. 626/839-6747, Karsten Browning.

COMPUTER, power computing PowerTower Pro 250 (PowerMac Clone): 250MHz 604e CPU, 192MB memory, two 2GB HDs, 16xCD-ROM, 4GB tape backup unit, Zip100, Apple Multi-Sync 17" monitor, 8MB video card, Voodoo 1 card, 56k V.90 modem, keyboard, mouse and SideWinder Pro joystick; SOFTWARE: MacOS 8.1 and 7.6.1, FWB RAID Toolkit, Norton Utilities 3.5 and Retrospect tape backup software; has 9 drive bays and 6 PCI slots; $3,000. 626/795-6530, evenings.

COMPUTER DRIVE, external SCSI-2 Jaz, 1 GB, w/7 MacOS formatted disks, $500. 626/795-6530, evenings.

COMPUTER DRIVE, Iomega SCSI Zip, $89; SCSI card for Iomega Zip, $35; 2.3 GB Western Digital Caviar hard drive, $45; SOFTWARE: MS Publisher '97, $29; Bruderbund Application Bible CD, $10, orig. $59; Greeting Card Creator, $5; Premier Edition Draw Print Studio, $15, orig. $49; Jeopardy, $9; '99 Yellow Page USA 14M listings, $5; Photo Studio Special Edition, $7; Macafee Anti Virus Security Suite w/free updates, $19, orig. $79; Compton Encyclopedia, $5; Dream Analyzer CD, $5; You Don't Know Jack CDs, $15. 366-6134.

CRUTCHES, new aluminum Health Aids, $30; bedside alum. commode w/arms in frame, $60; alum. adjustable walker, $65; 8-ft. beige tufted sofa, $100; coffee table, 54" x 24" black onyx in brass frame, $60. 790-6060.

DICTATION/transcribing mach., Sony prof BM75 w/foot pedal, $75. 323/221-8620, Richard.

DRYER, Whirlpool 1998 gas, like new, $250. 957-7905.

EXERCISE EQUIPMENT, Nordic Track Pro, new, w/pulse monitor, $250. 626/798-8970.

FURNITURE, all from Ikea, about 2 yrs. old, gd. cond.; white desk, no shelves or drawers, $30; TV stand, black, 3 shelves, VHS storage, $25; end tables, cherry wood finish, set of 3, $35. 352-2337.

FURNITURE, dining room, Ethan Allen cherry wood server, Georgian Court Collection, 40" x 21" x 34", exc. cond., $800; matching wall-mounted shelf, $40. 626/577-8107.

FIREWOOD, eucalyptus with some pine, $250/cord, pick up in La Canada. 790-6851, Roger or Margaret.

GOLF SET, left-handed, jr., like new, $95. 626/797-1673.

GUITARS: '66 Fender Super Reverb, black face, no mods, grill cloth & speakers not orig., gone thru, new tubes, filter caps, great tone, $975; '55 Fender P-bass, blond, bakelite pickguard, contour body, $3,750; '61 Gibson Les Paul/SG, cherry red, great cond., great tone, $3,300; '57 Fender Telecaster, neck refinished, body paint & pickups original, $3,500/obo; '66 Gibson ES-335, cherry red, trapeze bridge, all orig. w/orig. hse, $1,850. 626/797-7339.

HAMSTER PENS, 2 pet pens, colorful plastic, major brands, incl. tower, wheel, connecting tubes, attached feeding dishes, water dishes, gd. cond., orig. $250+ for all parts, willing to sacrifice to a good home, JPL discount. 909/981-7492, Jim.

HOCKEY TICKETS, Kings at Staples Center (2), various games. 562/947-0557, Shiela.

INFLATABLE BEDS, new and used in original boxes, great for camping or temporary extra bed, various sizes, $10-20. 805/582-9494.

LAZER DISK PLAYER, new, Sony, with remote, $58. 805/582-9494.

MISC, bed, twin w/3 underdrawers, perfect cond., natural wood color, $75; coffee table, walnut wood, $45; 7-piece dining set, new, $500; women's golf club set in original bag, $50. 957-8614, Mina.

MISC, desk, $40; lg. folding table $10; set of speakers $75; encyclopedias in small bookcase, $30; 4 wooden crates for LPs, $5 each; HP 20S calculator still in box, $20; National Geographics from '60s-'90s, 5/$1. 626/791-8848 eves.

MISC, baby crib; portable playpen; stroller; redwood picnic table; SUV dog gate; Somma CA king bed; garden power tools; 16" boy's bike; pontoon pool loungers; pool cover and reel; basketball hoop; moped, needs work; Weber BBQ; snow chains, 185 60 R14; 6 ft couch; 80# punching bag; beer making kit; ping pong table. 626/643-9769.

MISC, queen sofa sleeper, love seat recliner, matching set, accommodating colors, pd $1,499, sell $750/obo, dlvy. avail; washer/ dryer, GE, manuals, exc. cond., $250, dlvy. avail; Beta tapes, new, used once, $1; Beta camcorder, used less than 30 hrs., like new, incl. accessories & batt., $250. 805/582-9494.

MISC, sled, $5; 286 PC, $5, Pentium PC, $50, apprx. 100 balls for ball bath, $10; battery-operated baby fans, $10; baseball and soccer cleats/asst. children's sizes, $5/pair; vertical blinds, asst. sizes, $5/ea; outdoor light fixtures, $5/each. 909/598-0065.

MOVING SALE, calculator, Texas Instruments TI-83, new, used for 1 mo., $60; washer & dryer, Whirlpool, exec. cond., 2-yrs. old, $300 ea.; car seat for toddler, top quality, exec. cond., $35. 231-8208, Irene, eves.

PHOTOGRAPHS, 40" x 30", color, framed; 2 tall-ship pics by prof. photog., vg cond., 1 of Span. ship in SF bay, one of German ship nr Puerto Rico, $70/each, $120/both obo. 626/568-8298.

PICTURE FRAMES, 3, brass, 22" x 28", $6/ea., $15 for all 3/obo. 626/568-8296, Ana.

POOL, Doughboy, 16-ft. diameter by 4 ft. deep, exc. cond., incl. ladder, pump, DE filter, accessories, $2,000. 249-9534.

PRINTER, Xerox Diablo 630 daisywheel with print wheels/ribbons, exc. cond., works great, $10/obo. 626/568-8298.

RANGE, GE XL44 gas, sealed burners, $100/obo. 957-2173.

RANGE, Whirlpool gas, almond, 30" self-clean oven, like new, $350. 626/337-6130.

REFRIGERATOR, Kenmore 22 cu. ft., ice/water dispenser, 1 yr. old, $675; WASHER/GAS DRYER, stacked, x-large capacity, 1 yr. old, $750; crib, $25; CAR SEAT, infant seat/carrier, $15; BABY GYM, $4. 626/445-7125.

REFRIGERATOR, 18 cu. ft., 1970s, retro brown, frost-free freezer, compressor rebuilt 2 yrs. ago, works great, clean, $35; can be delivered locally. 352-2337.

RELAY RACK, 19" half height w/wheels, $30/obo. 957-2173.

SEWING MACHINE TABLE, three drawer, solid wood, cherry, $58. 805/582-9494

WATER FAUCET FILTERS, Pur replacements in sealed pouches, $15 for 2. 626/395-8516, Mary.

WEDDING DRESS, exc. cond, used once, kept in garment bag, white, straight, long sleeves, bow in back, $40/obo. 626/568-8298.

Vehicles/Accesories

'90 ACURA Integra LS, auto, AC, mroof, new radiator, exc. cond. full records, 150K miles. $3,500/obo. 714/838-7175, James.

'98 BMW F650 motorcycle, Funduro, red, BMW topbox, no scratches, never on ground, just serviced, exc. cond., 6,000 mi., $6,500. 626/797-6573.

'85 BMW K100 RT M/C, custom paint, corbin seat, lots of extras, see in red lot, $3,500. 248-1997.

CADILLAC wire hubcaps (3), chrome, $25/ea. 626/798-7339.

'91 CHEVY S10 pickup, good condition, 5 speed, AM/FM radio w/CD changer, like new tires, 323/259-8604 Traci.

'92 DODGE Caravan, 7 passengers, auto, 70k mi., $4,950. 626/792-3083.

'93 FORD Escort LX hatchback, 3D, 4 cyl., 5 spd., am/fm/ster. cass., rear spoiler, alloy wheels, exc. cond. 626/857-3753.

'89 FORD F350 transvan motorhome, 21 ft., fully self-contained, sleeps 2, roof and dash a/c, ps, pb, cruise control, 58,000 mi., $15,000. 909/591-4142.

'85 GRUMMAN 14' Alum Boat w/trailer & 25 Hp Merc otbd motor, $1,500/obo. 909/599-2598.

'95 HONDA Acura Legend LS Coupe 2D, black, auto., 104,000 mi., mint cond., leather, sunroof, heated seats, alloy wheels, CD changer, remote keyless entry, $22,000/obo. 626/568-8298.

'88 JAGUAR XJ6, black/beige int., 100K mi., exceptionally gd. cond., new Pirelli tires, sunroof, serv. records, $7,500. 626/798-4056.

'68 NEWPORT sailboat, 30', fully equip., spinacre & multi bars, engine rebuilt '97, running exc., in the water, ready to sail, $12,500/obo. 248-0491.

'95 PLYMOUTH Acclaim, 4-dr, silver gray, auto, a/c, PSW/L, cruise, tilt whl, V6, 90K mi., AM/FM/cass., very roomy 6-passngr, orig. owner, gd cond., $5,995. 790-0335.

'95 SATURN, SL-2, 4-dr. sedan, A/C, AM/FM/tape, cruise control, 5-spd., exc. shape, low mileage (28K), $8,400. 626/797-3310, eves/weekends.

TIRES, 4 Michelin X 185/70 R13, less than 500 mi. on BMW 320I, steel rims, all for $100/obo. 790-4457.

'95 TOYOTA Supra SE, auto, 58K mi., CD, power windows/locks, am/fm/cass., spoiler, black/black, salvage title, exc. cond., $17,500/obo. 909/599-3230.

'94 TOYOTA 4 x 4 pickup, 5 spd., ps/pb, matching shell, CD player, bedliner, ~81K mi., exc. cond., new tires, brakes and shocks, $9,800. 626/666-4170.

'91 TOYOTA 4-Runner, white, V6, sunroof, pwr windows/locks, grey cloth interior, $9,000/obo. 909/621-4392, olivegrove@mindspring.com., evenings.

'89 TOYOTA Supra, "turbo" look w/factory spoiler, ext/int, silver/grey leather, VR-rated tires, Targa sports rf., alloy whls., factory alarm, 109K mi., exc. cond., $6,500. 874-7668.

'74 VW Bug, vg cond., high-perf. 1800 engine, 26 mpg city, new tires, needs no work, $2,800. 626/791-3797, Dennis McMurray.

Wanted

ARC WELDER, 110-120 volt, single phase, prefer wire feed. 626/797-1673, Anthon.

CARPOOLER, Rancho Cucamonga, Upland, Claremont, LaVerne area, need reliable 3rd driver (prefer a Packers fan) to share commute, relax and enjoy carpool lane on 210, 7:00 to 3:45 (best for parking and traffic), leave Upland at 6:10, Claremont at 6:20 a.m. 909/981-7492, Jim or 909/624-7392, Elroy.

GRADUATES, Belmont High School, L.A., '57-'62. 956-1744, Barbara.

HOUSE to rent in Altadena, 1-2 bd. for professional, creative person. 626/796-1286, evenings.

RADIO/VACUUM TUBES, '20s/'30s; L.A. radio ads & catalogs of radio mfgrs. & dealers. 242-8961.

TV, 20" +. 626/431-2999.

VOLLEYBALL PLAYERS, coed, all levels of play, every Tues. nt. 8-10, Eagle Rock High School, $3/nt. 956-1744, Barbara.

WORLD BOOKS from '90s. 626/797-1673.

Free

DOG, cute black lab mix, abandoned approx. 6 mo., gentle, soft mouth, intelligent, loves people, good w/other dogs, needsloving family w/fenced yd., no cats. 626/791-4519.

For Rent

EAGLE ROCK, furn. rm in single-fam. house, nice area, 10 min./JPL, priv. entr. and ba., share kitch./laundry privileges, $350 incl. util. 323/256-1785.

GLENDALE condo, downtown, 1-yr. lease, 2 bd., 2 ba., underground prkg., appliances furn., credit report, no pets, non-smoker, ref. Required, walking dist. to Galleria. 548-0588.

PASADENA condo near Caltech in nice and quiet neighborhood, 2 bd., 2 ba., pool, Jacz., sauna, ex. rm., rec. rm., garage, all utilities paid except electricity, $1,050. 626/447-4028, Kumar or Ratnakumar Bugga.

PASADENA, room in 3-bd. apt to share w/2 others; pool, parking, a/c, washer/dryer; $460 + 1/3 util. 626/564-1078.

SAN GABRIEL, housemate to share 3 br., 2 ba., house, all amenities included, easy 9 mi./JPL, $500. 626/281-2179, Mike.

SIERRA MADRE house, 3 bd., 2 full ba., LR, DR, fam. rm., lg. kit., laundry/utility room, detached 2-car garage, lg. yard w/fruit trees, $1,500/mo. 310/662-5764, days.

Real Estate

ARCADIA townhouse, great location, 1,612 sq. ft., 3 bd. 3 ba., lots of upgrades, private patio, pool, exc. schools, must sell, job relocation, $238,888. 626/574-7462, Pam.

BIG BEAR, Sugarloaf area, 2-story cabin, 1,440 sq. ft., incl. 320 sq. ft. garage, 1 bd., bath & garage downstairs, 1 bd., bath, l/r, f/p, kitchen, laundry upstairs, nat. gas, sewer, paved road, easy access, sale by owner, $74,900/obo. 760/631-2675.

NORTHRIDGE townhouse, gated community, approx. 1,300 sq. ft., 2 bd., 2.5 ba., 2-car att. garage, immac. unit w/many upgrades, beautiful backyard, complex has pools, Jacz., tennis, 25 min./JPL, $205,000. 360-5235.

PASADENA, townhouse built '98 nr Rose Bowl, 3.5 mi./JPL, gated community, approx. 1,450 sq. ft., 3 bd./2.5 ba., 2-car att. garage, prof. organized closets, tiled FP, alarm, ceiling fans w/lights in all bedr., covered balcony off master, Pergo maple flrs everywhere, all Corian counters, lg enclosed backyd fully landscaped w/auto sprinklers, palm/fruit trees, pool, Jacz., basketball court, $260,000/obo. 626/568-8298.

Vacation Rentals

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

BIG BEAR LAKEFRONT, lux. townhome, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.

CAMBRIA, ocean front house, sleeps up to 4, exc. view. 248-8853.

DAYTONA BEACH, FL for Y2K, priv. beach access, 1 bd., 2 ba., cable TV/VCR, FM stereo, full kitch. w/dishwasher & microwave, laundry w&d in-rm, veranda overlooking ocean, Jacuzzi, sauna, pool, game room, indoor garage; easy access to shopping, nightlife; JPL discount, 5-day min., sleeps 4; avail. 12/17/99-1/7/00. 909/981-7492.

HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft./surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwv., dish-washer, pool, priv. lanai, slps. 4, 4/15-12/14 rate $95/nite/2, 12/15-4/14 rate $110/nite/2, $10/nite add'l person. 949/348-8047.

HAWAII, Kona, priv. house & guest house on 166 ft. of ocean front on Keauhou Bay, , private house and guest house comfortably sleep 6, 3 br, 2 ba., rustic, relaxing & beaut., swimming, snorkeling, fishing, spectacular views, near restaur., golf courses, other attractions. 626/584-9632.

LAS VEGAS, 2 bd., furn., New Year's Eve weekend, $150/night, 2-nite min., close to the Strip. 702/251-9021, Rick or Laura.

MAMMOTH, Chamonix condo, at lifts 7, 8, 16, 17; walk to Warming Hut; 2 bd., 2 ba., sleeps 6, fully equip. elec. kitch., microwave & extras, fireplace, cable TV, VCR, FM stereo, pool & sun area, o/d Jacuzzi, sauna, game, rec. & laundry rms, BBQ area, conv. to lifts, hiking, shops & summer events, daily/weekly rates, summer rates thru Oct. 249-8524.

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

LAKE TAHOE, North shore, 2 bd., 2-1/2 ba., sleeps 6-7, private sandy beach, great location, all amenities, hiking, golfing, fishing, 2 miles to casinos, special low rates for Oct/Nov, 3-day min.626/355-3886, Rosemary or Ed.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equipped kit. incl. microwave, D/W. Cable TV, VCR, phone, balcony w/mtn. view, Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discounts. 626/798-9222 or 626/794-0455.

PACIFIC GROVE hse, 3bd, 2 ba, fp, cable tv/vcr, stereo/CD, well-eqpd, kit w/microwv, beaut. furn, close to golf, bches, 17 Mile Dr., Aquarium, Cannery Row, JPL discount. 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.

SOUTH LAKE TAHOE KEYS, waterfront, 4 bd., 3 ba., hcp access fair, sleeps 12+, frplc. on 2 levels, decks overlook priv. dock & ski lifts, gourm. kitch., bikes, boats, 3 color TVs, VCR, ster., indoor/outdoor pools, hot tub/beach, lighted tennis, 10 min./skiing, casinos, golf, 1 hr./wine country, 3-day min.; $1,095/wk for high seas., 15 June to 15 Sept., 22 Nov. to 1 March; $495/wk low season, + $90 cleaning fee. 949/515-5812, Jim Douglas.