

Stone outlines Lab's 'most exciting year'

By MARK WHALEN

"It's been a great year at the Laboratory," JPL Director Dr. Edward Stone said in the annual State of the Laboratory talk on March 2. "I've been working at JPL since 1972 and I can't remember a time that is more exciting than now. What we have now is a continuum of wonderful activities that are going on, and our job is to find a way to manage it all."

While the current era of planetary exploration challenges JPL as never before, Stone noted that current and near-future missions will continue to prove exciting and ultimately rewarding.

Stone praised employees' current achievements in developing an unprecedented number of missions so quickly, all requiring hard work and rapid turnaround. Even with the anticipated delay of the launch of QuikScat to mid-May, JPL has a record six launches in just over six months. The Lab has successfully developed six very different missions, and four are already aloft: Deep Space 1, launched last Oct. 24, Mars Climate Orbiter (Dec. 11), Mars Polar Lander and Deep Space 2 (Jan. 3) and Stardust (Feb. 7). The Wide Field Infrared Explorer (WIRE) was expected to launch March 4 and QuikScat in mid-May.

"And these are not just routine missions," he said. "That's the interesting thing. Doing these things more rapidly is not just a matter of doing what's pedestrian and boring." They include new propulsion technology, detailed studies of Mars, collecting samples from a comet, studying the formation of stars and monitoring global wind patterns over Earth's oceans.

That JPL finds itself so busy has not been lost on Laboratory management, Stone said. He cited a number of initiatives now under way to address the heavy workload for many employees.

Regarding the challenge of matching work with JPL's facilities and resources, Stone asked, "How do we balance what we do in house and what we do with partners, so that we don't overwork ourselves? Ultimately, we collectively decide what we do in house, and we have put in place several plans to help better scope what we do ourselves and where we look for partnerships."

Stone cited the Future Program Council's Implementation Subcommittee, headed by Tom Gavin, as responsible for ensuring that planned work matches work force and facilities. "We are in an era of interdependence," he said. "Every project has to fit within our work force; a particu-



PHOTO BY TOM WYNNE / JPL PHOTO LAB

JPL Director Dr. Edward Stone takes a question from the audience following his State of the Laboratory address March 2.

lar project does not have the option of deciding for itself exactly how it's going to be implemented. This is something collectively the Lab has to deal with. I think the subcommittee's work will help us a great deal in making sure we're not trying to do more ourselves than is realistic for us to do."

Industrial partners will be an important part of the success of our programs, Stone said. He noted that several partners' contributions in areas such as science data operations have already pro-

vided 100 work-years of effort, "with an eventual capacity for about 300 work-years."

Stone also outlined several initiatives in which project experts will be further called upon to share their expertise with the rest of the Lab's work force. (See accompanying article.)

One idea that came from a recent project managers' retreat is certain to be welcomed by many employees: meeting blackout periods.

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Problems reported following WIRE launch

After a successful launch March 4 from Vandenberg Air Force Base, Calif., NASA's Wide-field Infrared Explorer (WIRE) spacecraft began to experience attitude control problems during its second pass over the ground station at Poker Flat, Alaska.

As this online issue of *Universe* went to press, it was not yet known specifically what caused the orientation malfunction on the spacecraft and a further investigation was being done to assess the problem.

An aberration was detected during the second pass over the Alaskan station, and con-

firmed on the third pass. The WIRE launch and science teams are reviewing and assessing the data stream from the spacecraft to try to determine the nature of the problem.

Further updates will be released as information concerning WIRE's anomaly is obtained.

The WIRE observatory consists of a three-axis-stabilized spacecraft designed, built and tested by the Small Explorer Project at NASA's Goddard Space Flight Center, Greenbelt, Md., and a cryogenically cooled infrared telescope provided by JPL. □

Baggett to head communications, education office

Blaine Baggett has joined JPL as executive manager of the newly created Office of Communications and Education.

Baggett will oversee the combined offices of Public Affairs and Educational Affairs. He will be responsible for an overall strategic communications plan for public affairs, education and outreach activities.

An award-winning television producer and published author, Baggett joins JPL from Los Angeles television station KCET, where he was vice president of national productions and scheduling. Baggett's science and technology documentaries for the Public Broadcasting System include "Spaceflight," "The Astronomers;" "John Glenn, American

Hero" and several NOVA programs. His production of "The Great War and the Shaping of the 20th Century," for which he also co-authored a companion book, achieved the rare distinction of winning television's coveted triple crown: the Alfred P. DuPont journalism award, the Peabody Award and two national Emmys.

Baggett was one of NASA's national finalists for its Journalist in Space program, which was put on indefinite hold following the Space Shuttle Challenger accident in 1986.

Baggett, a native of Mississippi, is a graduate of Millsaps College in Jackson, Miss. He was also a Peace Corps volunteer in Liberia, West Africa. He lives with his wife and son in Glendale. □



Blaine Baggett

Contest will name DS2's microprobes

A \$4,000 gift certificate for merchandise from CompUSA will go to the grand prize winner of a contest to name the two microprobes that comprise JPL's Deep Space 2 mission, which successfully launched in early January and are now headed toward Mars.

Although employees of NASA, JPL and corporate sponsors International Technology Education Association, Lockheed Martin, Boeing and CompUSA and their families are eligible to enter and win the contest, they would not be eligible to collect the grand prize,

See Contest, page 4

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, March 5

Jazz/Classical Jam Session—Fred Hersch and Jeffrey Kahane will perform piano at this 8 p.m.

show in Caltech's Beckman Auditorium. Tickets are \$35, \$31 and \$27. Call (626) 395-4652.

Sunday, March 7

Associated Retirees of JPL/Caltech—Members will take a round-trip train ride from Fillmore to Santa Paula, with lunch served onboard. The trip also includes a stop for wine tasting. Cost: \$48 per person. For information, call Lila Moore at (818) 790-5893.

Chamber Music—Violinist Laura Frautschi will perform at 3:30 p.m. in Caltech's Dabney Lounge. Admission is free. For information, call (626) 395-4652.

Tuesday, March 9

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

Wednesday, March 10

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

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

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. For more information, contact Mary

Sue O'Brien at ext. 4-5090.

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

SESPD Lecture Series—Genesis Project Manager Chet Sasaki will speak at 11 a.m. in Building 180-101.

Friday, March 12

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

Travel Film—"Pilgrimage Across Europe" will be shown at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. For information, call (626) 395-4652.

Saturday, March 13

Boys of the Lough—The Celtic quintet will perform traditional music from Ireland, England, Scotland and the Shetland Islands at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$32, \$28 and \$24. Call (626) 395-4652.

Sunday, March 14

Chamber Music—The Kalichstein-Laredo-Robinson Trio will perform at 3:30 p.m. in Caltech's Beckman

Auditorium. Tickets are \$25, \$21, \$17 and \$13. Call (626) 395-4652.

Wednesday, March 17

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

Thursday, March 18

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

Von Kármán Lecture Series—Joseph Beerer, Mars Global Surveyor flight operations manager, will speak at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, March 19

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

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

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

MGS to begin mapping mission

JPL's Mars Global Surveyor spacecraft will begin its primary mapping mission March 9, following a series of maneuvers designed to fine-tune its orbit and power on and calibrate science instruments.

Glenn E. Cunningham, deputy director of the Mars Exploration Program, said the flight team on Feb. 28 turned on Global Surveyor's thermal emission spectrometer, Mars Orbiter Camera and laser altimeter. Focus and calibration of the camera was scheduled to continue through March 8, he said.

This followed a successful firing of Global Surveyor's main engine on Feb. 19 to fine-tune its path around the red planet into a nearly circular, Sun-synchronous orbit.

The final "transfer-to-mapping orbit" burn lowered Global Surveyor's closest approach over Mars from 414 kilometers (257 miles) to approximately 367 kilometers (229 miles).

"On March 9, we will begin mapping operations with the high-gain antenna fixed to the spacecraft, and on March 29 will deploy the high-gain; that will be the final mapping configuration," Cunningham said.

Global Surveyor has an orbital trim maneuver scheduled for March 12, "but the orbit looks so good now that we probably won't do it," he added.

"Reaching our mapping orbit has been a long time coming for all involved," said Dr. Arden Albee, the Mars Global Surveyor project scientist at Caltech. "We are delighted to finally be able to do this mission as it was designed, in the proper mapping orbit with all the instruments working at their full potential."

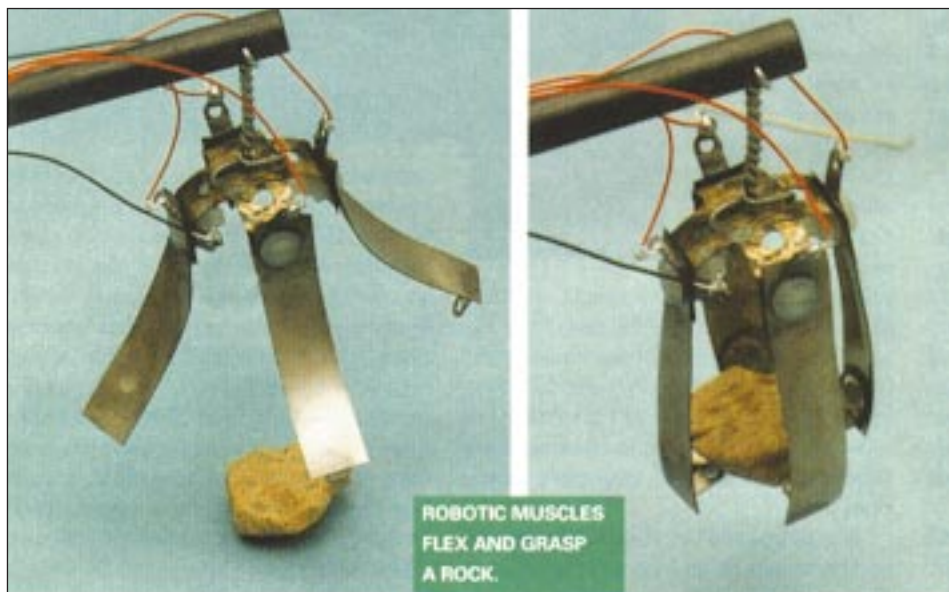
The mapping orbit was designed so that Surveyor passes over a given part of Mars at the same local time each orbit. At about 2 p.m. local Mars time, the spacecraft will cross the equator flying northward on the daytime side and about 2 a.m., it will cross the equator flying southward on the nighttime side. This timing is essential for effective interpretation of atmospheric and surface measurements, because it allows scientists to separate local daily variations from longer-term seasonal and annual trends.

Launched in November 1996 and in Mars orbit since September 1997, Mars Global Surveyor carries a dish-shaped high-gain antenna that will be deployed on a 2-meter-long (6.6-foot) boom. The antenna was stowed during launch and the early orbital phase at Mars to reduce the chances of it being contaminated by the exhaust plume from the spacecraft's main engine.

During deployment, the boom is pushed outward by a powerful spring. A damper mechanism cushions the force of the spring and limits the speed of the deployment, somewhat like an automobile shock absorber or the piston-like automatic closer on a screen door. Last year, engineers became aware of problems with similar damper devices on deployable structures such as solar panels on other spacecraft.

"Until we deploy the antenna, we must turn the

See MGS, page 7



Artificial muscles, or electroactive polymers, are lightweight strips of highly flexible plastic that bend and function similarly to human fingers when electrical voltage is applied to them. JPL's Dr. Yoseph Bar-Cohen and a small team of scientists and engineers are working to turn these strips into grippers and strings that can grab and lift loads, among many other potential uses, as a way of simplifying robotic spacecraft tasks.

Asteroid sample-return mission to test artificial muscles

By JOHN G. WATSON

Artificial muscles that should give space robots animal-like flexibility and manipulation ability will get their first test on a small NASA rover destined to explore an asteroid.

Under development by Dr. Yoseph Bar-Cohen of JPL, the artificial muscles are based on a simple, lightweight strip of highly flexible plastic that bends and functions similarly to human fingers when electrical voltage is applied to it.

Bar-Cohen and a small team of scientists and engineers are working to turn these strips into grippers and strings that can grab and lift loads, among many other potential uses. These strips and strings, known as artificial muscles or electroactive polymers (EAPs), have the potential to greatly simplify robotic spacecraft tasks. The technology could lead in the future to the development of insect-like robots that emulate biological creatures.

Years from now, these devices could also conceivably replace damaged human muscles, leading to partially "bionic men" and "bionic women" of the future, according to Bar-Cohen and his fellow researchers. "My hope is someday to see a handicapped person jogging to the grocery store using this technology," said Bar-Cohen, leader of JPL's Nondestructive Evaluation and Advanced Actuator Technologies unit, although such "blue sky" medical applications, even if proven feasible, may be decades away.

In the near-term, two EAP actuators are planned for use as miniature wipers to clear dust off the viewing windows of optical and infrared science instruments on the Mu Space Engineering Spacecraft (MUSES-CN) nanorover. This mission, led by the Japanese space agency ISAS, is designed to land the palm-sized rover on an aster-

oid following its 2002 launch, and return a sample of the asteroid to Earth.

"That's just the tip of the iceberg when it comes to space applications," Bar-Cohen added. "Electroactive polymers are changing the paradigm about the complexity of robots. In the future, we see the potential to emulate the resilience and fracture tolerance of biological muscles, enabling us to build simple robots that dig and operate cooperatively like ants, soft-land like cats or traverse long distances like a grasshopper."

Unlike human hands, which move by contracting and relaxing muscles, typical robotic arms utilize gears, hydraulics and other expensive, heavy, power-hungry parts. In future planetary exploration missions, where robots will need to perform tasks like collecting and manipulating samples of soil or ice, such mass and complexity becomes a problem. To meet these challenges, Bar-Cohen and his team have developed two types of artificial muscles that respond quickly to small amounts of electricity by lengthening or bending.

The first is a flexible polymer ribbon constructed from chains of carbon, fluorine and oxygen molecules. When an electric charge flows through the ribbon, charged particles in the polymer get pushed or pulled on the ribbon's two sides, depending on the polarity. The net result: The ribbon bends.

Using four such ribbons, Bar-Cohen has fashioned a gripper that can pick up a rock.

The second consists of thin sheets wrapped into cigar-like cylinders that stretch when one side of a sheet is given a positive charge and the other a negative charge. These charges cause the wrapped sheet to contract toward the center of the cylinder, and this constriction forces the cylinder to expand

See Muscles, page 7

New Millennium selects four concepts for study

By JOHN G. WATSON

NASA's New Millennium Program has selected four concepts for further study as candidates for its Earth Observing 3 (EO-3) mission, technologies that could revolutionize space-based Earth observations, according to Dr. Ghassem Asrar, NASA's associate administrator for Earth science. Each concept is designed to test innovative approaches for observing Earth's surface and atmosphere from positions outside low-Earth orbits, with an emphasis on advanced measurement technologies.

The primary goal of the JPL-managed New Millennium program is to identify, develop and validate key instrument and spacecraft technologies that can lower cost and increase performance of science missions in the 21st century.

The selected concepts are:

- Geostationary synthetic aperture microwave sounder, proposed by Dr. Bjorn Lambbrigtsen, a senior member of the technical staff in JPL's Earth and Planetary Atmospheres Research Element, which will lead this study.

- Active large aperture optical systems to provide high-resolution thermal imaging from geosynchronous orbit, proposed by Del Jenstrom, NASA's Goddard Space Flight Center in Maryland, which will lead this study.

- Geostationary imaging fourier transform spectrometer, proposed by Dr. William Smith, NASA's Langley Research Center, Hampton, Va., which will lead the study.

- Geostationary tropospheric trace-gas imager, proposed by Dr. Jack Fishman of Langley, who will work with Dr. James Gleason, a member of the Laboratory of Atmospheres at Goddard, with Langley leading the study.

These concepts were selected from 24 proposals submitted in response to a NASA research announcement released in September 1997. The selection process included evaluations of each proposal by external science and technology peer reviewers, along with two panel sessions with leading NASA scientists and technologists to categorize each proposal.

At least one of the concepts will be selected by the Office of Earth Science to enter the full implementation phase. Final selection is targeted for September 1999. □

News Briefs

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

Section 211: Robert Emmons.

Section 212: Yaun-Chyong Lee, Beth Ahkeah, Margie Ingersoll, Elena Pestano, Iris Ching, Ellen Sherman.

Section 221: Judy Falstreux.

Section 222: Melanie Chau-Budiman, Sella Moursalian.

Section 350: Jenny Needham.

Section 385: Regina Alleruzzo, Bruce Hancock, Charles Kurzweil, Kenneth McCarty, Ping Wang, Phyllis Zambrano.

Section 621: Leslie Berridge, Pat Parrett, Karen Thresher, Nancy Torres, Scott Yeats.

Section 622: Susan Scrivner, Kathy Sovereign, Francisca Steinman.

Section 623: Joyce Grunwald, Jason Lhamon, Steven Simpson. □

The Public Services Office is hosting the Eliot Middle School Science Fair in von Kármán

Auditorium March 22–25, and seeks employee volunteers to serve in the judging process.

At least 50 employees are needed March 23 from 9 a.m. to 5 p.m. and March 25 from 9 a.m. to 1 p.m.

If interested, call Public Services Office Manager **Kim Lievense** at ext. 4-0112.

An awards program and project viewing will be held March 25 from 7 to 9 p.m. in von Kármán Auditorium. Everyone is welcome to attend. □

Employees are invited to weekly scenic walks sponsored by JPL's Hiking Club.

Two 45-minute walks—one to the mesa area, the other to the arroyo—are held each Tuesday, starting at noon at the fountain area of the mall.

The club also presents a slide show on its activities on the third Wednesday of each month at noon in Building 238-543.

For information, call **Dan Lee** at ext. 3-4797. □

Facilities opens an online door to customers

By LINDA KYLE and ERIC TAUER
Section 661

As part of the Facilities Engineering and Construction Section's ongoing efforts to improve the quality of its customer service, customer survey techniques have been redesigned to focus on customers' needs and for easy, rapid electronic response.

A team effort to revise the existing method and layout of Facilities' customer satisfaction survey has culminated in the development of a web-based customer survey form and an interface that writes results directly to a database.

What does this mean for JPL employees? Facilities is doing this to enhance its fast response to Lab customers.

The newly designed web-based system consists of a number of modules that, together, handle all of the previous manual steps of data collection. In addition, it allows multiple users to simultaneously view the data, and eliminates the need for paper copies. Customer responses are automatically processed, providing prompt performance reports on how well Facilities is progressing toward the goal of service improvement. Results are openly published, but retain customer confidentiality.

A survey cover letter is e-mailed to the requester when the project is complete. This letter contains links to the Facilities Engineering and Construction Section home page—in order to answer process-related questions—and to the survey form, where different categories of work are identified.

Question format and content was revised to best elicit accurate responses from customers. Completing the form is easily accomplished, and once the form is filled out and submitted, it is automatically e-mailed to Facilities.

Upon submission of the survey form, three things take place: customers are shown a copy of their submission to print for their records if desired; an e-mail is generated that goes to the Facilities Help Desk, notifying them that a survey has been submitted and listing the survey record for them on the e-mail; and data from the survey form is entered into a collection database where customer input is converted into a timely data summary for early management review.

Customer participation is critical as it provides Facilities one of the ways to "see through its customers' eyes." The more surveys returned, the more accurately Facilities can measure performance and move to initiate process improvements that will speed the highest quality service to the JPL community. □

Contest

Continued from page 2

which would go instead to the first runner-up.

Participants in the contest can choose either two people from history (not living), characters from mythology or fiction, or two places or things that are in some way associated with each other, or a combination of any of the above elements. Submissions must be accompanied by a short

written composition of up to 100 words explaining why the entries would make good names for the miniature probes. In the case of duplicate names, the judges' selection will be based on this composition. Final selection of the probe names will be made by NASA Headquarters.

The deadline is April 30, 1999 and NASA will announce the winners in early November this year. The top 25 finalists will receive one copy each of a Deep Space 2 poster signed by

project team leaders. Complete rules, an entry form and further information about Deep Space 2 are available at <http://nmp.jpl.nasa.gov/ds2> or by writing to Name the Mars Microprobe Contest, MS 301-235.

Prize monies, provided by Lockheed Martin Corp., Boeing Co. and CompUSA, will not be administered through NASA, but rather will go directly from the donating companies to the winner. □

“It’s so important to have an integrated, Labwide approach to planning project implementation modes. Then, when we get a new project, we’ll look to make sure that it can be implemented, along with all the others, with available work force levels and facilities.”

“We’re being asked to do a lot of difficult things on shorter time cycles ... the [meeting] blackout will allow employees to have time for themselves and their families, without feeling that they are letting down other members of their team.”

Director elaborates on State of Lab

Dr. Edward Stone, the Laboratory director, agreed to expand on several topics addressed in his State of the Laboratory presentation last Tuesday.

Question: *With the advent of more “faster, better, cheaper” missions, coupled with downsizing and outsourcing, employees have been concerned about the workloads they’ve been asked to shoulder. Is the “Future Program Council Implementation Subcommittee” a management response to these concerns?*

Answer: Oh, yes. Overwork is clearly an issue. This subcommittee, which Tom Gavin [Deputy Director for Space and Earth Science Programs Directorate, SESPD] is leading, is a start, a first step, toward achieving a better balance between the work we must do and the resources available to us. We can’t change the commitments we made to NASA three or four years ago, but we can make sure that we match up future work with the work force and the facilities. That’s why it’s so important to have an integrated, Labwide approach to

planning project implementation modes. Then, when we get a new project, we’ll look to make sure that it can be implemented, along with all the others, with available work force levels and facilities.

There are several ways to strive for this balance. One is to reduce the “routine” aspects of the job so we can focus more on innovative elements. Another way is training and standardization of processes, so that people can come up to speed more quickly on their assignments. Principals [a job family] and experts will be involved in providing this training. SESPD is setting aside one-half of 1 percent of its projects’ budgets for training; that’s a commitment to helping our people do really challenging, exciting work.

And finally, we have to recognize we have a larger responsibility to NASA and the nation than just those tasks we can do in-house. We need to find ways to partner with industry, universities and other NASA centers and government laboratories so we can implement the variety of programs for which we’ve accepted responsibility.

Stone

Continued from page 1

Under this plan, no key project meetings will be scheduled the week of Thanksgiving, the last two weeks of December and the first week of January, as well as one other two-week period determined by each project. This will allow employees “to take well-deserved vacations without feeling they’re not supporting the projects,” Stone said, “and will hopefully address some of the overwork problems people feel.”

Stone acknowledged that the Lab’s work in the current era requires

the use of best business practices when available. To that end, in addition to the recent implementation of Oracle-based business systems by the New Business Solutions program, “another big administrative challenge was getting financial information to the projects so they could track their costs,” he said. To help address this, the Controller’s Office was reorganized, with Catherine Kiburtz appointed assistant controller, to focus on the financial aspects of using the new system. The newly created Project Resource Administration Division (250), headed by Cory Stevens, “is focused on getting the right kind of reports and information to the projects and to Headquarters



PHOTO BY TOM WYNNE / JPL PHOTO LAB

Q: You mentioned cutting down on the “routine” aspects of jobs. Can you elaborate?

A: The DNP Project, led by Jeff

Leising [Section 3100], is developing a set of tools and processes that will make it easier for projects to deal with

See Q & A, page 6

contacts as well.”

Stone mentioned the recent implementation of the new Bonus Awards program, which will provide cash prizes to outstanding achievers. “This is a very important way of recognizing, in some small way, the remarkable achievements this Laboratory makes, and the fact that you are making it happen,” he told the audience. “This will help employees understand that there really is an appreciation for all that you’re doing.”

Also, he said, the Family Day event presented last year just before Open House will take place this year in the fall, probably in September. “You can have the chance to have your families here separate from the

50,000 others who come to Open House (scheduled for June),” he said.

The director noted that JPL ought to celebrate its successes from the past year. In that regard, he said, “As soon as we get QuikScat launched in May, we’re going to celebrate with ice cream on the mall. I think we deserve it.

“You should feel proud of what you’ve done for the nation and for the world. JPL is a great place to work and one aspect of that is being able to share what it is you do, what you discover, what you invent, what you innovate. We can engage the public in what we do, and that is also a part of the reward and recognition we get.” □

Q & A

Continued from page 5

the routine and mandatory development tasks. This will free the projects up to concentrate on the difficult, creative aspects. One of the new processes is the "Quick Start" process, which helps new projects get off to a running start. It includes things like support web sites, on-line project management notebooks, planning guides, planning and requirements templates, and a checklist of requirements from NPG 7120.5A [NASA Program Requirements, a document] and ISO 9000.

There is also a parametric cost model, physics-based system analysis tools, and mission, system and sub-system architectural models to facilitate system analyses and help assure coordination and rapid iteration in the development and validation of mission, system and subsystem requirements and designs. They are also developing an information system architecture, on-line library, centralized database and configuration management system

to improve communications among project team members.

We expect these products and processes to be available in April, with the goal of reducing the time of a Discovery-class mission from start to PDR [Preliminary Design Review] from the current 12 months to six months. In September, we expect to have a second release that will cut another six months off the time between PDR and CDR [Critical Design Review].

Q: *What is the larger context for project "blackout periods," increased days for family sick leave, higher ceilings for extended work week and greater rewards and recognition?*

A: These all play together. We're being asked to do a lot of difficult things on shorter time cycles and the only way we're going to do this is through teamwork, through people pooling their talents and energies in creative ways. The "blackouts" [six weeks every year, including Thanksgiving, Christmas/New Year's and two others, during which projects will not schedule

design reviews or major meetings] will allow employees to have time for themselves and their families, without feeling that they are letting down other members of their team.

Q: *Is any consideration being given to a four-day, 10-hour-day work schedule?*

A: Not at this time. When you're trying to accomplish difficult things quickly, through co-located teams, it's essential that all the members of the team are available to work with each other and our industry partners in the short amount of time allocated for the project's completion. That's very hard to do if work schedules don't mesh.

Q: *In the "faster, better, cheaper" era, what are the career prospects for JPL employees?*

A: They're excellent. We have, today, as many project managers at work as there has been in all the years of the Laboratory's history. There are some 30 projects running right now. With more projects, there are that many more opportunities for individuals to grow and show what

they can do. I've been involved with the Laboratory since 1972 and I can say this really is the most exciting time I can recall in all those years. □

Passings

Joe Rogers, 91, a retired employee from Section 351, died of heart failure Feb. 11.

Rogers worked at JPL from 1958-75. He is survived by his wife, Gertrude.

Services were private. □

Sylvia Amrick, 58, a secretary in Section 331, died of brain cancer Feb. 12 at her home in Pasadena.

Amrick had worked at JPL, within Division 33, since 1968. She is survived by nieces Melinda Steep and Cherie Cox.

Services were held Feb. 17 at Mountain View Cemetery in Altadena. □

Joel Wood, 74, a retired millwright in Section 357, died of cancer Feb. 15 at his home in Walnut, Minn.

See Passings, page 7

Astronauts train for SRTM

The astronaut crew for Space Shuttle Endeavour's Shuttle Radar Topography Mission (SRTM), who will fly the JPL-managed radar imaging antenna this September to generate the most detailed, three-dimensional maps of Earth's surface ever obtained, visited JPL last month for simulation training.

SRTM, scheduled for launch on Sept. 16, will yield a wealth of high-resolution topographic data of Earth's varied landscape, from its highest volcanic peaks to the deepest canyons carved millions of years ago.

The radar data, which can see through clouds, thick vegetation and ground cover such as sand, will improve scientists' ability to see subtle changes in geologic features such as earthquake fault lines and rivers that have swelled and changed course. Radar data may also allow them to detect changes in some of Earth's most fragile ecological niches, such as the rain forests of South America and the unspoiled highland regions of central Africa, home to endangered mountain gorillas. □



PHOTO BY TOM WYNNE / JPL PHOTO LAB

In JPL's Spaceflight Assembly Facility, mechanical engineer Howard Eisen (back to camera) explains to astronaut crew how the SRTM radar antenna mast will be deployed from its cylindrical canister. In the foreground is the outboard radar antenna, which will be mounted at the end of the mast. The large white structure in the background is the main radar antenna. Astronauts, from left to right (back row): Mamoru Mohri, National Space Development Agency of Japan (NASDA); Dominic Gorie, NASA STS-99 mission pilot; Dr. Janice Voss, NASA; Dr. Janet Kavandi, NASA; (front row): Gerhard Thiele, European Space Agency, and Kevin Kregel, NASA STS-99 mission commander.

Non-conformances addressed as ISO audit draws near

By DR. JERRY SUITOR
ISO 9000 Team

In preparation for JPL's ISO 9000 audit at the end of March, employees are completing a concerted effort to address non-conformances, or findings, discovered in the press-assessment audit last November.

During that audit, the Laboratory's third-party registrar, Det Norske Veritas (DNV) Inc., identified a number of areas where

JPL did not conform to the ISO standard. Fourteen working groups formed to address these findings worked through the year-end holiday season and concluded the first phase of their work at the end of February.

The first phase consisted of identifying an approach to address the findings. The necessary documentation and aids to resolve the findings was developed. A number of new procedures and two new Laboratory standards were created. These new documents, plus the updates of many others, will be largely completed and available in the DMIE Information System (<http://dmie.jpl.nasa.gov>) by March 5. This will provide employees three weeks to become familiar with any changes in preparation for the initial audit by DNV the week of March 29.

Now, the second phase of

deployment to the Laboratory begins. Some of the deployment will consist of physical surveys of facilities to verify compliance with the ISO standard. The surveys will also be used to train managers on how to survey other facilities under their cognizance. Other aspects of the deployment will include training that targets specific groups who need to understand design control, document and data control, and controlled records.

Weekly on-Lab "brown bag" lunches covering various topics, including mock ISO audit interviews, are but a part of the training activities available to employees as the initial DNV audit gets closer. Also scheduled are 30 two-hour audit preparation classes similar to the ones conducted before the pre-assessment audit in November.

The schedule and location of the classes will be posted on the ISO home page at <http://iso>. A month away from the initial audit, JPL personnel need to work together to complete these last few actions and get prepared for DNV. □

Passings

Continued from page 6

Wood joined JPL in 1962 and retired in 1988. He is survived by his wife, Shirley, and five children.

Military services were held in Minnesota. □

Maurice Hagey, 88, a retired engineer from a former Section 194, died of stroke Feb. 17 at Pomona Valley Hospital.

Hagey worked at JPL from 1956-78. He is survived by his wife, Helen, and son John.

Services were held Feb. 17 at Rose Hills Memorial Park in Whittier. □

Retirees

The following employees retired in March:

Larry Wright, 40 years, Section 504; **Gordon Wood**, 32 years, Section 331; **Dennis Enari**, 29 years, Section 920; **Bette**

Gillette, 24 years, Section 321; **William York Jr.**, 21 years, Section 664; **Thomas Fogle**, 20 years, Section 391; **Michael Zydowicz**, 19 years, Section 516; **John McLeod**, 16 years, Section 313; **Nancy Campbell**, 15 years, Section 642. □

LETTERS

To my colleagues in the Logistics/Accountability Group and the ERC: Thank you for your thoughtfulness and expression of sympathy following the recent death of my mother.

LeeRoy Abeyta

□□□

To my JPL/Caltech friends and colleagues: thank you all so very much for your kindness, calls, cards, flowers and support following the recent death of my mother. I'm so pleased that she had the chance, a few years back, to visit JPL and meet some of you. That was a special day, and I feel fortunate to work at such a special place.

B.C. Lathrop-Pino

□□□

I want my friends at JPL to know that their prayers and expressions of sympathy, during the illness and death of my mother, are deeply appreciated. Thanks to the ERC for the beautiful peace lily. The kindness of the JPL community has comforted me during this difficult time.

Jim Davis

□□□

To all my friends at JPL: thank you for the beautiful flowers and plant from the ERC. The Valenzuela family would like to express their deep appreciation on behalf of our brother, Freddy.

Lorraine Garcia

FOR SALE

AIR CONDITIONING UNITS (2), window, both in gd. cond. 766-5354.
BABY ITEMS, Graco 3-speed battery powered swing, \$40; Century car seat, \$5; Century playpen, \$30. 957-5502, Karen.
BED, Ortho electric/adjustable twin, exc. cond., pd \$599, sell \$300. 626/793-1586.
BED FRAME, queen size, good condition, \$25. 249-8735.
BURIAL LOTS: 2 ea. in the "Eternal Love Section" of Forest Lawn, Hollywood Hills, \$3,500/ea.; 4 ea. in the "Veterans Honor Section" of Forest Lawn, Covina Hills; buy 3 @ \$1,000/ea. and get the veterans lot free. 909/886-2615.
CHARITY SALE, "Dress Party - Shop Til You Drop," Wed., March 10, 5:30-8:30 p.m. at Elks Lodge, 27 W. Huntington Dr. Arcadia; ample parking in 2 rear lots; fashions from Nordstrom, Robinson's-May and Macys, nothing over \$38; sizes 4-24; Elks Ladies Auxiliary of Arcadia receives 10% of all sales, proceeds to Major Project, supporting disabled children in Calif. and Hawaii; no charge for admission.
CHINA SET, 60 pieces for \$70/obo. 909/592-0780, Ana.
COFFEE TABLE, approx. 60 x 30; matching end table, approx. 24 x 27; exc. cond., oak w/leaded glass inserts, \$250/both. 626/296-1537.
COMFORTER SET, twin, Walt Disney's Jasmine theme, includes flat & fitted sheet set w/one pillow case, ruffle, and comforter;

also have the matching lamp w/shade, window valance and curtains; will negotiate any reasonable offer. 626/797-9846.

COMPUTER, Leading Edge, model D, 2 FD, 5.25", 360 KB, MS DOS 3.10, Phoenix 8088 ROM, BIOS V.E., 649K RAM, 14" Amber monitor, working, \$25. 541-0062.

COMPUTER, Mac II FX, Conner 30170E HD, 780 KB 3.5" FD, 1.4 MB 3.5"; Global Village Teleport 33.6 fax/modem; system 7.5.3; Netscape Communicator Pro 4.04; 20 MB RAM, 32-bit addressing memory; 14" color monitor; \$250. 541-0062.

COMPUTER, Toshiba Satellite 335CDT laptop, 12.1 active matrix screen, 32MB RAM, 4.1GB HD, 56K modem, CD, 2 PCMC slots; software includes Windows 98, MS Encarta, Quicken, MSWorks, Golf; Targus laptop case, \$1,400. 248-9432, Stan.

COMPUTER/PRINTER, Mac SE & LaserWriter II NT, both work great, nice starting system for kids, \$380 for set. 909/599-2598.

COUCH, off-white with foldout bed (double), 5 lg. throw pillows, w/cond., \$300/obo; FUTON COUCH/BED, solid pine frame, mauve & lt. brown futon, exc. cond., \$200/obo. 957-7642.

CRIB, white, exc. condition, includes mattress and bumper pads, \$55. 626/448-8809, Shary.

CROCK POT square by Rival w/Comingware, \$15/obo. 626/568-8298.

DESK, solid oak roll-top, like-new cond., \$475; FILING CABINETS, metal, 1 four-drawer, \$40, 1 two-drawer, \$20. 626/791-1266.

DESK with hutch, 60 x 30, wood top, 3 metal drawers on the left, one metal drawer and one metal file cabinet on the right, wood hutch, good condition, \$60. 790-9772.

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

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

EXERCISE MACHINE, Soloflex, with butterfly and leg extension, excellent condition, newest model, all manuals and weights included, \$500/obo. 626/398-5667, Stephanie.

FAX MACHINE, Daewoo brand, 10-number speed dial, \$45 includes two rolls fax paper; TELEVISION, 13-inch RCA color, w/remote, works OK, great for bedroom, \$25. 661/297-0219.

FILING CABINET, 2-dwr., white, \$15. 626/793-1586.

FIREWOOD, 2 cords mixed cut to size, loaded on trailer & ready to go, will deliver free up to 20 mi., you unload, \$175/obo. 626/303-5595.

FOOTBALL CARDS, 200 assorted, major players, rookies, inserts & Hall of Famers; include your favorite teams/players, \$20; BASEBALL CARDS, 1 unopened box of Fleer Ultra 98, 24 unopened packs, 10 cards/pack, rookies, major players, Griffey Jr., Ripken Jr., Piazza, McGwire, \$40. 626/914-6083.

FURNITURE: dining table with 6 chairs, \$160; glass top dining table with 4 chairs, \$150; floral print sofa with matching love seat, \$350; leather sectional sofa, \$400; daybed with mattress & pillows, \$70; all in very good condition. 790-8216.

GOLF CLUBS, Cobra TI driver, 9.5 stiff shaft, \$125; Cobra TI 3 wood, 15-degree reg. shaft, \$100; Big Bertha War Bird driver, 10-degree, \$80. 626/695-0811.

GIUITAR, Ovation Elite, emerald burst, 3-band eq., E-tuner, must see, w/hard case, w/cond., \$600. 626/432-1990.

HEATER, Kero-Sun kerosene Omni 105 by Toyotomi, 17100 BTU + 3 kerosene containers + extra wick, \$150/all. 626/793-1586.

JUICER, Champion electric, gd. cond., \$100. 626/793-1586.

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

MODEM, Apple Geoport adapter fax/modem, model M1694 experss, new, \$25. 541-0062.

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

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

POWER CENTER for computer, \$20. 790-3899.

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

PRINTER, HP DeskJet 660Cse, inkjet for PCs, 600 dpi color, still under factory warranty, \$170. 249-1239.

REFRIGERATOR, Whirlpool Limited Edition frostless, 18 cu. ft., equipped for auto icemaker, measures 31" w x 64" h, almond color, excellent condition, \$250/obo. 626/797-9846.

SANDWICH MAKER by Oster, makes 2, \$10/obo. 626/568-8298.

SKATES, child's Rollerblades, sizes 1 and 2, \$20. 626/797-4758.

SOFA, queen hider-a-bed, brown tones, \$100; BEDROOM SET, girl's, 6-piece, 2 dressers, 2 nightstands, desk, twin bed, white, \$500; ENCYCLOPEDIA Britannica, 1976 w/bookcase, \$50; GUITAR, 12-string Yamaha, \$300. 248-5274 or dshirley@earthlink.net.

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

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

SWEATER, Coogi, from Australia, new, sells in Nordstrom for \$325, \$100. 790-3899.

TABLE, dining room, round, mahogany, sits 8 with two extensions, almost new, comes with 6 matching chairs, picture on ERC board; \$650/obo; matching China buffet, \$950/obo; all for \$1,400/obo. 909/592-0780, Ana.

TABLE, dining room, pecan wood, round, opens to oval size, 1 leaf, 6 chairs, \$400/obo. 626/256-6242.

TABLES, glass, four 2-shelf tables with brass feet, three make up a coffee table (one round 2.5-ft. dia., two "half-moon"), fourth is a round end table (2.5-ft. diameter), \$125/obo. 909/592-0780, Ana.

TRAYS, silver plated, Rogers Bros. heavy duty, 20 x 12" rectangular,

Continued on page 8

\$50; 14" round, \$40; GUITAR, gd cond., \$40/obo. 626/793-1895.
 TREADMILL, Forever Young, \$900/obo. 626/935-1387.
 TV, color, RCA XL-100, works well, nice color picture, \$75/obo. 909/599-2598.
 TV, Panasonic 13", 1 yr. old, perfect, \$50. 909/593-4046.
 TV, deluxe portable 5" B&W, 82-channel VHF/UHF tuner, telescopic ant., compact design, weighs 5 lbs., AC converter included or uses D batt., never used, still in box, \$50. 626/791-7645.
 VIDEO GAME, Sega system, 1 controller, 6 games, excellent condition; Batman Returns, Herzog Zwei, Joe Montana II Football, Super Hang-on, Sonic the Hedgehog, and John Madden Football; \$50. 626/797-9846, after 6 p.m.
 VIDEO GAME, Sega Genesis CD System, 4 controllers, 21 games, \$200 for all/obo. 626/309-0429.
 VIDEO GAME, Sega Genesis w/Sega CD, includes 2 game pads and 2 joysticks, 12 CDs: Space Ace, Dragons Lair, Lethal Enforcer w/gun, etc.; 30+ cartridges: Road Rash, John Madden, etc.; all like new in original boxes, \$400. 626/355-6350.
 WEDDING DRESS, excellent condition, used once, kept in garment bag; white straight dress with long sleeves, bow in the back, \$40/obo. 626/568-8298.

VEHICLES / ACCESSORIES

AIR FILTER, genuine Honda part, new, #17220-PE-010, \$5/each or \$12 for 3. 626/793-1586.
 '64 BYERS boat, flat bottom, wood deck, 17.5', with tandem axle trailer, 350 Chevy, Casale v-drive, needs restoration, good project boat, \$1,500/obo. 249-4729, James.
 CAMPER SHELL, Davlin, beige color, sunroof, screened windows, nice, approx. 88" long, \$120/obo. 626/356-0048.
 '98 FORD Explorer, Eddie Bauer, 7K miles, power windows & door locks, auto, awd, climate control, am/fm/stereo/CD, premium sound system, rear air cond., keyless, much more, salvage title, \$20,990/obo. 909/599-3230.
 '92 FORD Aerostar van, beautiful condition, red black interior, 10-CD player, new tires, \$5,800. 626/578-7226, Erik.
 '89 FORD Thunderbird, midnight blue, all power options, recent tires and brakes, runs and looks great, \$3,250/obo. 626/445-5214.
 '85 FORD F150 XLT Lariat, 5.0 V8 engine, auto, loaded, short bed w/shell, exc. cond., tow pkg., \$4,250/obo. 323/255-9016.
 '79 FORD pickup, needs work, great for someone who fixes autos as a hobby. 626/797-9846, after 6 p.m.
 '95 GEO Tracker, black, soft top, 2-dr., 2-whl. drive auto, am/fm, only 33K miles, \$8,500. 562/860-9140 eve. or e-mail: g1troung@earthlink.net.
 '95 GMC Safari van, 8 passenger, white, 68,000 miles, \$14,500. 626/963-8288.
 '91 HONDA Civic DX hatchback, 5 spd, a/c, am/fm cass., low mileage (80K), original owner, regularly maintained in exc. cond.; new tires, timer belt, battery; \$5,500/obo. 626/791-0585.
 '90 HONDA Accord EX, original owner, sunroof, auto, a/c, ps/pb, exc. mechanical condition, paint like new, maroon w/ivory interior, 120K mi., \$6,200/obo. 626/296-1537.
 '88 HONDA Civic CRX Si, 5-speed, red, a/c, am/fm/cass., 122K mi., \$2,500. 626/793-1586.

NOTICE TO ADVERTISERS

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

Universe

Editor

Mark Whalen

Photos

JPL Photo Lab

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

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

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

'87 HONDA Accord LX 4-door, white, auto, a/c, genuine 60K miles, well-maintained, new cam drive belt, good Michelin tires, just passed smog test & reregistered, \$3,000. 626/403-9685.
 '82 HONDA Accord, 4 door, 5 speed, a/c, am/fm/cass., good cond., \$1,600/obo. 909/596-5774.
 '95 JEEP Wrangler Rio Grande, 5 speed, sidestepp, bumper ext., overhead speakers, soft top, 56K miles, moss green w/space int., must sell fast, will include 2 bike carriers for tires, \$10,700/obo. 562/908-9253.
 '88 KAWASAKI Ninja 600, 11K original miles, very clean, accessories included: leather tank cover, motorcycle cover, etc.; been pampered by female driver; second owner, must sell. 323/913-3193 or 323/340-5850, pager.
 '83 MERCEDES BENZ 280 SE, auto, am/fm/cd, alarm, 135K miles, vg cond., \$5,500/obo. 949/854-8659.
 '97 NISSAN Altima, 19K miles, auto, a/c, power windows & door locks, power antenna, am/fm/stereo, exc. cond., \$11,750. 909/599-3230.
 '85 NISSAN Maxima, gd cond., must sell, \$2,300. 626/578-7226.
 '77 PACE ARROW motorhome, 25', 61,000 mi.; new motor, tires, interior, exhaust; a/c awning, 4.0 Onan gen., 3 new batt.; \$6,000. 249-4729, James.
 '89 PONTIAC Grand Am SE, orig. owner, quad 4 engine, auto, a/c, am/fm/cass., power windows/locks, 112K miles, exc. condition, \$2,750/obo. 323/255-1106.
 SNOW CHAINS, truck weight, for older Cadillac, \$20. 626/793-1895.
 '94 SUZUKI Swift, 4 dr., 45K miles, exc. condition, great gas mileage, white w/gray int., am/fm/cd, \$4,500/obo. 626/296-0032.
 '94 TETON 5th-wheel trailer, 40' Atlanta III, 3 slideouts, sbs fridge, conv. microwave, 2 a/c & furnaces, 2 roof fans, 7 kw Onan gen, HW/H, hydraulic lifters, awnings, no smoking, mint cond., in Palm Springs. 760/345-3713.
 '79 VW Westphalia camper, only 1,000 miles on new engine w/factory warranty, AM/FM detach stereo, rebuilt trans., new clutch, new tires, nice yellow + white paint, pop-top, sleeps 5, excellent condition, must sell, \$4,700/obo. 626/798-1971.
 '93 YAMAHA Blaster, very low hours; completely stock; excellent condition, \$2,300/obo. 626/339-9872, after 6 p.m.
 '91 YAMAHA Virago 1100, black with gray accent, lots of chrome, Jardine pipes and foot controls, \$3,350/obo. 626/355-6350, Paul.

FREE

BOOK, illustrated, NASA flights to Jupiter and Saturn, '82 publica. 626/793-1895.
 DOG, female, 10 yrs old, dachshund mix, healthy, great companion, needs gd. home; was the well-loved pet of JPLer Sylvia Amnick, who passed away Feb. 12; all shots up-to-date, spayed. 626/351-8388.
 DOGS, 2 inseparable, gorgeous & loving mother/daughter pair, "Thelma and Louise," part Doberman, spayed, housebroken, great w/kids, need loving home with lg. fenced yd. 626/798-6886.
 FIREWOOD, 2" x 16" boards, your saw, my electricity. 957-4218, Woody.
 MAGAZINES, several years of Victoria, to someone who will appreciate them. 626/395-3705, Barbara Buckley.
 OFFICE DESK, office chair, 2-drawer file cabinet, computer desk. 249-8735.
 RATS, 5 large feeders. 626/821-6451.

WANTED

ACCORDION, must be in good cond., intended as a 75th B-day present for father-in-law, will pay reasonable price. 626/966-5451, Doug.
 HANDYMAN for general maintenance work in my home, Montrose area. 957-8169.
 PIANO, upright, for beginner student. 952-8032.
 SINGERS, tenor and alto for existing Pasadena-based madrigal group, meets Wed. eves. 626/791-3802, Audrey.
 SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
 VANPOOL RIDERS, van #3, from Fontana, Rancho Cucamonga, Upland, Claremont, La Verne area to JPL. Ext. 4-8343, Mike Taylor or 4-5831, Rhea Clearwater.
 VOLLEYBALL PLAYERS, coed, all levels of play, Tuesday nights 8-10 at Eagle Rock High School, \$4/night. 956-1744, Barbara.

LOST & FOUND

Lost: GLASSES, wire frame, prescription, lost 2/18/99 afternoon, Row 9 of East Lot; CIGARETTE LIGHTER, small, thin, gold. Ext. 4-1736.

FOR RENT

ALTADENA, Rubio Canyon area, room in private residence, kitchen & laundry OK, no smoking, no pets, \$350. 626/797-8082.
 ARCADIA, cozy, furnished room, includes laundry, kitchen privileges, pool; no smokers, \$350. 626/448-8809, Shary.
 ARCADIA, charming, very small 1 bd.; rear house in quiet area, private entrance; stove, refrig. and A/C; tree-shaded yard, storage buildings; trash & water paid, no pets; \$500. 626/447-7080.
 GLENDALE, townhouse-style 2 story, C/A, 2 bd., 2.5 ba, kit/blt-ins, built in 1987, \$775, one-year lease. 240-1523, mgr.
 GLENDALE, darling, large 1-bd. apt. with small bonus rm., newly re-decorated, wall-to-wall carpets, air conditioning, dishwasher, \$650 incl. water, gas and basic cable. 241-9448.
 LA CRESCENTA house, 3 bd., 1 1/2 bath, living rm. w/fireplace, formal din. rm., spacious kitch., breakfast area, laundry rm., detached 2-car gar., fenced backyard, gardener paid, \$1,300.790-9772.
 MONTEREY HILLS (outside S. Pas.) condo, bright/airy, priv. end unit on 3rd flr. w/great view, 2 bd., 1 ba., sep. vanity area, hwd. floors, frplc., cathedral ceiling, central air/heat, balcony, stove, dishwasher, garp. disposal, cable, some util., pool, laundry rm. for w/d in unit (or use of Indry. facil. on 3rd flr.), security bldg., sec. parking

(2 spaces), pets OK, close 110 frwy. access, 10 min./JPL, \$1,000. 626/296-9073.
 MONTROSE apt., 1 bd., 1 ba., a/c, garden, off-st. pkgng., Indry., charming, trash/wtr/grdnr. pd., 10 min./JPL, walking dist. to Montrose Mall, \$650. 248-4637.
 MONTROSE apt., 2 bd., 1 ba., a/c, garden, off-st. pkgng., Indry., charming, trash/wtr/grdnr. pd., 10 min./JPL, walking dist. to Montrose Mall, \$750. 248-4637.
 MONTROSE, roommate wanted to share 2-bd. apartment, 5 minutes/JPL, \$370 + 1/2 util. 501-0794.
 PASADENA apt. to share, 3 bd., 3 ba., fully furn., patio, parking space, laundry facility, close to PCC & Caltech, \$400 + sec. dep. + 1/3 util., avail. March 20. 626/351-9641.
 PASADENA apt., 2 bd., 2 ba., cent. air/heat, small patio, laundry facil., stove, carport, close to PCC/Caltech, \$825 + util. 626/351-9641.
 PASADENA home, near Caltech and JPL, 3 bd., 2 ba., large kitchen, lots of storage, laundry hook-ups, living room with fireplace, dining room with sun room area, hardwood floors, patio, double garage, enclosed backyard, fruit trees, \$1,100. 626/794-0455, after 6 p.m.
 PASADENA, share 2-bd., 1-ba. house; washer/ dryer, dishwasher, cent. air, lg. backyard, gd. area, female preferred; \$500 + 1/2 util. 626/405-8845.
 PASADENA townhouse-style apt., nr. PCC, 2 bd., 1 1/2 ba., built-in range & oven, refrig., central a/c, carpets, drapes, laundry, disposal, cvrd. parking, \$725. 790-7062.
 SAN DIMAS townhouse, 3 bd., 2 ba., CAC, stove, 2-car covered garage, full carpeting, drapes, \$900. 909/592-2933.
 TUJUNGA upper apt., 2 bd., 1 ba., 20 min./JPL, \$650. 352-5608.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundering room, \$129,000. 909/585-9026.
 PALM DESERT, 2 bd., 3 ba., den, separate din./liv. rms., on the golf course @ Palm Valley, 12" tile floors w/borderd carpeting, marble fireplace, Corian kitchen/baths, mirrored walls, custom built-in wall units, \$299,000 furnished. 760/345-3713.

VACATION RENTALS

BIG BEAR cabin, cozy, quiet area, walk to village, 2 bd., slps. 8, compl. furn., F/P, TV/VCR, \$75/night. 249-8515.
 BIG BEAR, 7 mi. from slopes; full kitchen, f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-night min.; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
 BIG BEAR CITY, 4 miles from ski slopes, 2 bd., 1 ba. cabin, nicely furnished, sleeps 8, fireplace, TV, full kitchen, microwave; \$100 refundable cleaning deposit; \$75/nite weekdays, \$250 for weekend (2 nites). 909/982-2986.
 BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more, JPL disc. price from \$65/night. 909/599-5225.
 BIG BEAR LAKEFRONT lux. townhome, indoor pool/spa, nr. skiing, beaut. master bdrm. suite, sleeps 6. 949/786-6548.
 CAMBRIA, ocean front house, exc. view, sleeps up to 4, \$125 per night for 2, \$175 per night for 4. 248-8853.
 CORNWALL, ENGLAND, Aug. '99 total solar eclipse; prime loc. campsite on path of totality; incl. lecture series by Caltech, JPL and UK astronomers; <http://www.ctg-windows.co.uk/eclipse.html>. 626/356-2998.
 HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house and guest house comfortably sleep; 3 bd., 2 ba., swim, snorkel, fish; spectac. vws., nr. restaur., golf, other attrac. 626/584-9632.
 HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, microwave, dishwasher, pool, priv. lanai, slps. 4, 4/15-12/14 rate: \$95/nite/2, 12/15-4/14 rate: \$110/nite/2, \$10/nite/add'l person. 949/348-8047.
 LAKE TAHOE, N. Shore, 2 bd., 2-1/2 ba., sleeps 6, great location, all amenities, priv. sandy beach, pool, walk to golf course, fishing 150 yds from front door, 2 miles to N. shore casinos, JPL discount rate, avail. after June 1. 626/355-3886, Rosemary or Ed.
 MAMMOTH condo, walk to ski lifts, 3 bd., 3 ba., beaut. furn.; special midweek rate for JPLers. 626/794-6860, eves.
 MAMMOTH condo, studio + loft, 2 ba., fireplace w/ wood supplied, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitchen w/microwave, terrace, view, amen. 714/870-1872.
 MAMMOTH condo, 2 bd + loft, 3 ba., slps. 8, spa, full kitchen, TV/VCR, JPL disc. rates, walk to Canyon Lodge. 249-8088.
 MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft; sleeps 6-8; fully equip'd 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.
 MAMMOTH condo in Chamonix at lifts 7, 8, 16, 17; walk to Warming Hut, 2 bd., 2 full ba., slps. 6, fully eqpd. elec. kitch., microw. & extras, frplc./wood, color TV, VCR, FM stereo, d/d Jacz., sauna; gm. rec. & Indry. rms., walk to shops, lifts; spec. midwk rates. 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.
 PACIFIC GROVE house, 3 bd., 2 ba., fp, cable tv/vcr, stereo/CD, well-eqpd. kitchen w/microw., beaut. furn., close to golf, beaches, 17 Mile Drive, Aquarius, Cannery Row, JPL discount. 626/441-3265.
 PALM SPRINGS condo, 1 bd., compl. furn., pool, spa, tennis, cable TV, VCR, carpets, paint, cooking utensils new; rent daily, weekly, weekends, monthly. 626/445-0884.
 S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., slps. 12+, 2-level frplcs, decks overlk. priv. dock/ski lifts, gourmet kitch., bikes, boats, color TVs, VCR, ster. w/tape/disk, pools, hot tub & bch.; tennis, 10 min./skiing, casinos/golf, 1 hr./wine cntry; \$995/wk. hi seas. [15 June to 15 Sept; 22 Nov. to 1 March]; + \$90 clean fee; 3-day min. 626/578-1503, Jim Douglas.