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Lab to develop interplanetary Internet

'Father of the Internet' Dr. Vinton Cerf named JPL Distinguished Visiting Scientist

By MARK WHALEN

Internet pioneer Dr. Vinton Cerf has been named a Distinguished Visiting Scientist at JPL to help develop an interplanetary Internet.

Cerf will serve a two-year post that will be in addition to his regular duties as senior vice president of Internet Architecture and Engineering at MCI Communications Corp.

"It took 20 years for the Internet to take off here on Earth," said Cerf, widely known as the "Father of the Internet" for co-developing the TCP/IP protocol, the computer language that gave birth to the communications medium. "It's my guess that in the next 20 years, we will want to interact with systems and people visiting the moon, Mars and possibly other celestial bodies."

Cerf will work in concert with Adrian Hooke, manager of NASA's Space Mission Operations Standardization Program and a member of Gael Squibb's staff in the Telecommunications and Mission Operations Directorate. Cerf and Hooke will be supported by a small team of technical experts drawn from the Internet community, other NASA centers, universities and the private sector to explore ways to merge the work of the Internet and space communications communities.

The first job of the team will develop a new interplanetary Internet architecture that can cope with the long transmission delays and noisy, intermittent data links inherent today in deep space communications. The traditional framework of TCP/IP will have to be radically adapted for interplanetary communications. Other challenges include the construction of interplanetary gateways and perhaps methods to provide for local caching of content—much in the same manner as many World Wide Web sites are mirrored in different geographic areas to optimize performance.

Cerf's work with JPL will also address how space missions can be made more openly accessible and exciting to the public by engaging individuals via the interplanetary Internet in voyages of interplanetary exploration and discovery. Together, Cerf and Hooke hope to enhance scientific research by allowing scien-

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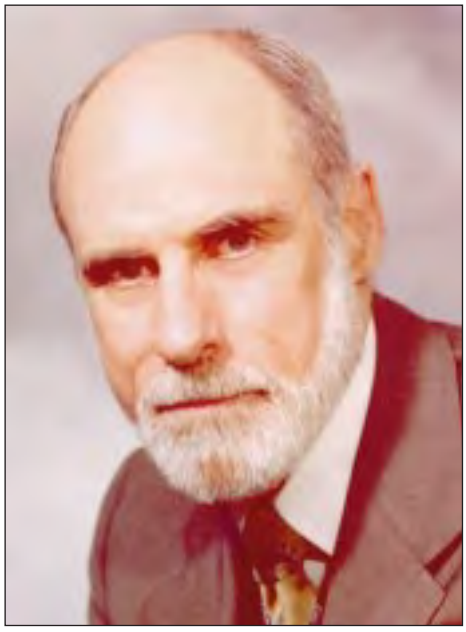

Dr. Vinton Cerf

JPL contributes to Chernobyl analysis

'Pioneer' robot, which will enter and inspect facility, could be used this fall

By MARK WHALEN

Twelve years ago, a catastrophic explosion rocked the nuclear power plant at Chernobyl in the Ukraine, killing 32 people and poisoning the surrounding environment. Today, the reactor remains highly radioactive and potentially deadly to humans, with the threat of nuclear waste seeping into the outside water and air.

A concrete sarcophagus built over the reactor following the accident is decaying. Radiation levels inside many rooms are still so high that people cannot work in them without serious health risks.

But thanks to the combined efforts of a couple of JPL teams—in collaboration with U.S. university and industry partners and Ukrainian engineers—efforts are under way to analyze and ultimately repair the deteriorating structure.

A 453-kilogram (1,000-pound), radiation-hardened robot called "Pioneer" has been constructed to inspect and assess the damage to the reactor. JPL provided two vital components of the robot's payload: a drill system to collect core samples of structural material to determine the integrity of impacted walls and columns; and software to generate photo-realistic 3-D images of Chernobyl's interior, based on Mars Pathfinder mapping technology.

Pioneer was built by RedZone Robotics Inc., a spinoff company of Carnegie Mellon University in Pittsburgh, which also developed a robot to clean up the Three Mile Island nuclear facility in Pennsylvania.. Pioneer is based on a robot model made by the company to clean up nuclear waste storage tanks for the Oak Ridge National Laboratory in Tennessee. The robot will move on tank tracks and resemble a mini-bulldozer.

After less than a year of designing and developing their contributions to the project, JPL engineers will take part in end-to-end integration and testing of the units at Carnegie Mellon by this fall. The robot is scheduled to be shipped to Chernobyl by late November.

Dr. Ali Ghavimi, a senior member of the technical staff in the Guidance and Control Analysis Group, Automation and Control Section, has led the task of developing a unique control system architecture for the Pioneer coring mechanism.

The control system design for the 91-centimeter (3-foot), 68-kilogram (150-pound) drill system, Ghavimi said, is inherited from earlier studies in the area of exploration of interplanetary small bodies, such as comets and asteroids. In a

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News Briefs

Dr. Charles (Chad) Edwards has been named manager of the Telecommu-nications and Mission Operations Direcorate's (TMOD) Tech-nology Program Office 970.

Dr. Chad Edwards

Edwards most recently served as deputy manag-er of the office.

Concurrent with the appoint-ment, Edwards was named end-to-end information system (EEIS) technology integration leader, reporting to TMOD Director Mike Sander. ❑

A NASA/JPL workshop called Biomorphic Explorers for Future Missions will be presented on Lab Aug. 19 and 20.

A wide variety of presentations will be made by scientists from JPL and other NASA centers, Caltech and other universities, and industry.

The workshop will be subdivided into three sections: science applications, small mobile exploration systems and biomorphic explorers component technologies.

For registration and other information, go online to http://nmp.jpl.nasa.gov/bees . ❑

Nominations for JPL's Space Flight Awareness Award are due Aug. 31 to Reward and Recognition Program Administrator **Monica Garcia**.

For information, including how to download the nomination form, go to the SFA home page at http://eis /sec614/reward/sfa.htm or call Garcia at ext. 4-3825 or **Laurie Lincoln** at ext. 4-8515. ❑

The Benefits Office reminds employees who have changed their primary residence and have not updated personnel records to provide their section office with the new address by Aug. 31.

This will ensure that employees receive ben-efit open enrollment materials in a timely fash-ion, according to **Patrice Houlemard** of the Benefits Office, who noted that employees may not list JPL's address as their primary residence.

For more information, call Houlemard at ext. 4-2549. ❑

The next JPL/Red Cross Blood Drive will be held in von Kármán Auditorium Aug. 11 from 10 a.m. to 3:15 p.m. and Aug. 12 from 7 a.m. to 12:15 p.m.

Sign-up sheets will be available prior to the the blood drive at the ERC, Occupational Health Services (Building 263), and Occupational Health Services' home page at http://eis/medical .

For those who have not signed up ahead of time, or wish to change their appointment, call Ginger Morris at the Pasadena Red Cross at (626) 799-0841 ext. 630. ❑

Special Events Calendar

Ongoing

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

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

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

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

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

Tuesday, August 11

JPL Scuba Club—Meeting at noon in Building 168-427.

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

Wednesday, August 12

Associated Retirees of JPL/Caltech—Members will attend the Lawrence Welk Theatre and Will Rogers Follies. Luncheon is included. Cost: $43 with bus transportation; $33 without. Cal Lila Moore at (818) 790-5893.

Investment Advice—Fidelity representative Jasson Rasmussen will be available for individ-ual appointments. Call Patrice Houlemard at ext. 4-2549.

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.

Thursday, August 13

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

SESPD Lecture Series—Dr. Les Deutsch of the Space and Earth Science Programs Directorate's Program Planning Office will discuss the Deep Space Systems Technology Program, also known as X2000, at noon in Building 180-101.

Friday, August 14

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

Wednesday, August 19

Investment Advice—A TIAA/CREF represen-tative will be available for individual appoint-ments. Call Patrice Houlemard at ext. 4-2549.

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

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

"Steps To Retirement"—The Benefits Office, in conjunction with TIAA/CREF, offer this workshop tailored for employees who are with-in one year of retirement. From 1 to 3 p.m. in Building 291-202. Seating is limited. For reser-vations, call Patrice Houlemard at ext. 4-2549.

Thursday, August 20

Investment Advice—A TIAA/CREF represen-tative will be available for individual appoint-ments. Call Patrice Houlemard at ext. 4-2549.

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

JPL Bicycle Club—Meeting at 5 p.m. in the Building 167 conference room.

Von Kármán Lecture Series—Deep Space 1 chief engineer Dr. Marc Rayman will discuss the mission at 7 p.m. in von Kármán Auditorium. Open to the public.

Friday, August 21

Von Kármán Lecture Series—Deep Space 1 chief engineer Dr. Marc Rayman will discuss the mission at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Thanks to JPLers, summer campers have fun with learning

Students in the Child Educational Center's (CEC)summer camp this year have enjoyed the usual arts and crafts, field trips and outings to the park.

Many of them, however, have also turned their summer activities into learning experiences, thanks to an outreach program led by several JPL employees whose children attend the CEC.

Hands On Science, supported in part by the National Science Foundation, is a one-hour, eight-session, enrichment program for children from pre-kindergarten through sixth grade. The goal of the program, said Kay Ferrari of JPL's Public Services Office, is to stimulate awareness of "science in your life" through the fun of active involvement in experiments, games, music and projects.

The children's hands-on activities include the construction of simple materials into learning tools. For example, by combining a cardboard tube, rubber band and piece of wax paper, they learned about the eardrum and how a sound is "felt." Another activity taught about the vocal cords through the use of rubber bands and tongue depressors.

The year-round program is generally taught during after-school hours, but was offered as an optional activity to students from grades 2 through 6 at the CEC's three summer camp sites.

JPL employees leading the summer activities were Arvid Croonquist, Pam Hoffman, Tom Hoffman, Jeanne Holm, Ron Holm, Brian Muirhead, Dave Redding, Jeff Srinivasan, Mark Whalen and Mary White.

PHOTO BY DUTCH SLAGER / JPL PHOTO LAB

Mary White of the Space Instruments Implementation Section works with Child Educational Center summer camp students on making paper parachutes, part of the Hands On Science curriculum. From left are Ashley Hoffman, Elizabeth Phillips, Jennifer Parham and Laura Boyd.

The Public Services Office sponsors this activity within the local community by supplying Hands On Science kits and instructor training to JPL employees who teach these classes at elementary schools and youth organizations.

For information about the program or how to become an instructor, contact Ferrari at ext. 4-9312. ❑

Educational web pages bring quake research to students

By MARY HARDIN

A new educational tool that allows students to track earthquake motions from their classrooms is now available online at a JPL web site.

The project is part of the Southern California Integrated GPS Network (SCIGN), an array of 250 Global Positioning System (GPS) receivers that continuously measure the constant, yet barely perceptible, movements of earthquake faults throughout Southern California.

"The project was initiated because many of our GPS stations are being placed at schools," said Dr. Andrea Donnellan, a geophysicist and SCIGN scientist at JPL. "We wanted students to have an opportunity to be involved in the project; however, the pages have been developed for use in any school and are also available to the general public and other organizations such as libraries. These web pages use earthquakes as a starting point and we hope the site will enable students to look at and use real data to solve problems. Also, in the event of an earthquake, they'll be able to get online and see how their area moved as a result of the earthquake."

The pages are available at http://scign.jpl.nasa.gov/learn .

"The site is designed for high school and beginning college students, but middle school teachers have told us they can use parts of it too," said Maggi Glasscoe, the SCIGN team member who designed the pages. "Our hope is to illustrate math concepts, such as reading a graph, help students learn how to do research and encourage them to explore concepts ranging from plate tectonics and earthquake faults to earth science and physics. We've included a lot of animation and graphics that we hope will get students excited."

The Southern California Earthquake Center is working with the team to have the educational pages reviewed by educators to meet current curriculum guidelines of the state of California.

At this time, there are about 50 GPS receivers in place around Southern California with new

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Lab's maintenance, operations services outsourced

By MARK WHALEN

JPL has announced the outsourcing of its maintenance and operations services at the Oak Grove facility.

The Laboratory has signed a contract with JE Remediation Technologies, Inc., a subsidiary of Jacobs Engineering Group Inc. of Pasadena, to provide such services effective Sept. 21.

Vaji Nasoordeen, manager of the Facilities Maintenance and Operations Section 662, said 92 employees within the section will transfer their employment to Jacobs. All will remain at JPL and will be guaranteed a minimum of one year of employment with the company.

The three-year contract, Nasoordeen said, affects four groups in the section—electrical services, mechanical services, building services and Space Flight Operations Facility operations.

"The intent is to make the change as seamless as possible to customers here at the Laboratory," Nasoordeen said, adding that a Lab-wide presentation is planned to provide information on how services will be offered under the Jacobs contract.

Jacobs is a provider of engineering, procurement, construction, construction management, operations and maintenance, design, environmental remediation and consulting services. It was formed in 1947.

The contract has a value in excess of $38 million. A potential two-year extension may be negotiated in 2001. ❑

PHOTO BY CAROL LACHATA / JPL PHOTO LAB

SCIGN team member Maggi Glasscoe works on one of the home pages she designed to help students explore earthquakes.

Quake

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sites being added every week. The earthquake network began in 1990 with only four GPS receivers as a prototype project funded by NASA. It detected very small motions of Earth's crust in Southern Califor-nia associated with earthquakes in June 1992 in Landers and in January 1994 in Northridge.

SCIGN is a consortium of institutions with a common interest in using GPS for earthquake research and mitigation. The consortium is coordinated by the Southern California Earthquake Center (SCEC), a National Science Foundation Science and Technology Center headquartered at USC. The lead institutions in the installation and operation of SCIGN are JPL; the Institute of Geophysics and Planetary Physics-Scripps Institution of Oceanography at the University of California, San Diego; the United States Geological Survey; and USC. ❑

College degrees earnable on Lab; fall courses coming up

By BARBARA KOTULLA
Educational programs support

In accordance with the Laboratory's goal of expanding opportunities for individual growth, JPL and Caltech employees are able to obtain an associate of arts degree from Glendale Community College, bachelor of arts degree from California State University, Los Angeles, or master's or doctorate from USC through programs offered on site through Professional Development.

The Glendale College (GCC) and Cal State L.A. (CSULA) programs are offered after hours at the Professional Development Center complex. CSULA courses run on Monday and Wednesday evenings, with a different course each night (two per quarter). GCC courses are offered Tuesday and Thursday, with one course being offered for a 16-week period.

The overall themes of both programs focus on JPL curriculum in science, environment and public policy. Key areas include business, human relations, technology and skills courses. Core classes include library and database research techniques, science-based courses and interdisciplinary study courses where students will be advised to pursue a research interest relevant to themes studied in the programs.

The University of Southern California Instructional Television (USC-ITV) program is offered daily from 7:30 a.m. to 9:30 p.m. Monday through Friday at the Professional Development Center using interactive television feeds from the USC campus. JPL is one of eight remote sites participating with USC.

Among the courses offered through the USC master's and

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Internet

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tists to use familiar Web-based tools via interplanetary gateways that operate throughout the solar system.

"The excitement we saw generated when people followed the exploits of the Mars Pathfinder is just the sort of thing we'd like to recapture on a regular basis," Hooke said. "What we'd like to do is involve wide segments of the public by letting them become part of the exploration experience—to actually have a hands-on sense of what it's like to be 'telepresent' on Mars and other places throughout the solar system. In fact, I wouldn't be surprised if the work we're beginning now might one day allow students to be able to control their own Mars rover in much the same way JPL scientists controlled the movements of Sojourner last summer."

One driving force behind this effort, he added, is the possibility that the Deep Space Network (DSN) could one day serve as an "interplanetary Internet service provider."

Hooke's office has worked for about 20 years within an international body known as the Consultative Committee for Space Data Systems (CCSDS) on the standardization of data transfer between spacecraft and ground stations. "In the next few years, a unique opportunity exists to unite the Internet and CCSDS space communications communities," he said. "By defining a long-range architecture for extending the current Earth Internet to be replicated on other planets and connected by high-performance long-haul links, we can help shape the investment decisions we make to upgrade the DSN in the future. In fact, it is quite possible that the network will evolve from being primarily ground-based to having significant components distributed in space around the solar system."

He said the development of what is termed the "InterPlanNet" (IPN) is inevitable, with current and emerging technologies and protocols becoming intertwined between the two communities.

"If we don't start thinking about the issues of expanding the Internet beyond Earth, then whatever changes they put into the Internet are virtually guaranteed to be incompatible with any messages that go outside of Earth," Hooke added.

As part of two days of intensive technical meetings held at JPL Aug. 3 and 4 between Cerf, Hooke and members of the evolving InterPlanNet design team, Cerf addressed a von Kármán Auditorium audience as part of the Director's Topical Seminar Series, discussing where the Internet is now and the challenges it faces in both the near term and long term.

Noting the Internet was first deployed in 1983 and its first commercial services not delivered until 1990, he said he considers the medium still very young and in its "gold rush" stage. In the near future, he said, he foresees a transition from people's current "episodic" connections to the Internet to "dedicated," open-ended connections, where the Internet is always "on."

"We will begin to treat the medium as a different kind of resource," Cerf said, pointing to an instance where a device might be hooked up to the web and also equipped with a Global Positioning System (GPS) receiver to answer questions that are geographically related. In an era of "Internet-enabled" devices, for instance, a laptop computer operating over a cellphone link might be able to rapidly find the closest Thai restaurant.

Cerf stressed the importance of coordinating new Internet-related communications technologies and protocols with JPL mission plans, as well as those of other agencies.

He listed a goal of a 2005 mission where Mars is accessible as a "node" on the Internet. In the years to follow, he saw the possibility that any spacecraft landing on a planet or other celestial body could "leave behind a little piece of the Internet" for future interplanetary communications development. By building up communications infrastructure in a planned way over many incremental missions, Mars could be gradually equipped with a sophisticated Internet capability for future use, he said.

"The challenges for all of us now are which technologies to develop for the terrestrial Internet that can be used for the interplanetary Internet," he said.

Among the critical issues to be considered in the design of the InterPlanNet, Cerf noted, are standardization of domain names, and security.

Also, he wondered, "will there be a single InterPlanNet, or competing ones?"

Among Cerf's numerous career honors, he and partner Robert Kahn in December 1997 received the U.S. National Medal of Technology from President Clinton for founding and developing the Internet. ❑

Chernobyl

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small-body exploration task led by Donald Sevilla of Section 352, JPL developed technologies that enable autonomous sample acquisition and in-situ science in the presence of challenging environments such as low gravity, cold temperatures, unknown surface substrate properties, and rover or lander mobility and stability limitations. Under the task, JPL has developed technologies that allow the drilling operation to perform at a prescribed thrust force while archiving information on penetration rate, thrust force variances, and other subtle differences in bit interactions with substrate. JPL has developed analyses techniques that are able to differentiate between sample properties of various cometary simulant rocks.

"The Pioneer coring mechanism is designed to acquire core samples from various points in the interior of the Chernobyl power plant," Ghavimi said. "This process is essential to evaluating the structural integrity of the site by extracting core samples from the associated concrete walls and floor. The sample mechanical properties are studied further in order to estimate the degradation of the structure due to the aftermath of the explosion."

The coring mechanism consists of several subsystems. JPL has designed and implemented the end-to-end hardware/software interfaces, the closed-loop control software, appropriate data acquisition processing and archiving, and a user-friendly graphical interface. The control system is carefully designed to meet specifications and requirements imposed by the RedZone rover limitations.

The coring mechanism is designed to operate both autonomously and manually. Autonomous operations include both position- and force-controlled modes for various operational scenarios. "Special attention has been given to include 'smarts' to ensure robust operation of the coring mechanism in the presence of operational anomalies, uncertain environments and material discontinuity," Ghavimi noted. Manual operation enables any human decision to control the operation of the mechanism, by passing autonomous operations entirely.

Ghavimi said that Pioneer is the first mobile robot equipped with a drill system and that its design posed unique engineering challenges. The drill is mounted to a flexible platform, the robot can move in response to the applied drill forces and torques at the coring bit, and the system structural modes may be excited throughout the operation, which may lead to instability. In addition, it was built to withstand a high-radiation environment.

Other robots entering the reactor have been unsuccessful due to high radiation, which freezes joints, short-circuits computers and destroys camera lenses.

The robot, and all of its parts, was built to withstand a lifetime radiation exposure of 1 million rads. By comparison, humans' exposure should not exceed five rads a year.

Dr. Mark Maimone of the Machine Vision and Tracking Sensors Group, Autonomy and Control Section, worked as mapping sensor lead for the Pioneer project.

The group provided hardware requirements and software needed to process stereo triples into range data that will enable generation of an online 3-D reconstruction of the interior.

Three cameras—each with an 8-millimeter (1/3-inch) focal length lens and CCD sensor—will be mounted on an L-shaped configuration and provide a 35-degree field of view. The whole unit weighs about 9 kilograms (20 pounds).

Encased in lead, the three cameras will calculate the distance between the robot and various points on the walls of the structure. Eventually, the cameras will measure enough points to make a virtual model of the building.

"To enable accurate sensing, the stereo cameras need to be precisely calibrated," noted Maimone. "Geometric calibration consists of correctly modeling the optical path of each camera, which allows us to correctly predict the 3-D locations of objects from their two-dimensional images."

Others at JPL involved with the sensor work were Larry Matthies, Autonomy and Control Section; George Alahuzos, Avionic Equipment Section; and Jim Lloyd; Fabrication Services Section.

Maimone also noted that the work is one of many projects being funded out of the National Robotics Engineering Consortium, a NASA-sponsored organization located in Pittsburgh and co-directed by Dr. Neville Marzwell at JPL and Carnegie Mellon University.

Lawrence Livermore Laboratory is overseeing the Pioneer project, which is financed equally by the Department of Energy and NASA's telerobotics program, led by Dave Lavery of NASA Headquarters. Other organizations working on it include NASA's Ames Research Center, Westinghouse Electric Corporation's Science and Technology Center, the University of Iowa, and computer firm Silicon Graphics. ❑

JPL PHOTO LAB

Software engineer Fred Serricchio, left, and task leader Dr. Ali Ghavimi stand behind the coring mechanism for which they developed the control software. The entire unit, developed by Carnegie Mellon University, will be part of the Pioneer robot that will analyze the Chernobyl plant.

African American culture interest group formed on Lab

The African American Resource Team was organized this summer, one of three cultural interest groups on Lab under an agreement with the Advisory Committee on Minority Affairs (ACMA).

AART's vision is to advance African American diversity at all levels of the JPL workforce and ensure that African Americans are viewed as valued and influential partners in JPL's business development, technical operations and growth, according to membership chair Tom May. He added that four subteams—membership, professional development, community outreach, and image and communication—were established to help accomplish this vision.

About 50 people attended the team's kickoff meeting on July 7. Meetings will be held quarterly and are open to all interested. For questions, call organization chair James Black at ext. 4-1961. ❑

Anniversaries

Service award ceremonies were held July 21 to honor the following JPL employees, who have completed 20 or more years of service:

45 years

Charles Stelzried.

40 years

Takashi Kiriyama, Walter Skotnicki, Thomas Sorensen, Donald Starkey.

35 years

Dan Bathker, Roger Brandt, Richard Green, Rolando Jordan, Jo Jean Kos, Warren Moore, Theodore Moyer, Linus Pakulski, Charles Vegos.

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Dr. David Bayard


Dr. Josette Bellan


Dr. Alan Harris


Dr. Nicole Rappaport

Four appointed senior research scientists

Four JPL employees have been named senior research scientists.

Dr. David Bayard of Section 345 was recognized for his significant fundamental contributions to the theory and application of adaptive control systems.

Dr. Josette Bellan of Section 353 was named for her pioneering research and development of seminal models in the fields of multiphase flows dynamics and combustion relevant to a multitude of applications.

Dr. Alan Harris of Element 3238 was recognized for his research specialty in planetary physics and for distinguishing himself as an international authority on the photometric and dynamic properties of asteroids.

Dr. Nicole Rappaport of Section was named for her international seminal work in planetary ring dynamics, planetary gravity field determination, radiation pressure effects and numerous areas within radio science.

The senior research scientist grade—along with that of senior research engineer—was established in 1979 to give special recognition and promotion to outstanding individual research achievers. Eligibility for the grade is established by the demonstrated ability to meet the research requirements typical for appointment to the position of full professor at a leading university, as evidenced by outside peer review. In addition to demonstrated research leadership, appointment also depends on the individual's active participation in programs related to JPL's institutional goals.

Appointments to the positions are made by JPL Director Dr. Edward Stone, in consultation with Chief Scientist Dr. Moustafa Chahine. ❑

First two ISO assessment rounds completed

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

The results of the second round of ISO 9001 internal assessments—held the week of July 13—reveal a growing understanding of the kind of documentation that is required when documenting a process. Round 2 assessors interviewed 82 process owners, six domain owners, nine sub-domain owners, and 187 other employees regarding their processes and procedures.

The first four rounds of assessments were specifically designated as training rounds. One of the purposes of these two rounds was to familiarize employees with the assessment process; a kind of trial run. In a sense, the objective was to create an environment where learning could take place.

For example, employees were asked to describe what they do and what process they work in. The answers given to assessors pointed to a general lack of overall understanding of the processes they work in and where to find the documentation for procedures related to those processes. Process owners were asked about element policy requirements (JPL terminology for ISO standards requirements such as management responsibility, design control and other ways of assuring a quality product) that need to be considered when writing their processes. This question also revealed a lack of understanding among process owners regarding elements and how they relate to process policies. Assessors worked at providing explanations to help clarify these areas.

Training rounds 3 and 4 will introduce the notion of "corrective action," where documentation of the process or procedure is non-compliant or places where the documentation is not being followed; that is, it does not follow the ISO credo of "say what you do, do what you say and prove it." Corrective action is not a disciplinary procedure, but rather a way of rectifying gaps or discontinuities in what employees say they do. It helps to identify problems and avoid mistakes that affect the quality of the product.

Nearly 100 anonymous feedback questionnaires regarding assessment rounds 1 and 2 were received in the last two weeks, and showed a balance between those who feel they understand both ISO and process-based management (PBM) versus those who do not. The findings are currently being reviewed to help the ISO team see how they can best improve getting the Lab up to speed for certification.

New classes are being designed to address what ISO 9001 and PBM mean to employees—from process owners through all levels of the organization. The ISO 9001 management class will continue for group supervisors as well as any section managers and others who were unable to attend previous classes. An added emphasis will highlight how PBM and ISO are related and clarify ways in which PBM can enhance readiness for and receptivity to change. This will help the organization adapt to change and encourage innovation at all levels.

The cornerstone for this approach is communication. Plans are under way to augment the training, assessments and upcoming November audit with flyers, presentations and speakers on the subject of ISO 9001 and PBM and what they mean for JPL. The ISO/PBM home page is expected to debut Aug. 10 and will contain a comprehensive "ISO Guide," describing ISO and how it is being implemented. Assessment results, presentations, a glossary of terms and a resource listing are included. Feedback is encouraged; buttons will be found on each page of the site for that purpose.

More information on ISO 9001 and process-based management at JPL can be found at a temporary home page at http://iso . ❑

Correction

A story in the July 24 issue of *Universe* on last month's Safety Incentive Awards should have stated that JPL has reduced lost-time days by 84 percent over the last year—from 295 such days down to 47. The safer workplace has also resulted in a 90 percent reduction in lost-time days since the inception of the safety incentive program in 1990. ❑

Passings

Eleanor Victoreen, 62, a retired administrative secretary from Section 352, died of cancer July 16.

Victoreen worked at JPL from 1958–82. She is survived by daughters Jane Cover and Joyce Flack, sons Ron and Rick Baker, and brothers Paul and Lester Vickers.

Services were held July 22 at Rose Hills Memorial Park in Whittier. ❑

John Fuhrman, 76, former manager of the Technical Documentation and Materiel Services Division, died of complications from surgery July 19.

Fuhrman joined the Lab in 1965 and retired in 1987. He is survived by his wife, Marguerite; sons John, Kevin, Donald and Andrew; and two grandchildren.

Services were held July 23 in Nevada City, Calif. ❑

Dan Cain, 69, a retired member of the technical staff in Section 368, died of a heart attack Aug. 2 at his home in Pasadena.

Cain, who worked at the Lab from 1959–94, is survived by his wife, Patricia Jacka Cain; sons Timothy and Paul; daughter Mary Ann Istvanyi; and one grandson.

No services were held. ❑

Education

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Ph.D. programs are computer science, electrical engineering, aerospace engineering and aeronautical engineering.

Undergraduate courses offered at JPL by both GCC and CSULA cost approximately $3,000 per calendar year. The unit cost is reimbursable to eligible JPL employees. USC courses cost $645 per unit, plus a $100 per unit fee for ITV and a computer fee. The fees and units are covered under JPL's tuition reimbursement policy up to $10,000 per calendar year.

Registration for GCC's biology course is open now, with class beginning Sept. 1. Students may also register now for the CSULA program, with instruction beginning Sept. 28. Registration for USC courses starts Aug. 27, with classes beginning in September.

For more information, call the author at ext. 4-0088. ❑

Anniversaries

Continued from page 5

30 years

Harry Detweiler, Fred Krogh.

25 years

Marc Adams, Mary Bothwell, Victor Chavez, Nancy Durland, James Granger, Robert Irigoyen, Erik Ivins, Edward Morassini, Adriana Ocampo, Ladislav Roth, David Skinner, Henry Valtier.

20 years

Terrence Adamski, Genji Arakaki, Shari Asplund, Shehenaz Bhanji, Jeffrey Boyer, Garry Burdick, James Carter, Yolanda Castillo, David Clough, Richard Cofield IV, James Constantine, William Eggemeyer, Lee Elson, Robert Gustavson, Eric Hines, Rudolph Horton, Ronald Hungerford, Bolinda Kahr, Julius Law, Ray Morris, Eni Njoku, Michael Orr, Darlene Padgett, Thomas Pastorius, Joan Pojman, Robert Robinson, Claudia Romain, Arnold Ruskin, John South, Andrea Stein, John Trauger, Roy Vitti, Irving Webb, Kirby Willis. ❑

LETTERS

Phil Eckman and I want to thank you all for coming to our recent retirement party in von Kármán. Special thanks to Esther, Shari, Barbara and Beatriz for "engineering" the whole event. This is a wonderful way to cap off our many years at JPL. Now with so many fond memories to take with us we both feel this is just another fine example of why JPL is a terrific place to work. Thank you all again.

Phil Eckman and Gerry Meisenholder

❑❑❑

Thank you all 662 employees for the wonderful farewell party. A special thank you for all the 662 trades mechanics. Without your guidance, training and patience I would not have the skills I have today. I will never forget all of your "unique" personalities and humor. Thank you again, my special friends. I will miss you all! Love,

Vicki Reifer

❑❑❑

Thank you very much for your kind and thoughtful condolences and support following the loss of both of my parents within 10 days. It certainly helped me get through the worst times. The fact that that is how my father wanted it also made it easier to bear. Thank you also for your generous contributions on their behalf. Mary and I have donated the money to the L.A. Times Summer Camp Fund so some kids, who otherwise couldn't, would get to go to camp this summer. My folks would have liked that.

Marty Nachman

❑❑❑

I want to express my thanks to the many friends and coworkers who participated in the two retirement events for me. You were much too kind and generous, and I will always remember the expression of good wishes. JPL is a special place because of you. Good luck.

Chuck Lifer

FOR SALE

BEDROOM SET, woodgrain laminated corner group (corner desk, chair, cabinet with drawer, 3-drawer dresser), perfect for spare bedroom or teenager's room, vg cond., $150/obo. 626/337-7522.

BEDSPREAD, king/"periwinkle", lightly quilted, very new: $40. 626/398-4960.

BIKE CARRIER, hitch mount, four bikes, fits 1.25-in. hitch receiver, Thule Brand, near new, used twice; new $150, sell $100. 626/564-8405.

CAMERA, 3D, complete gift package with Nishika n8000 35mm, 3010 twin flashlight, leather case and video instruction; whole package for $120. aslai@hotmail.com.

CAMERA, Minolta x-700, 35mm SLR, Minolta 50mm F1.4 Lens, Soligor 80-200mm, F4.5 macro 700m Lens, Albinar 28mm F2.8 wide angle lens, skylight filters, Minolta auto 280px flash, case; all for $150. 626/564-8405.

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

CANISTERS ceramic, for tea, sugar, coffee; two 5" diameter and two 6" diam.; white w/blue flower designs; all 4 for 11/obo. 626/568-8298.

COFFEE TABLE, white marble, 23" x 69", $120. 626/797-6982.

COMPUTER, 486DX2-66MHZ Turbo, 32MB RAM, TEAC 58E, CD-ROM 2 HDs, Fujitso 1285 MB, Maxtor 345 MB, 2 floppy drives, 3.5 & 5¼ (1.2M & 3.5M); 38.4 baud modem, EIDE BIOS-upgrade, Propoint mouse, Keytronic keybd.; Windows 95 Microsoft Office, games, screen saver, numerous (3.5 & 5¼) software disks, etc., $475/obo. 805/481-8914; e-mail shnbh@juno.com.

COMPUTER, Apple Mac plus, 2.5MB RAM, 60MB ext. hard disk, built-in 9-in. black/white display, keyboard, mouse, Appletalk, tilt/swivel stand, software; all for $100. 626/564-8405.

COMPUTER, Apple Mac II FX, 20MB RAM, 317MB HD, dual floppy, 13-in. color monitor, CD ROM drive, sound, speakers, modem, Ethernet, AppleTalk, software; all for $400. 626/564-8405.

COMPUTER, Packard Bell, 486 SX-25, w/Windows 3.1, extremely compact, no monitor, $50. 626/398-4960.

COMPUTER, Pentium II 300 MMX, 32 MB RAM, 4.2 GB HD, 4 MB AGP video, 32X CD-ROM, 15' monitor, 56K fax, 2 USB ports, PS2 mouse and keyboard, 1.44 floppy, sound card, less than a month old, has original win95 cd, $1,300/obo. 247-5272, pgr. 327-3227.

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

COMPUTER POWER CONTROL CENTER, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, $15. 790-3899.

COMPUTER SYSTEM, 166Mhz Pentium, multimedia PC (7280P), 1.66MB RAM, 2.5GB HD, 8xCD ROM, photodrive, 33.6 modem; includes 15" monitor & Epson stylus color 800 printer; $2,500 (includes extended warranty). 773-8933.

COMPUTER SYSTEM, IBM PS1 386SX w/Windows 3.0, PS1 printer, works fine, $20/obo. 805/254-6134.

COMPUTER SYSTEM, PowerBook DUO 280C, 12MB RAM, 320 HD, ducking station w/2 MB V RAM, 1 GB HD, keyboard, mouse, SCSI cable, AC adapter, leather case, etc., $700/obo. 832-5556.

DISHWASHER, Maytag,. exc. cond., $200; CONVECTION OVEN, GE Profile under-counter mode, exc. cond., $500; both used less than 3 years; reasonable offers considered. 248-9432, Stan.

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

END TABLE, $20; EXERCISE BIKE, $15; TYPEWRITER, Olympia electronic, xtra-wide carriage, font/pitch change, underlining, correction, etc., exc. cond., incl. 6 new ribbons and 12 correction tapes, $100/obo; SOFTWARE, Quicken for Windows, unopened, $20. 626/355-3886, Rosemary/Ed.

ETHERNET CARD, PCMCIA, brand new in box, type II, 10 BaseT, Win95/NT, Eigler model no. EXPBK-ET10BT, $45. 591-1218, eves.

EXERCISE WALKER, Stamina Advantage Walker 2000, $70/obo. 626/799-1707.

FUTON BED, king size, gray, $100. Montrose, 541-0782.

GUITAR AMPLIFIER, Peavey 5150, Eddie Van Halen model, half stack w/slant cab, exc. cond., $799/obo. 626/446-0165.

HAIR DRYER, professional, beauty salon style, $35. 956-1744.

LAWNMOWER, Murray 22" 3.5 HP, runs great, $30; EDGER, Black & Decker, used twice, $15. 805/291-1912.

LOVESEAT SOFAS, 2 brown & beige, exc. cond. $30 ea.; COFFEE TABLE, square, oak, exc. cond., $25; END TABLE, oak, exc. cond., $20; all 4 items for $100. 249-2669.

MATTRESS and foundation, California king-size, firm, gd. cond., $200. 909/598-0065.

MOVING SALE, everything less than 1 year old; queen-sz. bed, $250; Sharp TV, 20" with desk, $190; many other things at very good prices. 626/844-9227.

ORGAN, 1962 Hammond C-3 console with 22R single-speed Leslie speaker, tremelo, walnut cabinetry, exc. cond., $3,000/obo. 249-6731.

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

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

PAINTING, orig. oil on canvas, impressionistic landscape, 42" x 52", w/invisible frame, $250. 626/797-3156.

PRINTER, Epson 1070+, 132 column, both tractor & pressure feed, bought new $419; including 15' cable, all manuals incl., approx. 15 sheets of paper been run through; perf. cond.; $250/obo, incl. 1/2 box of paper. 805/481-8914; e-mail shnbh@juno.com.

PRINTER, HP 870 Cse, like new, used for 15 months, prints black 8 pgs./min., 600 x 600 dpi; prints color 4 pgs./min., 600 x 300; C-REt, supports 125 True Type fonts for Windows and 27 for Mac; single-sheet feeder for paper or envelopes; works w/Windows 3.1, '95 or Mac; cables & s/w drivers included; $250. 626/963-1960, eves.

REFRIGERATOR, large side-by-side, $250/obo; DISHWASHER, portable $150/obo; MICROWAVE/ CONVECT oven, $50/obo (old but works). 626/457-8435.

REFRIGERATOR/FREEZER, almond color, 18'; runs well, $100. 353-3836.

SEWING MACHINE, Singer featherweight, exc. cond., $550/obo. 626/355-2957.

SHOWER & TUB DOORS, Sears, still in box, high quality; $100 for tub, $55 for shower. 626/355-3950, pager 626/256-5453.

SLEEPING BAG, 3-season REI down, rated +20; used twice; exc. cond., incl. stuff sack and storage bag, $75. 353-6369, eves.

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

SWEATER, Coogi, from Australia, size small/medium, new, Nordstrom sells for $325; sell $100. 790-3899.

TABLE, dining rm., oval, cherry; sits 8 w/one extension; exc. cond., $300/obo. 626/796-7330, Ben or Connie.

TABLE, dining rm., round, mahogany; sits 8 w/two extensions; almost new; incl. 6 matching chairs, $1,000/obo. 626/568-8298.

TEACUPS, Franciscanware, Desert Rose pattern: $7/ea. 626/398-4960.

TELEVISION, color, used, 27" Toshiba, stereo, sharp picture, exc. cond., $245/obo. 626/446-9991.

TELEVISION STAND, oak, on coasters w/storage below, can easily accommodate up to 27" TV, $50. 626/398-4960.

TENT, cabin, 9 x 11, 80" high, free-standing, sleeps 6, gd. cond., $60. 626/797-6982.

TREADMILL, manual, gd. cond., $80. 626/303-2735.

VCR, Sony 4-head, $75; STEREO RECEIVER, JVC basic model, $30; CD PLAYER, Kenwood portable, $50. 957-2898, Keith.

Continued on page 8

VERTICAL BLINDS, assorted sizes, good cond., white aluminum, $20/ea. 909/598-0065.
WASHER & DRYER, Kenmore portable (larger than stackable), electric (120V, 15A), ~2 yrs. old, perfect for apt. or condo; $250 for both. 637-8456.
WATERBED, oak frame, motionless mattress, needs base, $50. 805/291-1912.
WEIGHT SET & BENCH, w/additional equipment, like new, $250; BIKE, Peugot, 10 speed men's, exc. cond., $125. 248-0610, Randy.

VEHICLES / ACCESSORIES

'89 ALFA ROMEO Spider Graduate convertible, 4 cyl., 5 spd., 2 litre, red, black soft top, tan interior; willing to trade for 4-dr. Saturn or $6,800/obo. 626/237-4153, Albert Ramirez.
'88 BMW 735I, loaded, beautiful, chrome wheels, mini-disc/CD changer, 140k miles, $11,000/obo. 790-7129.
'92 CADILLAC STS touring sedan, black interior/exterior; meticulously kept, with maintenance/repair receipts; body style same as that through '97; fully-optioned incl. heated windshield; factory security system; zebrano wood & leather; Bose sound system incl. CD; shop manual; warranty avail.; Kelley retail blue book is $15,100, sell $13,500. 626/796-1239.
'89 CADILLAC Sedan DeVille, dark blue in/out, loaded, digital dash, leather, 4.5L V8, 69K mi., exc. cond., orig. owner, $6,300. 790-4028.
'91 CHEVY Corsica, auto, air, 4 door, V6, airbag, new paint, 107,000 miles, runs great, $3,400. 957-5678.
'51 CHEVY ½-ton pickup, off-frame restoration, spent over $14,000; sacrifice for $8,750/obo. 248-0610, Randy.
FLOOR CONSOLE for SUV mini-vans, etc. w/front bucket seats; storage, cupholders, coin, cassette holder, etc.; 27 x 8 x 14 in. high; black, exc. cond.; new $90, sell $40. 626/564-8405.
'93 FORD Taurus GL, V6, 3.8L, 4 dr., ABS, a/c, AM/FM cass., exc.cond., great family car, moving, must sell, $5,200/obo. 626/844-9227.
'91 GEO Storm hatchback, 73K, dark blue, 5 spd, A/C, AM/FM/cassette stereo, good cond., fun to drive, $2,900. 893-6084.
'91 HONDA Civic DX, auto, am/fm, A/C, 2-dr, white, 94 K, runs exc., minor body, $4,200/obo. 626/796-7941.
'89 JEEP, Cherokee 4x4, all power, newer tires, brakes, shocks, tow pak, $9,450. 626/799-8776.
'84 LAZY DAZE RV, 22 ft., 50-gal gas tank, new tires, exc. cond., $13,500. 626/355-2096.
'86 MASERATI Quattroporte, all orig., 41k mi., dk. gray metallic paint, saddle tan leather int., garaged for the last 8 yrs., needs a new home with TLC, $12k/obo. 909/624-2880.
'95 MAZDA Miata convertible, red exterior, black interior, loaded, 51K mi., exc. cond., $12,950. 909/598-0065.
'86 MERCEDES 190E, auto, good cond., orig. owner, $3,450. 790-3802, Bill.
'92 MITSUBISHI Eclipse, 82,000 miles, 5 spd., black, 16 valve, power windows, locks, mirrors; $6,500. 249-6068.
'91 NISSAN 240SX SE coupe 2d, 4-cyl., 2.4 L, 5-speed manual, loaded, $2,500. 832-5556.
'92 PONTIAC Grand Am coupe, only 53K mi., white, ABS, pwr. windows/mirrors/locks, cruise, fog lights, auto alarm, AM/FM/cass., delux sound, exc. cond., runs/looks great, $5,900/obo. 626/796-3442.
'87 TOYOTA, Corolla, 4 dr., automatic, vg cond., must see, $2,000/obo. 626/793-7475.
'85 TOYOTA 4 Runner, good cond., 134,000 mi., rebuilt eng., $4,500. 805/285-1287.
'70 VW, 1835 c.c. motor, good cond., $1,100. 562/464-0446.
'64 VW bug, crank sunroof, changed carb., new tires w/warranty, good brakes, good trans., needs minor details, runs great, $1,800/obo. 626/793-3948, Alex.
'88 VOLVO 240 DL, 4 door, 5 speed, 110k, gray metallic, exc. cond., orig owner, good tires & battery, needs paint. $4,999/obo. 626/446-0165.

WANTED

BICYCLE, tandem for beach cruising. 562/423-2224, Fred.
HOUSEKEEPER, 2 times monthly, own transportation for Sierra Madre area. 626/355-2957, after 6 p.m.
PORCH SWING, old-fashioned with canvas canopy, desperate. 626/395-3705, Barbara Buckley.
PRINTER PART, HP 19C, working or not. 626/398-3192, George.
ROOM/APARTMENT in JPL/Caltech area for students working at JPL for 7-wk. period from end of Aug. until mid-Oct. 626/797-5674 or e-mail gonzo@WPI.EDU.
ROWING MACHINE, good cond., cheap. 626/303-3016.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.
TOY pieces or sets, "K'nex" and "Brio Mec." 626/303-3016, Ellyn.
VOLLEYBALL PLAYERS, coed, all levels of play; every Tuesday nt. 8:00-10:00 at Eagle Rock High School; $4/nt. 956-1744, Barbara.

FREE

COMPUTER, IBM PC x86, two floppy drives, keyboard, monitor. 626/683-9414, Craig.
DOG, boxer/shepherd mix, 4-yr.-old female, loyal, good with kids, good watchdog, includes 20-lb. bag of food, dish, collar. 249-4536.
KITTENS, 3 mos. old, to loving homes, 3 females (two calicos, one black and white), 1 male (orange tabby); cute, smart, litter-trained. 626/357-2741, eves.

LOST & FOUND

Lost: GOLD TWIST BRACELET, women's (slightly mangled around the clasp), sentimental value. 790-3899.

FOR RENT

ARCADIA, furnished, cozy rm., includes kitch. priv., laundry, pool, $350. 626/448-8809, Shary.
EAGLE ROCK, 1 bd. duplex, approx. 10 miles from JPL, 5087 Glen Iris Ave. 626/355-2096.
LA CRESCENTA, private 2-bd. home with pool, high above Foothill, fireplace, beamed ceilings, $1,350. 952-6007.
LAKE HOLLYWOOD, 2-bd. apt. in 7-unit bldg. (adjacent to Universal Studios, Griffith Park, and Toluca Lake in Burbank); pleasant hillside community w/close freeway access; outside floor entrance, newly remodeled, hardwood oak floors, small private patio, refrig., a/c, solar-heated water included, laundry rm. downstairs, parking; non-smoker. 626/798-3235.
MONTEREY PARK room, bright, airy, spacious; lots of closet space, off-street parking; quiet, tree-lined community; $98/wk. 626/280-7659.
N. GLENDALE, rm. in big Spanish house, nr. college, kitch. priv., priv. ba., must not be allergic to cats, non-smoking only, female pref. $425 + $100 sec. dep. 242-3633, eves.
PALM DESERT, exquisite, 2 bd., 2 ba. villa for vacations or long term, newly remodeled, w/skylight, patio & 2-car gar.; located across Living Desert; great locality; priv., secure resort w/ tennis cts., multiple pools, spas and clubhouse facilities; around 2 top resorts. 909/620-1364.
PASADENA twnhse., 2 bd. + den, 2 ½ ba., Caltech area, 2-car garage, fireplace, washer/dryer; $1,250. 626/585-1400, Dunken.
PASADENA apt., 2 bd., lanai, garage, lndry. rm., a/c, stove, garbage disposal, carpets, miniblinds, good closet and cabinet space, outdoor lighting; gardener, water & trash paid; great area, Sierra Madre Blvd. near California, close to Caltech, $840. 805/967-7725.
PASADENA, lux. condo, spacious 2 bd., 2 ba., 1 blk. from Caltech, private end unit on 3rd flr. w/mtn view, patio, pool, parking, central heat & a/c, washer/dryer in unit; $1,400, includes some utilities. 818/249-3059.
PASADENA, nr. Caltech, 2 bd., 2 ba., townhouse-style apt., central a/c, crpts., drapes, refrig., blt.-in oven, covered parking, $975. 626/355-0417.
PASADENA, rent-to-own condo, 2 bd/ba.; first 6 months rent can be used as down payment; security building, 2nd level, spacious, forced-air heat & cooling; Sierra Madre Blvd., $895. 626/584-6526.
PASADENA, 1 bd. in nice 3-bd., 1-ba. townhouse, crss/Caltech, backyard, lndry., garage, all hse prvlgs., $320 + share utils; long-term prfrd. 626/795-5284, Damien.
SOUTH PASADENA, fully furn. studio apt. on 1 level; nice area on Huntington Dr. betw. Milan and Marengo, near shopping area; utilities pd., laundry facilities on premises, + parking space; non-smoker; $565. 626/792-9053, Marilyn.
TUJUNGA, 2 +1 + bonus, picket fence, roses, air, appliances, hdw. flrs., lrg. yd., gar., patio, mtn.vw., quiet, $1,150. 353-4705.

REAL ESTATE

BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry room, $129,000. 909/585-9026.
LAKE COUNTY, N. Calif., 2 1/2 acre lot, in beautiful Kelseyville near Clear Lake, perfect site for permanent or retirement home, 30 walnut trees, paved road, electricity, $36,000. 626/337-7522.
LAKE VIEW TERRACE home, 3 bd., 2 1/2 ba., fireplace, covered patio, built in '84, 20 min./JPL, $168,000. 626/303-5243.
MEXICO CITY, Fr. Provincial style, artisan hand-carved façade, forged iron gate & fence, 3 stories, master suite, 3 add'l bd. w/balcony, 1 1/2 ba., liv. rm. w/ Fr. doors & fireplace, sep. maid's qrtrs. w/priv. ba., sep. serv. rm., priv. din. rm., lg. kitch. & dining area, studio, fam. rm., spiral stairway to roof solarium, 2-car carport. 626/794-0455, Olivia Tyler, Tu/Th, 6-9p.m., Sat/Sun 9 a.m.-6 p.m.
NORTH HILLS house, great family home 25 min. from JPL, 4 bd., 2.5 ba., 2,450 sq. ft., 21x17 LR, formal DR, FR w. fp & wet bar, central ac/heat/vacuum, sec. syst., covered patio & nice yard, drastically reduced to $169,000. 893-6084.
NORTH SAN GABRIEL, close to San Marino, excellent Temple City schools, 11 yrs. old, custom detached planned unit development, like new, looks like single-family home, 3 bd. and den/4th bd., 2.5 ba., 1,654 sq. ft., new paint, flooring and landscaping, security shutters, exc. cond., $268,000. 909/598-0065.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, newly remodeled, w/skylight, patio & 2-car gar.; located across Living Desert; great locality; priv., secure resort w/ tennis cts., multiple pools, spas and clubhouse facilities; around 2 top resorts. 909/620-1364.
PASADENA, prestigious Ritz-Carlton area, by owner, custom-built contemp. w/Buff and Hensman-designed patio & ent. area; 3 bd., 2-1/2 ba., att. 2+car gar. on huge lot (approx. 17,000 sq. ft.; very tranquil & priv. on tree-lined st.; addl. prkg. for 5 extra cars on long driveway; many extras, $658,800. 626/799-6308.
PASADENA, rent-to-own condo, 2 bd/ba.; first 6 months rent can be used as down payment; security building, 2nd level, spacious; Sierra Madre Blvd., $895/mo. 626/584-6526.

VACATION RENTALS

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 cabin, walk to village, quiet area, 2 bd., slps. 8, completely furn., F/P, TV/VCP, $75/nt. 249-8515.
BIG BEAR CITY, near airport, 2 bd., 1 ba. cabin, nicely furnished, sleeps 8; fireplace, TV, full kitch.; $100 cleaning deposit; $50/nt. weekdays, $150/ weekends. 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 condo, 1 bd., 1 ba., sleeps 4, full kitchen, gym, indoor pool, Jacuzzi, BBQ areas, Oct. 16-23, $75/night. 213/296-6641.
BIG BEAR LAKEFRONT, luxury townhome, 2 decks, tennis, pool, spa, sleeps 6. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/night for 2, $175/night for 4. 248-8853.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, priv. house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, near restaurants, golf and other attractions. 626/584-9632.
HAWAII, Maui, condo on beach w/ocean view, 25 ft. from surf, 1 bd. w/loft, compl. furn., incl. phone, color TV, VCR, microwave, dishwasher, pool & priv. lanai, slps. 4; 4/15 - 12/14 rate $95 nite/2, 12/15 - 4/14 rate $110/nite 2, $10/nite/add'l person, less 10% JPL & Caltech disc. 949/348-8047.
HAWAII, W. Maui, luxury condo, located on beach front; separate living, bedroom, kitchen, w/loft lanai, completely furnished; $125/nt./2. 626/355-0577.
LAKE TAHOE, N. Shore, 2 bd., 2-1/2 ba. condo, sleeps 6; great location, all amenities; private sandy beach, pool, sauna; walk to golf, fishing 150 yards from front door; 2 miles/N. Shore casinos; 1 summer week left, Aug. 29-Sept. 5; special JPL rate, $630/week (includes tax, cleaning); reduced daily/weekly rates after Labor Day. 626/355-3886, Rosemary or Ed.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps. 8, spa, pool, full kitchen, TV/VCR, JPL disc. rates, walk to Canyon Lodge. 249-8088.
MAMMOTH condo, studio + loft, 2 ba., fireplace, Jacuzzi, sauna, game rm., color cbl. TV/VCR, full kitchen w/microwave, terrace, view, amen., low rates. 714/870-1872.
MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft; slps. 6-8; fully eqp'd. kitch. incl. microwave, D/W; cable, VCR, phone, balcony w/mtn. view, Jacuzzi, 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/marina, pool, spa, game rm. 714/786-6548.
ROSARITO BEACH condo, 2 bd., 2 ba., ocean vw., pool, tennis, 18-hole golf w/in 6 miles on scenic rd., short walk to beach, private secure parking. 626/794-3906.
SAN FRANCISCO, Nob Hill honeymoon suite (for 2 only); kitch., maid, concierge; $105/nt. 626/797-3156.
S. LAKE TAHOE Keys waterfront home, 4 bd., 3 ba., sleeps 12+, fireplace on 2 levels, decks overlook priv. dock/lifts, gourm. kitch., bikes, 20' sail and paddle boats, 3 color TVs, VCR, stereo w/tape/disk, indoor/outdoor pools, hot tub, beach; lighted tennis courts, 10 min./skiing, casinos/golf, 1 hr./ wine country; $995/wk. high season [15 June to 15 Sept; 22 Nov. to 1 March]; $495/wk. low season, + $90 cleaning fee; 3-day min. 626/578-1503, Jim Douglas.

NOTICE TO ADVERTISERS

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

Universe

Editor
Mark Whalen

Photos
JPL Photo Lab

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Jet Propulsion Laboratory

Universe

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MGS antenna deployment may be delayed

Extension of high-gain antenna could be postponed for up to nine months

Concern over the deployment mechanism for the high-gain communication antenna on the Mars Global Surveyor spacecraft has caused NASA managers to consider postponing the antenna's deployment in order to maximize the probability of mission success.

The project team is studying a postponement of up to nine months in the antenna deployment, which currently is scheduled to take place in March 1999. The spacecraft uses the undeployed high-gain antenna to communicate with Earth, but the entire spacecraft must be turned to point the antenna toward Earth during each communication session.

"We have not made any decisions yet, but we want to take a conservative approach in order to protect the mission as fully as possible," said Project Manager Glenn E. Cunningham. "A delay in the antenna deployment would reduce the flow of imagery and science data somewhat, but we have some ideas about how to compensate for that."

Launched in November 1996 and in Mars orbit since September 1997, Mars Global Surveyor carries a dish-shaped high-gain antenna that is to be deployed on a two-meter-long (6.6-foot) boom for the global mapping portion of the mission. The antenna is stowed during launch and the early orbital phase at Mars so that it is not contaminated by the exhaust plume from the spacecraft's main engine. The mission plan calls for the antenna boom to be deployed following the final use of the main engine next spring, at the completion of the spacecraft's orbit-shaping aerobraking activity.

During deployment, the boom is pushed outward by a powerful spring. A damper mechanism cushions the force of the spring and limits

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Deep Space 1 arrives at KSC to prepare for October launch

JPL's Deep Space 1 spacecraft, designed to validate 12 new technologies for scientific space missions of the next century, has arrived at Kennedy Space Center to begin prelaunch processing. Deep Space 1 will be launched aboard Boeing's Delta 7326 rocket and is currently targeted to lift off Oct. 15. This is the first flight in NASA's New Millennium Program.

Among the experiments aboard Deep Space 1 is an ion propulsion engine strikingly similar to those described in futuristic science fiction works, and software that tracks celestial bodies so that the spacecraft can make its own navigation decisions without the intervention of ground controllers.

At launch, the diminutive Deep Space 1 weighs only 490 kilograms (1,080 pounds) fully fueled and is just 2.5 meters (8.2 feet) high, 2 meters (6.9 feet) deep and 1.7 meters (5.6 feet) wide, including such attached items as twin stowed solar arrays. However, when those arrays are deployed, the width will grow to 11.8 meters (38.6 feet) across. Deep Space 1 should complete most of its mission objectives during the first two months after launch. However, it will continue validating these

See DS1, page 3

KENNEDY SPACE CENTER PHOTO

Wearing protective suits, workers maneuver the Deep Space 1 spacecraft into place for prelaunch processing in the Payload Hazardous Servicing Facility at Kennedy Space Center. The mission is targeted for launch on a Boeing Delta 7326 rocket on Oct. 15.

Lab, local company agree to commercialize technologies

By JOHN G. WATSON

JPL and Jacobs Engineering Group Inc. of Pasadena have signed a memorandum of understanding to commercialize JPL technologies.

Under terms of the agreement, JPL will work with Jacobs to review and discuss available JPL technologies that are of specific interest to Jacobs, including:

• Hyperspectral imaging for land cover classification in agriculture and pollutant detection;

• Advanced mapping for new facility siting, land use planning and resource management;

• Ground-penetrating radar for detecting such buried objects as pipelines and ordnance;

• Radar remote sensing for detection and measurement of ground movement over a wide area;

• Regenerative fuel cell systems for high-efficiency, environmentally friendly energy generation and storage;

• Miniature sensors and instrumentation for in-situ analytical chemistry;

• "Electronic noses" for rapidly detecting and monitoring complex gas mixtures; and

• Precision robotics for a multitude of engineering and industrial applications.

"This represents an innovative step in JPL's continuing efforts to bring the best of its cutting edge technologies to the attention and benefit of American business," said JPL Director Dr. Edward Stone.

"We are pleased to forge this new relationship as yet another cornerstone of JPL's commitment to technology transfer," added Dr. David Tralli, manager of JPL's Targeted Commercialization Office.

"Our office is fundamentally about market-driven technology commercialization," Tralli said. "Development and demonstrations of our technologies in applications for which they were not initially intended provides an enormous opportunity for new business growth."

The agreement represents a formal acknowledgement of an ongoing business relationship between Jacobs and JPL. "I am not aware of any other such commitment between two significant entities, with complementary resources, to work toward bringing advanced technology to non-traditional markets," said Terrance Mason of the Targeted Commercialization Office.

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Special Events Calendar

Ongoing

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

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

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

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

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

Friday, August 21

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

Von Kármán Lecture Series—Deep Space 1 chief engineer Dr. Marc Rayman will discuss the mission at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Tuesday, August 25

Eudora Training for Technical Staff—This session features an introduction to using Eudora and its various features, and offers more detail than the sessions for business users. At noon in the Building 167 conference room.

Wednesday, August 26

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.

Preparing Graphics for the Web—Web developer Sugi Sorensen of Section 389 will provide information to web developers and graphic designers who prove content for publication on the web. It will include discussion of 2D graphics file formats (e.g., JPEG, GIF, PNG), tools to create and process graphics, and techniques for creating, optimizing and deploying graphics. Also included will be a showcase of web graphics resources available both on Lab and the World Wide Web. At noon in von Kármán Auditorium.

Thursday, August 27

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

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

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

Concepts In Fracture Mechanics Applied To Reliability and Quality Assurance—Engineering mechanics professor Michael Wnuk of the University of Wisconsin-Milwaukee will deliver this lecture at 10:30 a.m. in Building 157-210.

Friday, August 28

Folk Music—Singer/songwriter Michael Smith will appear in Caltech's Dabney Lounge at 8 p.m. Tickets are $12. Call (626) 395-4652.

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

Monday, August 31

Space Flight Awareness Award—Nominations for the award are due today to Reward and Recognition Program Administrator Monica Garcia. For information, including how to download the nomination form, go to the SFA home page at http: //eis/sec614/reward/sfa.htm or call Garcia at ext. 4-3825 or Laurie Lincoln at ext. 4-8515.

Tuesday, September 1

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

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

Wednesday, September 2

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

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

Thursday, September 3

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

Friday, September 4

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

NOVA Vouchers Expire—ERC vouchers that were received as part of a NOVA award expire today. For questions, call the Reward & Recognition Program office at 4-3706.

2 NEAT asteroid discoveries noted

By DIANE AINSWORTH

A NASA-sponsored asteroid tracking system has found two new large objects that cross Earth's orbital path, but show no signs of coming dangerously close to Earth within at least the next several decades, astronomers say.

The asteroids were found in observations made with the Near-Earth Asteroid Tracking (NEAT) system, managed by JPL.

"These discoveries come on the heels of last month's installation of new state-of-the-art computing and data analysis hardware that speeds our search for near-Earth objects," said NEAT Project Manager Dr. Steven Pravdo of JPL. "This shows that our efforts to find near-Earth objects are paying off."

The newly discovered asteroids 1998 OH and 1998 OR2 are both large enough to cause global effects if one impacted Earth, and both are classified as "potentially hazardous objects" because they pass periodically near Earth's orbit (like at least 125 other objects discovered so far). Both asteroids are 1 to 3 kilometers (about 1 mile) in diameter.

Crucial follow-up observations of both asteroids made by co-investigator Dr. David Rabinowitz of JPL were used to calculate projected orbits that show that neither of the objects pose an immediate threat to Earth. Rabinowitz made the observations with the 61-centimeter (24-inch) telescope at JPL's Table Mountain facility in Wrightwood, which is used to make immediate follow-up observations of recently discovered near-Earth objects in an effort to better determine their orbits, compositions and rotational state.

"Our goal is to discover and track all the potentially dangerous asteroids and comets long before

See NEAT, page 6

Mars Program Manager Shirley retires

By DIANE AINSWORTH

Donna Shirley, manager of NASA's Mars Exploration Program at JPL and original leader of the team that built the highly acclaimed Mars Pathfinder rover, retired Aug. 21.

An aerospace engineer and author who joined the Laboratory 32 years ago, Shirley is best known for her work on the first rover to explore the surface of Mars. Her recent book, "Managing Martians," includes a chronicle of the adventures of the Mars Pathfinder rover team that built the six-wheeled robotic explorer named Sojourner, as well as the story of the Mars Global Surveyor team.

She was named manager of the Mars Exploration Program Office when it was established in August 1994.

An aerodynamicist by training, Shirley joined JPL's former Engineering Mechanics Division in 1966. She served in a variety of positions in engineering systems analysis for space missions, worked on new space technologies with terrestrial applications, was the mission analyst for the Mariner Venus-Mercury mission in the early 1970s, and played an instrumental role in the 1980s and 1990s in the development of automation, robotics and mobile surface vehicles.

Shirley headed a 1979 study of a Saturn orbiter and probe that eventually led to Cassini, an international mission to the ringed planet, mounted by NASA with the European Space Agency and Italian Space Agency, which was launched in October 1997. In 1990-91, she acted as project engineer for the Cassini flight project.

She led work at JPL in the 1980s supporting an early version of NASA's space station and developed concepts for automated mobile vehicles to be used on planetary surfaces, with an emphasis on the moon and Mars. She also led NASA-wide teams that developed systems engineering and management processes for the agency in the early 1990s.

Donna Shirley

Born in Wynnewood, Okla., Shirley received a bachelor's degree in technical writing in 1963 and a bachelor's degree in aerospace engineering from the University of Oklahoma. She earned a master's degree in aerospace engineering in 1968 from USC. She is currently working on a doctorate in human and organizational development at the Fielding Institute in Santa Barbara.

Shirley is a recipient of several NASA group achievement awards, including those for her work on the 1973 Mariner 10 mission to Venus and Mercury and the 1985 Space Station Task Force, and has been awarded the NASA Outstanding Leadership Medal. In addition to her book on her experiences in the Mars program, she is the author of another book, "Managing Creativity," which is published on the Internet.

A past president of the Caltech Management Association, Shirley resides in La Cañada-Flintridge and has one adult daughter, Laura. ❑

Report says Lab's water presents no health hazard

By MARY BETH MURRILL

A federally mandated public health assessment of JPL has found that groundwater at the Laboratory does not present a past, present or future public health hazard.

The public health assessment was prepared by the Agency for Toxic Substances and Disease Registry (ATSDR), a public health agency of the U.S. Department of Health and Human Services, and will be available for public review and comment by Aug. 21 at the Pasadena Central Library, La Cañada-Flintridge Library, Altadena Library and the JPL Library.

ATSDR is responsible for evaluating possible human health effects that can occur when people are exposed to certain hazardous chemical or hazardous wastes. The agency reviewed environmental and health-related information about JPL's site.

The site is known to have been contaminated in the past due to past chemical waste disposal practices and is now listed on the National Priorities List, which includes facilities throughout the United States known to have environmental contamination. ATSDR is responsible for evaluating all such sites for possible human health effects that may occur if people are exposed to environmental contamination.

The ATSDR reported that groundwater at JPL does not represent a public health hazard because groundwater has never been used for drinking and there are no plans to use this groundwater in the future.

In addition, the ATSDR report includes findings that:

• Perchlorate contamination (a by-product from burned rocket fuel) in off-site groundwater presents no apparent present or future public health hazard. Current sampling and blending procedures by the drinking water suppliers are expected to prevent any potential present or future public health hazards posed by perchlorate in groundwater.

• Past exposures to perchlorate contamination present an indeterminate public health hazard because there are no data on perchlorate levels before 1997.

• No public health hazards are associated with exposure to contaminated soils at JPL.

The ATSDR report is available for public review and comment through Sept. 9. Comments will become part of the public record and will be addressed and included in the assessment, although the names of those commenting will not be included.

For information about the JPL site, the public health assessment or to receive a copy of the assessment, contact the ATSDR's toll-free number at (800) 447-1544, refer to the JPL site, and leave the name, address and telephone number of the person to whom the report should be mailed, or ask for health assessor W. Mark Weber or community involvement representative Linda West. Callers may also contact ATSDR's regional representative, Dan Strausbaug, in San Francisco at (415) 744-1774. ❑

Lab to provide new technology visions for TV

New science-fiction show 'Crusade' to benefit from JPL Tech Affiliates deal

BY JOHN G. WATSON

Through a unique technology transfer program, space scientists and engineers have begun sharing their brain power with producers and writers at Babylonian Productions, producers of "Babylon 5" and the new science-fiction television series "Crusade."

JPL will provide "Crusade" producers with new visions of technology and will assist them in portraying science and astronomy as accurately as possible, forecasting science and technology issues circa the year 2250.

The producers, whose "Crusade" debuts on Turner Network Television (TNT) in January, were able to tap JPL's expertise by participating in the Lab's Technology Affiliates Program, through which businesses form strategic alliances with JPL either to license intellectual property or to gain access to JPL's engineers and scientists to help solve technological problems.

To date, more than 120 companies, large and small, have utilized the program to solve upwards of 200 specific technology challenges.

"It's exciting for us to be able to share knowledge from the space program in order to help ensure the realism and accuracy of popular science-fiction programming," said Joan Horvath, a business alliance manager with the Technology Affiliates Program.

"We have a very challenging task before us on the production side, visualizing and creating different planets and planetary bodies complete with civilizations, flora and fauna," said "Crusade" producer John Copeland. "The scientists and engineers at JPL will be advising us on how to depict the future."

Copeland became aware of JPL's capabilities in large part through his acceptance of an invitation by the Caltech Management Association (CMA) to speak about "Babylon 5" to JPL employees last spring. JPL engineer Michael Eastwood, a CMA events co-chair, explained, "As a thank you, we gave the 'Babylon 5' team a Lab tour. John Copeland was excited and impressed with what he saw and called me two days later asking how we might all work together more closely. The Technology Affiliates Program was a perfect fit." ❑

JPL instruments part of high-altitude hurricane study

With an aim to better understand and improve ground-based predictions of hurricanes, two specially equipped NASA aircraft soon will take to the skies to collect high-altitude information about Atlantic hurricanes and tropical storms.

The Convection and Moisture Experiment (CAMEX) mission is scheduled for August and September. Results from the mission may increase warning time—saving lives and property—and decrease the size of evacuation areas—saving money—while giving scientists a better understanding of these dramatic weather phenomena.

CAMEX will yield high-resolution information on hurricane structure, dynamics and motion, leading to improved hurricane prediction. Results also will be used to validate existing measurements from the Tropical Rainfall Measuring Mission (TRMM) of hurricanes and tropical storms and to develop mathematical models for future Earth science missions.

The experiment unites eight NASA centers, other government weather researchers and universities.

JPL's contributions to the study include:

• Airborne Rain MApping Radar (ARMAR), measuring the strength of the signal reflected by the rain, with each scan providing a vertical slice through the storm. By putting many slices together, scientists can produce a three-dimensional view of the storm's structure. ARMAR also measures the speed of the raindrops and other particles like hail as they fall.

• The surface acoustic wave (SAW) dewpoint microhygrometer. Local humidity is measured by cooling a small quartz sensor and measuring the temperature at which microscopic quantities of water vapor condense on the surface. The device is about 100 times more sensitive to condensation than conventional chilled-mirror devices.

• A tunable diode laser hygrometer, which measures water vapor, in situ, through absorption of laser light in an open path outside of the aircraft.

When a hurricane or tropical storm erupts in the Atlantic, a NASA Dryden Flight Research Center DC-8—equipped with instruments to measure the storm's structure, environment and changes in intensity and tracking—will fly into the storm at about 10,700 to 12,200 meters (35,000 to 40,000 feet).

At the same time, a specially equipped Dryden ER-2 research plane will soar above the storm at 19,800 meters (65,000 feet). The modified U-2 will measure the storm's structure and the surrounding atmosphere.

On the ground, the storm research team will launch weather balloons and monitor land-based sensors to validate the high-altitude measurements taken by instruments aboard the planes. ❑

MGS

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the speed of the deployment, somewhat like an automobile shock absorber or the piston-like automatic closer on a screen door. In recent months, however, engineers have become aware of problems with similar damper devices on deployable structures such as solar panels on other spacecraft.

New data suggest that, in the vacuum of space, air bubbles may develop in the viscous fluid inside the damper. This may allow the boom to move through a considerable range of motion at a high speed before any cushioning effect begins to occur.

"To the best of our knowledge, we could deploy the antenna boom without any adverse effect," said Cunningham. "However, the forces that the damper and boom would be subjected to as a result of the bubble formation are close enough to the maximum force that they are designed to withstand that we want to take a cautious approach in evaluating the deployment." In a worst-case scenario, damage resulting from damper failure could render the spacecraft unable to communicate with Earth.

"The advantage of deploying the high-gain antenna is that we can then use its gimbals to point the antenna at Earth to send data at the same time science instruments are pointed at Mars acquiring science data," said Cunningham. "Until we deploy the antenna, we must store data on the spacecraft's onboard recorder and then turn the entire spacecraft periodically to transmit data to Earth." A similar approach was used on JPL's Magellan spacecraft, which orbited Venus from 1990 to 1994.

The project team is considering postponing the antenna deployment until after the landing of the Mars Polar Lander, which will reach Mars in December 1999. Mars Polar Lander carries an experiment called the Deep Space 2 microprobes, which will penetrate the soil of Mars in search of subsurface water. Deep Space 2 relies on Global Surveyor as its only possible communication link with Earth.

If the high-gain antenna remains undeployed when Mars Global Surveyor begins its prime mapping mission next March, Cunningham said that small gaps would exist in coverage of the Martian surface by the spacecraft's camera and other instruments, due to the periods when the spacecraft is turned to communicate with Earth. Those gaps could be filled in later in the orbital mission.

The project team is not yet certain how a postponed deployment would affect the total amount of data returned by the spacecraft. An initial estimate for the first 30 days of the global mapping mission found that it could return approximately 40 percent of the data that could be sent with a fully articulated antenna. However, the data return rate could be improved by strategies such as using larger ground antennas on Earth so that the spacecraft could transmit data more quickly, Cunningham noted.

A final decision on the antenna deployment will not be made until a review is held on Feb. 3, 1999, before the spacecraft's prime mapping mission begins the following month. ❑

In a Microdevices Laboratory clean room, Dr. Rich Muller of Section 346 prepares electron beam equipment for inscription of names on a wafer that holds a microchip similar to the one shown in inset, which will be engraved with more than 1 million names before it is placed onboard the Stardust spacecraft. For size comparison, the tiny spot in the center of the chip holds about 7,000 names.

BOB BROWN / JPL PHOTO LAB

More than 1 million names to fly on Stardust microchip

By MARY BETH MURRILL

More than 1 million people signed up to have their names electronically engraved on the second of two microchips that will fly aboard JPL's Stardust spacecraft. Stardust is scheduled for launch on a round-trip journey to a comet next February.

The one-millionth signature was received Wednesday, Aug. 6, at 5:49 p.m. Pacific Daylight Time and more than 100,000 additional submissions were received by the project by the Aug. 15 deadline. The first microchip, which contained 136,000 names collected last fall, has already been installed on the spacecraft, which is being assembled at Lockheed Martin Astronautics in Denver. The "Send Your Name to a Comet" effort is being coordinated by JPL and the National Space Society.

Names were submitted only electronically, either on the Stardust web site at http://stardust.jpl.nasa.gov or the National Space Society web site at http://www.nss.org/impact . Those submitting their names have granted permission for the Stardust project and its partners to use the names in possible future exhibits and/or publications.

Stardust will fly within about 160 kilometers (100 miles) of the nucleus of the comet Wild 2 (pronounced vilt-2). It will capture a sample of comet dust for return to Earth in 2006, and collect nearly 100 high-resolution pictures of the comet's surface. ❑

DS2 completes key thermal vacuum tests

By MARK WHALEN

The Deep Space 2 microprobe mission has successfully reached a critical milestone in its development with the completion of thermal vacuum testing.

Deep Space 2 is a New Millenni-um Program technology validation mission that will piggyback aboard the Mars Polar Lander, which is scheduled to launch Jan. 3, 1999 and land 11 months later. Just minutes before the lander touches down, Deep Space 2 will deploy two small, 2-kilogram (4.5-pound) microprobes beneath the Martian surface to study subsurface materials.

The end-to-end system verification sequences, the last of a series of major environmental tests, were conducted on Lab Aug. 1 to 4. "We had very positive results," said Project Manager Sarah Gavit. "This is a huge milestone in terms of verifying and proving our design end-to-end, because the tests simulated the entire mission in a Mars-like environment."

To simulate Mars' frigid climate, testing was conducted at temperatures as low as minus 110 degrees C (minus 166 F) for the probe's forebody and minus 80 degrees C (minus 112 F) for the aftbody. In addition, pressure testing was performed to prepare the mission for operation in a Martian atmosphere that is less than 1 percent that of Earth, she added.

The 10-centimeter-long (4-inch) forebody contains a drill for collecting a soil sample, a water detection instrument, a soil conductivity experiment and an impact accelerometer, and is designed to burrow up to 0.9 meters (3 feet) into the Martian soil. The circular aftbody, 13 centimeters (5 inches) in diameter, contains the batteries, telecommunications electronics, antenna, atmospheric descent accelerometer and sun sensor, and remains atop the surface. The two modules are connected via a flexible cable that unravels as the forebody dives into the soil after a freefall impact.

"In addition to verifying the probe's performance in a simulated Martian environment, the assembly of the qualification unit also provided invaluable lessons for the assembly of the flight probes," Gavit said. "This is especially important since the requirement for impact survival necessitates that many of the probe's assembly steps be irreversible.

"The skill level of the technicians involved in putting the probe's miniaturized assemblies together is phenomenal," she added. "The JPL Hybrid Laboratory has done an excellent job."

Work is still under way on the design of the microprobe's telecommunications system, which was not part of the qualification tests. The aftbody electronics assembly will be retested with the completed telecommunications system in September. The telecommunications system, together with miniaturized electronics in the forebody, will relay the probe's findings to Mars Global Surveyor for transmission to Earth via the Deep Space Network.

The project will continue with the assembly and test of the flight probes in the next several months. To date, the Mars Polar Lander inter-

See DS2, page 7

ISO assessments focus on process improvements

By KERRY LYN CASSIDY
ISO 9001 Implementation Team

Round 3 of internal assessments in preparation for JPL's November ISO 9001 audit took place the week of Aug. 10. While the first two rounds were mainly aimed at familiarizing employees with the nature of assessments, learning about processes and where to find documentation that supports the jobs they do, round 3 is the first assessment to emphasize findings and introduce the concept of "corrective action," the key aspect of which provides employees with an opportunity to improve the process.

A web-based internal assessment corrective action tool was beta-tested by the assessors during round 3. A version of this tool will eventually be made accessible to the Lab for use in reporting and correcting ISO noncompliances; for example, the identification of an error in a process that does not comply with ISO's slogan of "do what you say, say what you do and prove it."

In this round, about 250 people were interviewed from across the Lab from the Executive Council on down. As in prior interviews, people were asked to describe the work they do; however, this time they were also asked about the JPL Quality Policy and how it impacts their work. In addition, they were asked to show how the work they do complies with ISO 9001 requirements.

The Quality Policy and Quality Objectives are key guiding principles determined by the EC to be integral to the way JPL conducts business. The Quality Policy states that JPL will deliver products that meet or exceed customer expectations, while reducing cycle time and cost.

The official Quality Objectives are the change goals of the new Strategic Implementation Plan and state that JPL will:

• Rapidly develop and infuse cutting edge technology into flight missions and instruments;

• Seek substantive collaboration with high-caliber organizations whose strengths complement those of the Laboratory;

• As a collective responsibility of all at the Laboratory, create a work environment based on mutual trust and respect that enables high-quality work and promotes personal development;

• Base its administrative processes on best business practices;

• Implement challenging fast-track missions and systems in a process-oriented, interdependent, multi-mission environment.

The new ISO/process-based management web site at http://iso has made its debut. Containing an ISO guide and training manual, the site is actively working toward becoming an invaluable resource for understanding ISO 9001 and what JPL must do to achieve registration in March of 1999.

The excellent feedback thus far includes detailed questions probing the nature of the relationship between ISO, process-based management and the Define and Maintain the Institutional Environment (DMIE) process, which defines, generates, maintains and continuously improves the structures and operations of the Laboratory.

The process-based management section of the site is presently under construction but should be available in the very near future. ❑

DS1

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instruments while doing a flyby of a near-Earth asteroid named 1992 KD in July 1999.

The spacecraft is being processed in NASA's Payload Hazardous Servicing Facility. Among the processing activities to be performed are the attachment to the spacecraft bus of the Plasma Experiment for Planetary Exploration instrument and the attachment of the solar arrays, each of which is among the dozen new technologies being tested on Deep Space 1.

There is to be a functional test of the advanced technology science instruments as well as of the basic spacecraft subsystems. Checks of Deep Space 1's communications system will be performed, including a verification of the spacecraft's ability to send data to JPL via the tracking stations of the Deep Space Network. Also, the last of the thermal blankets will be installed.

Finally, before the spacecraft leaves the Payload Hazardous Servicing Facility, it will be fueled with its hydrazine attitude-control propellant. Then, on Sept. 22, it is to be transported to a spin test facility at Cape Canaveral Air Station. There it will be mated to a Star 37 solid propellant upper stage, and the combined elements will undergo a series of spin balance tests.

Meanwhile, at Complex 17, the Delta II rocket will be undergoing prelaunch checkout by Boeing. The first stage is scheduled to be installed into the launcher on Sept. 10. Three solid rocket boosters will be attached around the base of the first stage the next day. The second stage will be mated atop the first stage on Sept. 15, and the dual-sector spacecraft fairing will be hoisted into the clean room of the pad's mobile service tower the following day.

Deep Space 1 will be transported to Complex 17 on Oct. 5 for hoisting aboard the Delta rocket on Pad A and mating to the second stage. After the spacecraft undergoes state-of-health checks, the fairing can be placed around it three days later. The launch period ends Nov. 10.

If the spacecraft is healthy when the primary mission is completed on Sept. 18, 1999, NASA could choose to continue the spacecraft's voyage. Deep Space 1 may then be on a trajectory resulting in the flyby in January 2001 of the dormant comet Wilson-Harrington that is in the process of changing from a comet to an asteroid. Finally, in September 2001, as the spacecraft continues on this trajectory, it may also do a flyby of an active comet, Borrelly. ❑

—Kennedy Space Center

Jacobs

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Specifically, Jacobs engineers will work together with those from JPL's Radar Science and Engineering Section 334; Imaging and Spectrometry Systems Technology Section 385; Device Research and Applica-tions Section 346; Measurement, Test and Engineering Section 351; and Network Engineering and Distributed Systems Technology Section 394.

Jacobs Engineering Group Inc. is one of the nation's largest global engineering and construction firms, specializing in a variety of project delivery services, including engineering, procurement, construction and maintenance.

More information about JPL's technology transfer programs is available at the Commercial Technology Program's web site at http://tech-trans. jpl.nasa.gov/tu.html . ❑

JPL Director Dr. Edward Stone signs memorandum of understanding as Jacobs Engineering chairman and founder Dr. Joseph Jacobs looks on.

NEAT

Continued from page 3

they are likely to approach Earth," said NEAT Principal Investigator Eleanor Helin. "The discovery of these two asteroids illustrates how NEAT is doing precisely what it is supposed to do."

Additional follow-up observations are required to more precisely determine the orbits of these asteroids, but preliminary projections show that 1998 OH can get no closer than about 5 million kilometers (about 3 million miles)—about 12 times the distance between Earth and the moon.

NEAT uses a large, sensitive and fully automated charge-coupled device camera mounted on a 1-meter-diameter (39-inch) telescope operated by the U.S. Air Force at the 3,000-meter (10,000-foot) summit of Haleakela on the island of Maui in Hawaii. "Our upgraded equipment has speeded up the data processing, allowing us to analyze up to 40 gigabytes of data each night, equivalent to 1,200 images of areas of the sky," said Pravdo.

Images and other information about the new asteroids and the NEAT project can be found on the Internet at http://huey.jpl.nasa.gov/~spravdo/neat.html . ❑

July NOVA winners announced

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

Section 195: Sheri Kazz.

Section 211: Thomas Davall.

Section 212: Scott Yeats.

Section 302: Deborah Fambro.

Section 312: Vijayarag Alwar, Paul Chodas, Scott Fullner, Eric Graat, Yungsun Hahn, Earl Higa, George Lewis, Martin Lo, Robert Mase, Duane Roth, John Smith Jr., Raymond Solomon.

Section 313: Donald Langford.

Section 314: William Eggemeyer, Stephen Peters.

Section 321: Stacy Klinger, Darlene Padgett, Cheryl Walker.

Element 3231: James Bock, Maria Klein, Michael Ressler, Thangasamy Velusamy, Michael Werner.

Element 3232: Richard Cageao, Timothy Crawford.

Element 3233: Mark Allen, Stephanie Granger, Candice Hansen, Terry Martin, Edward Olsen, John Schofield.

Element 3237: Frank Carsey, John Crawford.

Element 3238: Diana Blaney.

Element 3239: Daniel Winterhalter, Joyce Wolf.

Element 3273: Barbara Gaitley, William Ledeboer, Duncan McDonald, Brian Rheingans.

Element 3274: Mingzhao Luo, Helen Worden.

Section 333: Martha Berg, Michael Ciminera, Cynthia Copeland, Larry Epp, Abdur Khan, Patricia Lux, Miguel Marina, Michael Tope, Gerald Walsh.

Section 334: Alona Benson, Thomas Bicknell, Glenn Cunningham, Stephen Durden, James Huddleston, Yong Liu, Leslie Nguyen, Paul Siqueira.

Section 335: George Lutes Jr.

Section 336: Jon Adams, William Berkley, Shehenaz Bhanji, Cosme Chavez, Wayne Harvey, Hamilton Hill, John Huang, Selahattin Kayalar, Richard Lovick, Frank Ott, Mark Schaefer, Robert Thomas.

Section 340: Adrienne Lovejoy.

Section 341: Randall Bartos.

Section 344: Eric Cassell, Michael Dickerson, Nancy Livermore, Carlos Salazar-Lazaro, Christopher Stell, Mark Underwood.

Section 345: Paul Backes, J. Balaram, Robert Bonitz, Tracy Carrillo-Coccaro, Daniel Chang, Jeffrey Chung, Kenneth Clark, Edwin Dennison, Allan Eisenman, Mehran Gangianpour, Ali Ghavimi, Peter Gluck, Kim Gostelow, Fred Hadaegh, Ricardo Hassan, Samad Hayati, David Hecox, Robert Hogg, Robert Ivlev, Burton Jaffe, John Lai, Larry Matthies, Allen Nikora, Clark Olson, Hiroshi Otake, Richard Petras, Christine Preheim, Alfred Schoepke, Boris Shenker, Frederick Serricchio, Gurkirpal Singh, Charles Vanelli, Richard Volpe, Edward Wong, David Zhu.

Section 354: Regina Bernardini, Talso Chui, Steven Elliott, Anthony Lai, Melora Larson, David Pearson.

Section 380: John Simmonds.

Section 383: Lawrence Azevedo, Debra Camp, Philip Irwin, Richard Johnson, Laura Needels, Edouard Schmidtlin.

Section 385: James Bradley, Rose Carden, Bruce Chippindale, Thomas Cunningham, Michael Eastwood, Jessica Faust, Robert Ferraro, Paul Henry, Daniel Katz, Stanley Love, Roberto Mendoza, Pantazis Mouroulis, James Raney, Cesar Sepulveda, Guang Yang.

Section 387: Rudolf Schindler, Marc Walch.

Section 388: Maribel Castillo, Qui Chau, John Diehl, Shirley Giuggio, Maher Hanna, Thomas Huang, Elizabeth Kay-Im, Thomas Logan, Lori Ludwig, Shari Mayer, Thuy Nguyen, Marc Sarrel, Robert Toaz Jr., Felix Vanshelbaum.

Section 389: Robert Berwin, William Carr Jr., Daniel Crichton, Robin Dumas, Adrian Godoy, Jason Hyon, Michael Kolar, Jason La Pointe, Michael Martin, Susan McMahon, Jose Pena, Sugi Sorensen, Quentin Sun, Betty Sword, Jennifer Ting.

Section 391: Laura Carr, Ronald Hungerford, James McClure, Lourdes McKim.

Section 395: Steve Chien, Daniel Dvorak, Sherrill Eastman, Tara Estlin, Rosemary Estrada, Forest Fisher, Edward Gamble Jr., Erann Gat, Russell Knight, Fred Krogh, Raymond Lam, Tobias Mann, Saleem Mukhtar, Darren Mutz, Gregg Rabideau, Angela Smythe.

Section 500: Yvonne Zieger.

Section 505: Michael Gross, Richard Kuberry, Pablo Narvaez, Naomi Palmer, Betty Ruff, Albert Whittlesey.

Section 506: Richard Aragon, Julie Corpe, Kathleen Drake-Willcox, James Howard, John Kennedy, Margaret Lam, Donna Markley, Sarah Marshall, Kenneth Ogden, John Vasbinder.

Section 507: Juliet Ellis, Kenneth Evans, Linda Facto, Robert Karpen, Linda Mayo, Deanna Rowe, Duc Vu, Joan Westgate, Donna Wu.

Section 515: Grant Faris, George Greanias, Walter Keryluk, Marc Trummel.

Section 601: Eva Bazzarre, Jeannine Harmon.

Section 620: Randall Taylor.

Section 621: Vicki Iwata, Steven Alfery, Jeffrey Cornish, Janester Short, Patricia Vitti, Jean Walker, Laura Sergott, Mitchell Shellman.

Section 622: Jan Ahn, John Brackin III, Alicia Dangerfield, Conrad Sherman, Christopher Carson, Javier Ramos, William Stewart.

Section 624: Martin Ramirez.

Section 700: Elizabeth Herrera.

Section 706: Anita Sohus.

Section 710: John Beckman, Samuel Gulkis, Eve Zimmerle.

Section 722: Gary Parks.

Section 738: David Cuddy.

Section 742: Linda Lievense.

Section 750: Donna Avila, William Irace, Johnny Kwok, Merle Ruiz, Charles Simon, Aurelio Tolivar.

Section 761: Elaine Corl, Karen Piggee.

Section 788: Jewel Beckert.

Section 790: Ulf Israelsson, Karla Miller.

Section 794: Thomas Luchik.

Section 893: Joan Horvath.

Section 920: Judith Hoeptner. ❑

DS2

Continued from page 5

face structure, aeroshells, science blocks and most of the aftbody structural assembly are already complete. "Over the coming weeks," Gavit said, "we will be focusing on the integration and test of the forebody prism electronics, including the microcontroller, power electronics and instrument electronics."

Deep Space 2 is scheduled for a mid-October shipment to Kennedy Space Center for its integration onto the Mars Polar Lander cruise ring. ❑

Retirees

The following employees retired in August:

Gerald Meisenholder, 41 years, Section 886; **Paul Vickers**, 39 years, Section 622; **Robert Conover**, 36 years, Section 313; **R. Rhoads Stephenson**, 34 years, Section 800; **Ralph Johansen**, 31 years, Section 314; **Otto Rotach**, 30 years, Section 333; **Philip Eckman**, 27 years, Section 800, **Charles Lifer**, 19 years, Section 354; **Gordon Mon**, 19 years, Section 353; **Faye Elman**, 11 years, Section 644. ❑

LETTERS

My husband, Don Fuhrman, my mother-in-law, Marge Fuhrman, and all our family wish to thank everyone at JPL for their kind thoughts, letters and flowers after the death of my father-in-law, John Fuhrman. We are especially grateful to the PDMS group and to the ERC for the magnificent flowers and plants. Your caring and sincerity during this difficult time has been a tremendous source of comfort. Wishing you all peace,

Linda Robeck and Don Fuhrman

❑❑❑

I would like to thank the library group for the nice going-away party. You have been a great group to work with the past 11 years. I will miss you all.

Kimberly Orr

❑❑❑

I'd like to thank Georgene Peralta, Anita LaCroix, Connie Gennaro and Donna Avila for organizing my going-away parties. They were very great times for me. A very special thanks to Amy Walton. Over the many years of our working together, Amy never failed to recognize the accomplishments of others and tried to make their accomplishments known to others. She is indeed a unique person. I'll miss my many friends at JPL and wish you all well.

Merle Ruiz

❑❑❑

Thank you to my friends and colleagues who participated in my going-away events. It's been a pleasure working with everyone, representing JPL as a Senior Contract Negotiator in Division 62, a Business Analyst on NBS and as Chair of the Director's Advisory Council for Women. The associations made during my 12 years of employment at JPL will truly be memorable for many, many years. I will miss all of you and close this note with best wishes and continued personal success for all in your future endeavors.

Jeanette K. Mills

FOR SALE

AMATEUR RADIO EQUIPMENT: mobile antenna, Larsen-KG 2/70 PL, on glass ant. for 2 meters and 440 MHz, slightly used, $45; mobile ant., Diamond NR-73BNMO, NMO-type mount, for 2 meters and 440 MHz, never used, $48; magnetic ant. mount, Larsen NMO-MM round magnetic for NMO-type, $10. 626/281-8195, Hugo.

BABY ITEMS: crib and mattress, $100; chest of drawers & changer, $150; car seat/carrier, $50; other items at reasonable price; all in vg cond. 248-8853.

BASEBALL COINS, 88 major league, 36 unopened packs players include Ryan, McGwire, Ripken etc., $20/ box; Proline DC-3, unopened box of 24 packs, football major stars, rookies, $30. 626/914-6083.

BED, 7-mo.-old Sealy Posturpedic qn size, $250. 626/796-1593.

Continued on page 8

BEDROOM SET, woodgrain laminated corner group (corner desk, chair, cabinet w/drawer, 3-drawer dresser), perf. for spare bdrm. or teenager's rm., vg cond., $150/obo. 626/337-7522.
BEDSPREAD (king), never taken out of pkg., Strouds, $200/obo; other king-sz. bedding (used) available. 626/577-6638, Suzanne.
CANISTERS, ceramic; for tea, sugar, coffee; two 5" diam. and two 6" diam.; white w/blue flower designs; all 4 for $10/obo. 626/568-8298.
COMPUTER adapter card PCI SCSI, Initio Miles Ultra-SCSI 3 w/narrow internal, wide internal and external connectors; for PCI Power Mac only; max. transfer rate 20 MB/sec on narrow connector, 40MB/sec on wide connector; $150. 626/795-6530, eves.
COMPUTER CD software for Mac, all $25 and under. 790-3899.
COMPUTER internal hard drive, Quantum Stratus 2.1 GB ultra-SCSI 3 narrow, max. transfer rate 20 MB/sec., manufac. warr., for Mac or PC, $125. 626/795-6530, eves.
COMPUTER power control center, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, $20. 790-3899.
COUCH/dual-recliner love seat, Lazy Boy, country blue, gd. cond., $50. 352-2036.
DINING ROOM SET, whitewashed oak table w/6 chairs, 57"L x 37" W w/20"L, extra leaf, $99. 248-2807.
DINING SET, antique, $375; REFRIGERATOR, 18 cu. ft., $225; COUCH, solid, $250; BED, child's loft, $220 (almost new). 626/445-6100.
DOG, German shep. mix, full shots, 1.5 yrs. old, happy attitude, must relocate where no pets allowed, to gd. home, $20. 626/401-2571.
FANZINE, sci-fi, w/superb Space:1999, Prisoner, and space art, stories and filmography; published '80; collector's items; $9/2 issues. 626/577-8587.
FUTON couch bd., solid wd. &hvy. mattr., grt. cond., $250/obo. 626/445-6100.
GARAGE SALE, 8/22-23, 8-5, 7521 Kyle St., Tujunga; clothing, household items, tools, furn., more. 352-7321.
MOTOR for model airplane, K&B .45 RC Sportster engine, re-cond., like new, $45. 626/281-8195, Hugo.
MOVING SALE, full-sz. bed, $100; couch, $100; TV, $80; TV furn., $20; lamps, $10/ea. 626/256-9233.
ORGAN, Yamaha 415 electr. console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifice for $3,000. 790-3899.
PAINTER, Wagner power, 2 wks. old, needed for just 1 job, exc. cond., pd $90, sell $60/obo. 626/683-7018.
PAINTING, orig. oil on canvas, impressionistic landscape, 42" x 52", w/invisible frame, $250. 626/797-3156.
PERSONAL INFORMATION MANAGER, Seiko "Phone-Pal", $25. 790-3899.
PRINTER, Panasonic KXP 4450 laser, 300 dpi, 512K RAM, 11 ppm, parallel and serial interface; 66 lbs.; runs well, manual included; $90/obo. 677-8895, Justin.
RECEIVER, Yamaha RV-502 ster. natr'l sound, only 6 mo. old, Dolby surround prologic, cinema DSP, 65W/chan. (2 front + center) + 2 x 25W rear, home theater ready; new $299, sell $190. 626/796-3442.
SECURITY SYSTEM (home), DSC PC 1500, 8-chan. controller, central unit, motion detector, siren, Yuasa batt., transformer, wiring, $50. 790-7062.
SPRINKER VALVE ADAPTERS, Lawn Genie automatic, model 756LG 3/4, new, $10/ea. 790-3899.
SWEATER, Coogi, from Australia; small/medium, new; $325 in Nordstrom, sell $100. 790-3899.
TABLE, dining rm., oval, cherry; sits 8 w/1 extension; exc. cond., $300/obo. 626/796-7330, Ben or Connie.
TABLE, din. rm., round, mahogany; sits 8 w/2 extensions; almost new; comes w/6 matching chairs, $700/obo. 626/568-8298.
TENT, Ridgeway by Kelty, 3-person, new, still in box; 7' x 7' x 4'4" ht., 4 inside zippered windows, roof vents, gear loft, rain fly, fast easy assembly, light weight; $50. 626/351-9117.
TREE, Ficus Benjamina, 6' in 14-inch pot, $30. 626/449-3699.
TV, 27" Magnavox, color, exc. cond., $250. 626/287-4249.

VEHICLES / ACCESSORIES

'92 ACURA Integra timing belt, original Honda parts, brand new in orig. packaging; retail $70, sell for $40. 562/420-2313.
'97 BMW Z-3 2.8, Atlantic Blue, 5,000 mi., $35,900. 790-0697.
'96 CADILLAC Seville SLS, pearl red with cappuccino cream interior, mint cond., chrome wheels, gold pkg., 20,600 mi., $33,800. 626/795-6538.
CATAMARAN, 13' Alcourt, with trailer, $400. 626/294-0426.
'93 FORD Escort, 94K mi., a/c, sport pkg., exc. cond., new tm. belt, tires, batt.; tags good until Feb. '99, $4,050/obo. 249-9093.
'93 FORD Probe SE, red, 5 spd., 2.0L eng., 81K mi., upgraded 300W ster. syst. (AM/FM/cass./CD), air, pwr. strng/brks, alarm, tinted windows, vg cond., runs great, $5,500 firm. pascaltech @yahoo.com.
'94 HONDA Nighthawk, 250cc, under 2,000 mi., $2,500. 562/693-1136.
'92 HONDA Accord shop manual and bra, $55/both. 626/798-1607.
'85 HONDA Interceptor 500, red/blue on white, 23K mi., full faring, alw. garaged; pretty but needs work, doesn't run, $1,250/obo. 626/683-7002.
'89 JEEP, Cherokee 4x4, all power, newer tires, brakes, shocks, tow pak, $9,450. 626/797-8776.
'88 KAWASAKI Ninja 600, 9.7K miles; accessories: cycle and leather tank covers, Arai helmet, kryptonite lock; clean, 2nd owner, must sell, $2,250/obo. 323/340-5850, pager.
'96 MAZDA Protégé, 25K mi., 4 dr., 5 sp., ac, pwr. steering, exc. cond., 1st owner, $11,500. 626/564-8986.
'89 MAZDA RX7, GTUs, ltd. edition, red w/black interior, heavy duty suspension, AM/FM stereo, alarm, premium wheels, 5 speed, new brakes, transmission; other extras; great for sports-car enthusiast; 1.3L dual rotary eng. runs great, good cond., orig. owner, 150k mi., $4,495. 626/967-8627.
'80 MERCEDES BENZ 240D diesel, vg cond., dark brown, 160K mi., 50k on new block, $2,500. 790-3957.
'57 MERCEDES BENZ, diesel, vintage, only 2 owners, $2,500/obo. 626/683-7002.
'93 SAAB 900S, 1 owner, ABS, air, leather, sunroof, etc., $8,500. 805/251-3854.
'91 SAAB 900, 1 owner, ABS, air, CD/cassette, etc., $4,800. 805/251-3854.
SAILBOAT, 24' Columbia Challenger, sleeps 4, $1,250/obo. 909/467-4248.
SAILBOAT, 13-ft. Zuma, as new, cartoppable $1,200. 626/294-0426.
'95 TOYOTA Previa LE S/C van, 40,000 mi., 4-wheel ABS, alarm, a/c, cassette, tilt wheel, cruise cont.; pwr. windows, locks & mirrors; burgundy w/gray interior, $18,500/obo. 909/980-3508.
'95 TOYOTA Tacoma truck, Xcab, very low mileage (30k), auto, 4 cyl., am/fm Alpine ster./cass., cruise, bed liner, power strng., sliding rear window, exc. cond., like new, burgundy, $11,500/obo. 626/795-3251.
'89 TOYOTA Camry DX, 6 cyl., at, ac, cc, tilt whl., overdrive, 4-wheel disk br., sec. alarm syst., exc. cond, orig. owner, $4,950. 909/981-5740.
'87 TOYOTA Corolla, 4-door, 5 speed, 100,000 orig. miles, new belts, seals and timing chain, complete maint. record, exc. cond., $3,500. 626/440-0609.
'95 VW Jetta III black, 58K miles, stick, a/c, sunroof, pwr. windows/locks, AM/FM/cass., cruise, ABS, alarm, more; exc. cond., plus extd. warr.; going back to school, must sell. $13,500. 626/683-7002.

WANTED

COMPUTER CPU, Pentium 200 or 166, regular or MMX. 993-6292, Troy.
SPACE INFORMATION & memorabilia from U.S. & other countries, past & present. 790-8523, Marc.
TREADMILL (Space Saver), small as poss.; nothing fancy needed; motorized pref. 626/577-6638, Suzanne.
VANPOOL RIDER, full-time, for #20, w/stops in Northridge and Granada Hills. Ext., 4-0307, Marilyn.

FREE

DIRT, mostly gravel-like, several cu yds., take as little or as much as you like, 3 blks. ESE of NY & Hill, Altadena. 798-5152.
DOG, 2-yr.-old black Lab, all shots, lonesome, needs children, very loving, to a good home. 626/355-2564.
PUPPY, Doberman, 9 mos. old, female, spayed, current shots, loves kids, will be a lap dog or sleep on bed w/you if you let her, to gd. home. 626/351-0097.

LOST & FOUND

Lost: GOLD TWIST BRACELET, women's, slightly mangled around clasp, sentimental value. 790-3899.

FOR RENT

ALTADENA house, 2 bd., 1.75 ba., garage, deck, stv., refrig., dshwshr, wshr/dryr, H2O included, 2 mi./JPL, avail. 10/1, $1,400. 626/797-8324.
LA CRESCENTA, 3 bd., 2 ba., 2 frplc., lg kitchen w/brk. nook, laundry rm., garage, wooded corner lot, above Foothill, $1,750. 236-9642, pgr.
LAKE HOLLYWOOD, 2 bd. apt. in 7-unit bldg. (adj. to Universal, Griffith Pk. and Toluca Lake in Burbank); pleasant hillside community w/close fwy. access; outside floor entr., newly remodeled, hardwood oak flrs., sm. priv. patio, refrig., a/c, solar heated-water, laundry rm. downstairs, parking; non-smoker. 626/798-3235.
PASADENA, 3-bd., 3-ba. townhome-style apt. nr. PCC, furn. or unfurn., lndry. facil., cent. air/heat; $1,200 + util., will rent individ. to 3-4 students @ $300-$400/ea. 351-9641.
PASADENA, 1 bd. w/lg. refrig., stove, cent. air/heat, on 2nd floor w/lg. patio, walk to Old Town, close to JPL/Caltech, $750. 626/797-2765.
PASADENA studio apt., nr. Caltech, JPL, bus stop; 180 S. Marengo, front bldg, upstairs, furn., incl. util., laundry on site, $650. 626/797-3103, Lois Moulton.
PASADENA studio apt., nr. Caltech, JPL, bus stop; 620 E. California Blvd., furn., includes water, off-street parking, $650. 626/797-3103, Lois Moulton.
PASADENA, townhouse-style apt., 2 bd., 1½ ba., built-in range/oven, cent. a/c, carpets, drapes, laundry, disposal, $725. 790-7062.
SOUTH PASADENA, furn. studio apt. on 1 level, 1718 Huntington Dr. betw. Milan/Marengo; laundry facilities on premises, parking space; non-smoker; $565, utilities pd. 626/792-9053, Marilyn.
SOUTH PASADENA, fully furn. 1-bd. apt. + office (extra bdrm.) for 1 or 2 persons; 1718 Huntington Dr., N side betw. Milan/Marengo, on 1 level, 6-unit bldg., full kitch., elec. heat & a/c, laundry facilities on premises, 2-car gar.; non-smokers; $1,000, tenant pays for electricity. 626/792-9053, Marilyn.
WINNETKA house, 2 bd., 1 ba., lg yard, 40 min. to JPL, $800 + utilities. 626/791-9049.

REAL ESTATE

ARCADIA, charming 3-bd., 1 1/2-ba., newly remodeled ba., new double-paned grid windows, 1-yr.-old carpet, wooden floor in living and dining rm., lg. enclosed patio, security syst., 2-car detached gar. w/bonus rm., manicured front/back yds.; move-in cond.; owner anx. to sell, $195,000/obo. 626/575-4569.
BIG BEAR, new cabin 2 blocks from lake, 2 bd., 2 ba., mud/laundry rm., $129,000. 909/585-9026.
LAKE CO., N. Calif., 2 1/2 acre lot, in beautiful Kelseyville near Clear Lake, perfect site for permanent or retirement home, 30 walnut trees, paved road, electricity, $36,000. 626/337-7522.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, newly remodeled, w/skylight, patio & 2-car gar.; located across Living Desert; great locality; priv., secure resort w/ tennis cts., multiple pools, spas and clubhouse facilities; around 2 top resorts. 909/620-1364.

VACATION RENTALS

BIG BEAR, 7 mi./slopes, full kitch. f/p, 2 bd., 1 ba., sleeps 6; reasonable rates; 2-nt. min.; no smokers, no pets; exc. hiking, biking, fishing nearby. 909/585-9026, Pat & Mary Ann Carroll.
BIG BEAR cabin, walk to village, 2 bd., sleeps 8, TV/VCP, F/P, $75/night. 249-8515.
BIG BEAR LAKE cabin, near lake, shops, village, forest trails; 2 bd., sleeps up to 6, fireplace, TV, VCR, phone, microwave, BBQ and more; JPL disc. price from $65/night. 909/599-5225.
BIG BEAR LAKEFRONT luxury townhome, 2 decks, slps. 6, tennis, pool, spa. 949/786-6548.
CAMBRIA, ocean front house, exc. view, sleeps up to 4, $125/nite for 2, $175/nite for 4. 248-8853.
HAWAII, Kona, on 166 feet of ocean front on Keauhou Bay, priv. house and guest house comfortably sleep 6; 3 bd., 2 ba., swimming, snorkeling, fishing, spectacular views, near restaurants, golf and other attractions. 626/584-9632.
LAKE TAHOE, N. shore, 2 bd., 2-1/2 ba. condo, sleeps 6; great location, all amenities; private sandy beach, pool, sauna; walk to golf, fishing 150 yards from the front door, 2 miles to casinos; special JPL weekly summer rates; reduced daily/weekly rates after Labor Day. 626/355-3886, Rosemary or Ed.
MAMMOTH condo in Chamonix; 2 bd., 2 full ba., slps. 6, fully equipped elec. kitch. incl. microwave & extras; f/p & wood; color TV, VCR, FM stereo; sauna, game, & lndry. rms; pool, sun area, o/d Jacuzzis; play & BBQ areas; walk to Warming Hut and lifts; conv. for hiking, shops, summer events, daily/weekly rates. 249-8524.
MAMMOTH condo, 2 bd. + loft, 3 ba., slps 8, spa, pool, full kitch., TV/VCR, JPL disc. rates. 249-8088.
MAMMOTH condo, slps. 5, shuttle nearby, summer rates $50/nite, 5 nights or more $40. 353-7839.
MAUI condo, on beach w/ocean view, 25 ft. from 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, less 10% JPL & Caltech disc. 949/348-8047.
OCEANSIDE, on the sand, charming 1-bd. condo, panoramic view, walk to pier/marina, pool, spa, game rm., sleeps 4. 949/786-6548.
PALM DESERT, exquisite, 2 bd., 2 ba. villa, newly remodeled, w/skylight, patio & 2-car gar.; located across Living Desert; great locality; priv., secure resort w/ tennis cts., multiple pools, spas and clubhouse facilities; around 2 top resorts. 909/620-1364.
ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.
SAN FRANCISCO, Nob Hill honeymoon suite (for 2 only); kitch., maid, concierge; $105/nite. 626/797-3156.

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.