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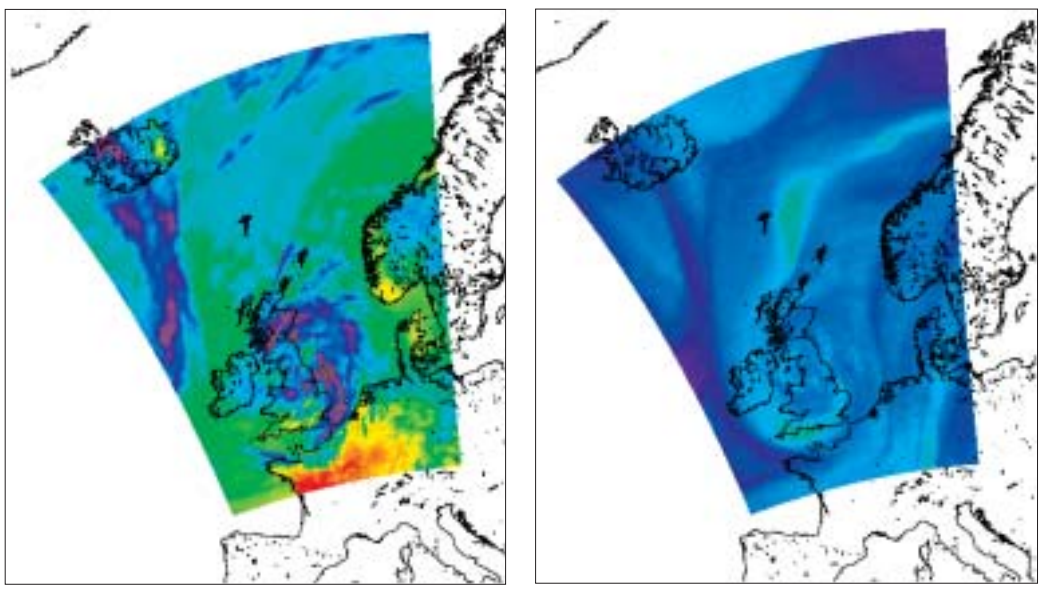
Inside

theme EARTH

First AIRS images exceed expectations

By Alan Buis

The old adage "everyone complains about the weather, but no one does anything about it" may soon fall by the wayside, thanks to the quality of data from NASA's new "thermometer in the sky"— a suite of three advanced weather instruments aboard the Aqua spacecraft.



Left image is from an infrared channel that measures the surface temperature in clear areas and cloud-top temperatures in cloudy areas, revealing very warm conditions in France and a storm off the east coast of England. Image at right represents a microwave channel that sees through most clouds and observes surface conditions everywhere. The images were taken July 20.

"First-light" images from the instruments—the Atmospheric Infrared Sounder (AIRS) spectrometer and its two companion instruments, the Advanced Microwave Sounding Unit and the Humidity Sounder for Brazil—are exceeding expectations of the world meteorological community. The result, project scientists say, should be an ability to nearly double the accuracy of short-term weather predictions by this time next year, substantially improving our ability to track severe weather events—such as hurricanes—and advance climate research.

"This experiment will capture, for the first time, a continuous, detailed picture of Earth's atmosphere for use in global weather prediction and climate studies," said JPL's Dr. Moustafa Chahine, experiment science team leader "The instruments are in excellent health and are ready to serve NASA, the National Oceanic and Atmospheric Administration and the broader climate research community."

The first-light images may be found at *www.jpl.nasa.gov/airs.*

The AIRS experiment, with its visible, infrared, and microwave detectors, provides a three-dimensional look at Earth's weather. Working in tandem, the three instruments can make simultaneous observations all the way down to the Earth's surface, even in the presence of heavy clouds. The 2,400-channel multispectral AIRS system will be used to map the three-dimensional global distribution of temperature, moisture and clouds. The primary objectives are to improve the accuracy of weather forecasts and to study climate change.

The infrared and microvwave data from AIRS/AMSU/HSB are integrated to retreive a single set of temperature, moisture and cloud values.

Chahine said the key to increasing the useful range of weather forecasts from the current two to three days to five days is to observe today's weather with much higher accuracy.

"The accuracy of computer models is dependant upon the quality of today's weather information," he said. "Our experiment will effectively multiply our existing global armada of 4,000 weather balloons by 100, giving us global coverage over land and sea from space with the same data quality. This additional data will dramatically reduce errors that have traditionally limited the range of current weather forecast models."

Experiment data is also expected to allow meteorologists to plot the path of hurricane landfalls within 100 kilometers (62 miles) up to three days in advance, saving lives and property and enabling better mobilization and deployment of resources and emergency personnel.

Climate research applications include the study of global carbon dioxide distribution and better understanding interrelationships between weather and climate.

"If we can determine changes in rainfall patterns and amounts, we can better understand the global water cycle and its implications for managing fresh water resources," said Claire Parkinson, Aqua project scientist at NASA's Goddard Space Flight Center, Greenbelt, Md. "Improved temperature predictions will allow commerce to move merchandise and fuel where needed to meet cold or warm weather demands. Other industries strongly dependent on weather include aviation, transportation and agriculture."

The experiment recently completed calibration and is now transmitting continuous, uninterrupted data to the project science team and NOAA. Instrument validation will continue through next June, as NOAA evaluates the new data set, learns how to integrate it and gains confidence in its accuracy.

Following instrument validation, the data will be integrated into existing weather prediction models by NOAA's National Centers for Environmental Prediction and six of the world's leading weather pre-diction centers. The data will also be distributed to the World Meteorological Organization in Switzerland, where it will be made available to 105 countries.

JPL manages the AIRS experiment for NASA. The AIRS Instrument was built by BAE Systems for JPL. NASA's Goddard Space Flight Center provided the Advanced Microwave Sounding Unit, which was built by Northrop Grumman. The Brazilian Institute for Space Research provided the Humidity Sounder for Brazil, which was built by Astrium.

Launched May 4, 2002, Aqua's six-year mission will collect data on global temperature variation and cycling of water, studying global precipitation, evaporation, changes in ocean circulation and how clouds and surface water processes affect climate. The information will help scientists better understand how global ecosystems change and how they respond to and affect global environmental change.

TOPEX celebrates 10 years of flight

Free ice cream will follow talks Aug. 15

Later this month JPL will celebrate the 10th anniversary of the launch of Topex/Poseidon, the ocean-observing mission that has helped revolutionize our understanding of Earth's climate.

Talks by several principal members of JPL's Topex/Poseidon team on Aug. 15 will be followed by free ice cream for JPL staff.

Charlie Yamarone, JPL's Topex/Poseidon project manager and now deputy director of the Earth Science and Technology Directorate, will be joined by project scientist Dr. Lee-Lueng Fu and research scientist Dr. Bill Patzert from 11:30 a.m. to 1 p.m. in von Kármán Auditorium. Ice cream will follow in the mall.

A joint mission between NASA and the French Space Agency launched from Kourou, French Guiana on Aug. 10, 1992 for what was then a three-year mission, Topex/Poseidon has been making precise measurements of sea-surface height continuously ever since. The first mission to map global ocean surface topography with sufficient accuracy for studying ocean circulation, Topex/Poseidon changed our view of the oceans forever. The social and economic benefits of the nine years of Topex/Poseidon observations include El Niño and La Niña forecasting, climate research, hurricane forecasting, marine mammal research, coral reef research, fisheries management, ship routing and offshore industries.

The mission has set the stage for Jason 1. a joint U.S.-French mission managed by JPL that launched last December. Jason 1 and Topex/Poseidon are flying in tandem, doubling the science data return for as long as Topex/Poseidon remains in good health. Jason 1 will then assume Topex/Poseidon's former flight path.

Through October, Jason science data will be distributed to the mission's science team, and work will begin to conduct a precise scientific assessment of product quality through cross-calibration of Jason products with those of Topex/Poseidon. A science working team meeting will be conducted at the end of this six-month validation phase to verify that Jason data are accurate, correctly calculated and meeting program requirements.

News Briefs

Dr. Erik Antonsson

Martin Lo

Lab names chief technologist

The chair of the mechanical engineering department at Caltech, DR. ERIK ANTONSSON, has been named chief technologist at JPL.

Antonsson has been a Caltech professor and researcher since 1984. He organized the Engineering Design Research Laboratory at Caltech and has made major research contributions in the area of formal methods for engineering design. He has been chair of mechanical engineering since 1998.

He earned his bachelor's degree in mechanical engineering from Cornell University in 1976, and a doctorate in the same field from the Massachusetts Institute of Technology in 1982.

Antonsson will join JPL in early September, and will also remain at Caltech as a professor of mechanical engineering. Until Antonsson begins at JPL, DR. LESLIE DEUTSCH will continue as the acting chief technologist to ensure a smooth transition.

Solar system 'freeway' envisioned

An "Interplanetary Superhighway" through the solar system resembling a vast array of virtual winding tunnels and conduits around the Sun and planets, as envisioned by JPL engineer MARTIN LO, can slash the amount of fuel needed for future space missions.

Most missions are designed to take advantage of the way gravity pulls on a spacecraft when it swings by a body such as a planet or moon. Lo's concept takes advantage of another factor: the Sun's pull on the planets or a planet's pull on its nearby moons. Forces from many directions nearly cancel each other out, leaving paths through the gravity fields in which spacecraft can travel.

To find the Interplanetary Superhighway, Lo mapped possible flight paths among Lagrange points—where one body's gravity balances another's—varying the distance the spacecraft would go and how fast or slow it would travel. Like threads twisted together to form a rope, the possible flight paths formed tubes in space. Lo plans to map out these tubes for the whole solar system.

Lo and his colleagues have turned the underlying mathematics of the Interplanetary Superhighway into a tool for mission design called "LTool," using models and algorithms developed at Purdue University in Indiana. The new LTool was used by JPL engineers to redesign the flight path for the Genesis mission to adapt to a change in launch dates. Genesis launched in August 2001.

Artist's rendering of the Interplanetary Superhighway.

The work on the Interplanetary Superhighway for space mission design was nominated for a Discover Innovation Award by Discover magazine editors and an outside panel of experts.

Utility signs tech affiliate agreement

Consolidated Edison of New York (Con Edison) has turned to JPL to develop sensor technology to detect and quickly analyze hazardous materials in the field. Using the best available commercial methods can take several hours of laboratory analysis to determine how to protect the environment and public when there is an environmental incident. Con Edison hopes to reduce that time to less than one hour.

Con Edison recently signed a technology affiliates agreement and will work directly with JPL researchers to develop the sensors, which will search for two specific chemical families: polychlorinated biphenyl compounds, or PCBs, and perfluorocarbon tracers or, PFTs.

PCB is a toxic chemical that was used to insulate high-voltage transformers. It also prevents pipes from rusting, adheres to any surface, tolerates extreme heat and does not degrade. Prior to 1970, all major utility companies used PCB oil in their transformers. The United States banned the use of PCBs in the early 1970s.

"This is one example wherein the increased sensitivity of the JPL detection system translates directly into speed of detection and quantification," said DR. ARA CHUTJIAN, senior research scientist and leader of JPL's Atomic and Molecular Collisions Team. "This will be true in New York City. It will also be true for detecting other chemical vapors, such as explosives and nerve-agent detection at airports, harbors and in public buildings where speed is key in attaining security without impeding the commercial flow."

Cassini can see clearly now

Now within two years of reaching Saturn, JPL's Cassini spacecraft took test images of a star in mid-July that reveal successful results from an extended warming treatment to remove haze that collected on a camera lens last year.

The quality of the new images is virtually the same as star images taken before the haze appeared. In the most recent treatment, the camera had been warmed to 4 degrees C (39 degrees F) for four weeks ending July 9. Four previous treatments at that temperature for varying lengths of time had already removed most of the haze. The camera usually operates at minus 90 C (minus 130 F), one of the temperatures at which test images were taken on July 9 of the star Spica.

"We're happy with what we're seeing now," said Cassini Program Manager ROBERT MITCHELL. The team will decide in coming weeks whether to proceed with another warming treatment later this year.

Blood drive coming up

The next JPL/Red Cross Blood Drive will be held in von Kármán Auditorium on Aug. 13 from 10 a.m. to 4 p.m. and Aug. 14 from 7 a.m. to 1 p.m.

Sign-up sheets will be available at Occupational Health Services, Building 310-202, prior to the blood drive. You may go directly to von Kármán at your preferred time if you were not able to sign up ahead of time.

To sign up now, log on to *http://eis/medical/blood_form.html.*

Occupational Health Services notes that the Red Cross is experiencing a critical shortage of all types of blood, and is appealing to all eligible donors for the August blood drive.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

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

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

Tuesday, August 6

Investments Review—Roland Jacobson, Fidelity vice president of investment consulting, will speak from 2:30 to 4 p.m. in von Karman Auditorium. He will provide overviews of the economy, market and advanced asset allocation principles, and will discuss historical mutual fund performance.

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

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

Wednesday, August 7

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

Tuesday, August 13

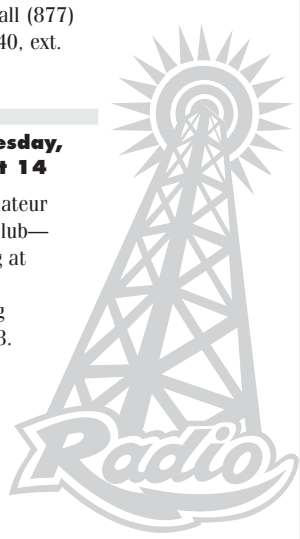
JPL Stamp Club—Meeting at noon in Building 183-328.

Tues.-Wed., Aug. 13-14

Investment Advice—One-on-one counseling appointments are available with TIAA-CREF. For an appointment, call (877) 209-3140, ext. 2614.

Wednesday, August 14

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



JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Roger Carlson at ext. 4-2295 for information.

Thursday, August 15

Social Security —A representative will be available for one-on-one counseling. Call the Benefits Office at ext. 4-3760 for an appointment.

Friday, August 16

TIAA/CREF Enrollment—This monthly meeting, designed to assist employees newly eligible for Caltech/JPL Retirement Plan participation, will be held at noon in T1720-137.

ISO pre-assessment audit a success

A successful ISO 9001 pre-assessment audit was held at JPL July 16 to 18, as two auditors from National Quality Assurance reviewed the key areas of change between the 1994 and 2000 versions of the ISO standard. This resulted in three minor noncomformances and one observation. The auditors will return in late September for both a surveillance audit and the 9001-2000 transition audit. More details are available online at *http://iso.jpl.nasa.gov/resources/archives.html.*

External ISO surveillance audits are held approximately every six months at JPL to ensure overall compliance and maintain the Lab's ISO certification. Every three years there is a renewal certification audit, which JPL successfully completed this past April. Now JPL is in the process of adjusting its management system to the revised ISO 9001-2000 standard.

Approximately 75% of the revised standard's requirements remain the same. Another 14% of the revised standards address work that JPL already does. Only 11% represent new areas that must be incorporated into the management system at JPL. The old standard focus was "Say what you do, do what you say, prove it" and emphasized individual tasks. The revised standard focuses on a big-picture view of a business and how it all works together to create a product. It has a far greater emphasis on management, customer satisfaction, performance measurement, and continual improvement. The pre-assessment audit in July addressed these new areas. The September external audit will address the entire standard.

JPL also holds internal assessments conducted by Lab employees. The assessments are identical to an external audit, but occur over a longer period of time and penetrate more areas of the Lab. They identify areas that require improvement and prepare the Lab for the external audit. The assessments also give employees practice at what they might experience during an external audit and help familiarize people with the auditing process.

If you have any questions, contact the ISO representative in your organization. A list of representative is available online at *http://iso.jpl. nasa.gov/help/list-orgreps.html.*

Canopy helps guards beat the heat

Vehicles pass through JPL's main gate beneath a newly installed canopy, built in support of the Lab's enhanced security measures. The 30-by-60-foot structure will serve as a semi-permanent location for security officers and will provide protection from heat and other severe weather conditions. Lights will soon be added, followed by a new gate house from which officers can store gear and perform badge checks.

Photo by Bob Brown /JPL Photolab

A dozen JPL employees recently gathered to commemorate their 40th year at JPL. Universe talked with five of the veterans to find out what life was like at JPL in the early 1960s, how the Lab has changed, and what they will remember most when they retire.

Hard Work, Good People, Exciting Times

by Mark Whalen

40-YEAR VETERANS DISCUSS THEIR CAREERS AT THE LAB

Joining the conversation are Charles Bryant, staff engineer in the Communications Ground Systems Section 333; Ab Davis, project manager of the Gravity Recovery and Climate Experiment (GRACE) mission; Alan Hoffman, a principal in the Reliability Engineering Office 513; Bob Polansky, deputy chief engineer and acting chief engineer of the Interplanetary Network Directorate; and Tom Shain of the Flight Systems Section 313, who currently provides logistics and facilities support to the Mars Exploration Rovers mission.

How did you come to stay at the Lab for 40 years?

BRYANT I am a native of Pasadena. At Oak Grove Park, I built and flew model airplanes, camped out with my Boy Scout troop, and played junior high school sports. Even though the general public was unaware of many of JPL's research projects, I reasoned that important things happened behind those gated fences, guarded by the military, and projected that I too, would work there one day. The continuing research, the scientific advances and my involvement with the Lab's achievements motivated and inspired me to remain.

DAVIS I arrived at JPL in June 1961 from Pittsburgh. Without anyone asking me "What are you going to do next?,"I went to Disneyland and rode all of the E-Ticket rides. Needless to say, working at JPL for the last 40 years has been better than any E-ticket ride. I have gone from one interesting project to another, each time pursuing an objective that had never been achieved before.

HOFFMAN I enjoyed the work and the opportunities to support the efforts related to new and challenging missions. We were (and still are) doing things no one else in the world had done before.

POLANSKY I have always been excited about space and space missions. To be able to build systems that supported those missions and to participate in many of them in some capacity fulfilled my wildest ambitions.

SHAIN My brother Larry worked in the cable shop and I came to join him. I built flight harnesses for eight months, then became a spacecraft flight technician. The opportunities kept coming to do more challenging and exciting things. So far, I've worked on 20 projects, including MER. It's been a dream come true, a wonderful 40-year experience.

What makes JPL so special?

BRYANT I have derived a great sense of pride and accomplishment in working for JPL, an organization that has done so much to further our knowledge of space, the galaxies beyond, and the universe, and to promote a deeper understanding of science in general.

DAVIS It is the people. The pool of talent never ceases to amaze me. The GRACE project was only possible because of the talented and creative people here. JPL has talented people who can solve a broad menu of problems—not only in the technical divisions but also in the administrative divisions and the Caltech Counsel's Office.

HOFFMAN JPL is a unique place to work. As a federally funded research facility, operated by a prestigious technical university for the nation's space agency, there is no other place like it in the world.

POLANSKY I enjoy being associated not only with space-related work, but also working so closely with my very prestigious alma mater, Caltech.

SHAIN The things we do here. There are very few places in the world that do what we do and do it as well as we do it.

Of all the projects you've worked on at JPL over the past 40 years, which have been the most exciting, the most memorable?

BRYANT As a mechanical designer in the Spacecraft Division, my first projects were to assist in the design of the main buss structure of the Mariner and Ranger spacecraft. The drawings were done by hand in those days, unlike the computer-aided design (CAD) generated drawings we create today. It was equally as exciting, as a mechanical engineer in Section 333, to assist in the detailed design and construction of the 70-meter antenna extension and the development of the 34-meter beam wave guide antenna at Goldstone.

DAVIS The GRACE mission. I've taken this project from the concept stage in 1992, through the competitive proposal process, development, and into mission operations with a successful launch from the Russian cosmodrome at Plesetsk in March of this year.

HOFFMAN All of the lunar and planetary missions were exciting for me. The project that brought me the most personal satisfaction was the Ranger 7 mission to the moon in 1964. It was the first successful project I had worked on and it made front-page news throughout the world during the height of the Cold War. I helped specify and implement the environmental testing program on the spacecraft hardware.

POLANSKY The most exciting for me was Surveyor, the first U.S. efforts to make soft landings on the moon. I was responsible for specifying, building, testing, and some operating of the data system that supported that mission set. One thing I'll never forget is when I was the first to see one of the Surveyors land multiple times on the moon when the engines failed to turn off after the first landing. No one believed me at first when I announced, "the darn spacecraft was hopping around on the moon!"

SHAIN My favorite was Mars Pathfinder, for which I was a test engineer responsible for the electronics integration of the spacecraft. I was one of the last people to have my hands on the hardware, just prior to launch reaching inside the fairing to install a pyro battery compleation connector. We worked many long hours but it was worth the payoff. What a fantastic success!

What is the biggest difference between today's JPL and that of 1962?

BRYANT In the earlier years the Lab built most of the spacecraft here at JPL, rather than contracting the work out.

DAVIS It's the tools of the trade. The tools that we have to do our job today are many orders of magnitude better than the tools we had in 1962. Also, the young talent at JPL today is better educated and more versatile than the talent pool at JPL in the '60s.

HOFFMAN The biggest difference is the number of flight projects that are in the development phase—in 1962 there were three programs: the Rangers; Mariners R and 1964; and Surveyors—in 2002 there are nearly 40.

POLANSKY In 1962, there was a much greater "can do" attitude at JPL. Today's JPL environment lacks the family orientation we once had, something that needs to be restored. In addition, the Lab has become much more territorial than before (probably true of most organizations that have been around for an extended period of time).

SHAIN We didn't have near the amount of manpower and support back then. Over the years, we have sometimes learned the hard way, by making mistakes. It's now referred to as "Lessons Learned." I guess you could say that I have had 40 years of on-the-job training.

When do you plan to retire? When that day comes, what will be your best memories of JPL, the highlights of the experience? What will you miss the most?

BRYANT I'm planning to retire on Sept. 6, 2002. Most of all, I will miss the colleagues with whom I worked throughout the years at the Lab and I will miss the ongoing new learning experiences that are inherent in the job at JPL.

DAVIS I will retire as soon as we get the twin GRACE satellites operating at their full potential. This should be soon! The highlight would be, under rather contentious circumstances, Tom Gavin's statement "At JPL, we back our project managers."

I will miss working with some of the most talented people in the world: Charley Dunn (the best of the young talent I know) and Brooks Thomas (already retired), to name two of many.

HOFFMAN I have no plans to retire in the near future. The best memory will be the one that I am thankful to have been part of the first attempts by humankind to explore the universe robotically. We, and the machines we built, continue to make history.

I will miss the excitement and thrill of exploring some object in space for the first time with a machine I helped build and launch.

Photo by Dutch Slager / JPL Photolab

JPLers celebrating 40 years at the Lab gathered at recent ceremonies. Front row, left to right: Raymond Prizgintas, Richard Emerson, Robert Hall, Charles "Rodger" Bryant. Back row: left to right: Tom Shain, James Johnson Jr., Robert Polansky, Alan Hoffman, Ronald Howe, Alvin Willems, Clayton La Baw, Ab Davis.

POLANSKY I plan on retiring in about a year. My best memories of JPL will always be the electrifying excitement associated with critical mission events I was involved with first-hand, not to mention the camaraderie with a large number of very smart, dedicated people.

What will I miss? Getting up too early to get to work and staying at work too late! And if you believe that, …

SHAIN My plan is to retire after returning from the Cape following the launch of the two MER rovers next summer. The highlight of working here came in a trip up the hill to the Library shortly after I started here, where I met a very pretty young lady who later became my wife of 40 years.

I'll miss the companionship of the people—not only working cohorts, but also friends. Close friends. We worked hellish hours, but when you like the people you work with, the long hours are not near as painful and it makes the job fun.

Passings

HELEN MILLER, 87, a retired senior administrative secretary in Section 294, died of heart failure May 26.

Miller worked at the Lab from 1968–80. She is survived by three daughters, four grandchildren and five great grandchildren.

Services were private.

JAMES MACKINTOSH, 71, a retired staff assistant in Section 505, died of cancer June 14.

Mackintosh joined the Lab in 1961 and retired in 1996. He is survived by his wife, Marie; sons Randy and David; and four grandchildren.

Services were private.

ROBERT HANSEN, 84, retired staff administrative assistant, Reliability Engineering Section, died of natural causes July 5.

Hansen joined JPL in 1965 and retired in 1982. He is survived by his son, Eric.

Services were held at Sierra Madre Congregational Church.

FRANCIS NICHOLSON, 77, a JPL scientist whose precise navigation skills helped guide the Galileo spacecraft to Jupiter, died July 6 of a blood disorder at a New Jersey hospital.

Nicholson worked at JPL from 1975–96. He is survived by his wife, Jean; daughters Erica, Judy, Carol and Pat; sons Bob and Dan, two brothers, one sister and 11 grandchildren.

SAMESH MANTHA, 50, a senior propulsion engineer in Section 353, died of stroke July 19 at his home in Arcadia.

Mantha had worked at the Lab since 1991. He is survived by his wife, Padmaja, and daughters Priyanka and Poonam.

Services were private.

Dr. Earle Huckins

DR. EARLE HUCKINS III, 59, a top manager for the Office of Space Science at NASA Headquarters, died July 22 at his home in Centreville, Va., of complications from amyotrophic lateral sclerosis, often called Lou Gehrig's disease.

From February 1996 until November 2001, he served as deputy associate administrator for Space Science at Headquarters, responsible for the executive direction of NASA's space science flight program including missions such as the Hubble Space Telescope; the Chandra X-ray Telescope; and planetary missions including JPL's Mars Pathfinder, Mars Global Surveyor, Mars Odyssey, Galileo mission and Cassini missions. Huckins was also responsible for the overall contract management of JPL.

He resigned as deputy in November 2001 because of his declining health, but continued working as a special assistant.

Huckins is survived by his wife, Cathy; daughter Christine; sons Scott and Brian; granddaughter Kelsey; and a forthcoming grandson, Connor. The family has requested that contributions be made to the ALS Association, National Capital Area Chapter.

Retirees

The following JPL employees retired in August: David Scaff, 43 years, Section 386; William Tibbitts, 43 years, Section 350; Eleanor Helin, 39 years, Section 322; Hiroshi Otake, 33 years, Section 345; David Rogers, 31 years, Section 303; John Peterson, 25 years, Section 661; Robert Deering, 18 years, Section 387.

View this and previous issues of Universe online

http://universe.jpl.nasa.gov

Universe

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Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission. Ads must be submitted on ad cards, available at the JPL Store and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

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

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

Classifieds

For Sale

BABY ITEMS: soft front carrier, Evenflo, $7; car seat w/base, Century, rear-facing, $40. bathtub carrousel, Safety1st, $7; all in superb cond., prices are obo; COFFEE MAKERS: Krups, 10-cups, white/gray, like new, $40/obo; Braun, 10-cups, white/black, like new, $30/obo. 626/791-6101.

BED, king, solid wood bed frame with 2 night-stands, vg cond., picture avail., must see, $600/obo; mattress, very good quality, king, $500/obo. 626/584-1164.

BED, antique oak & rod iron, queen size w/rails, $80; SKI SET, used women's Head 170s, Gala radial & poles, Salomon boots, size 7 & bindings, see pictures @ERC, $80. 626/744-9064.

BICYCLE, women's 20", Centurion Comp TA road bike equipped with Shimano 600 derailleur, etc., terrific cond., $60. 956-3745, Steve.

BIKE SEAT, child's, Rhode Limo, good cond., includes rear rack, $50; MOUNTAIN BIKE, Diamondback Apex 1991 model, dark green, 21-speed, 20" frame, $50; CHILD CARRIER, Kelty-Kids Country model, good cond., $50. 626/794-8720, Andy or Lisa.

COMPUTER, Dell Dimension L566cx, Celeron 566, 66 GB HD, 512 MB RAM, 17" CRT, CD-ROM, internal Zip 100, Cambridge Soundworks speakers, MS Natural keyboard, Mini Tower, exc. cond., picture in the JPL Store, $800/firm. 481-9591.

COMPUTER DESK, compact, on wheels, vertical design with room for large monitor, shelves top and bottom for PC and printer, pull out keyboard tray with pencil tray, pop up side shelf, wood color, good cond., bought for $110 at Office Depot, barely used, sell for $45/firm. 626/355-3657, Jason.

DESK, solid oak, 39 1/2" wide x 59" long, exc. cond., $199/obo. 368-7861.

DODGER TICKETS, various games throughout season, 2 seats on Loge (orange) level near first base, call for list of games, $23/ticket, parking not included. 626/296-1253.

FURNITURE: loveseat and ottoman, $350; love-seat, Italian leather, $450; dining set, corner nook, $350, e-mail for pictures, sell separately or all for $1,000/obo. dbljo7@yahoo.com or 626/535-9645.

GENERATOR, Craftsman, 6000-watt, w/cover & 5 ft., 30-amp extension cord, exc. cond., $1,000/obo; CARDIOGLIDE, good cond., $50; RIMS, Toyota 2000 Tacoma truck, stock w/hubcaps, exc. cond., $500/obo; RIMS, Chevy El Camino, stock w/tires, good cond., $500/obo. 899-7797.

KITCHEN DOORS, antique, early 1900s, 8 ft. tall, solid wood, beveled glass, from a large estate in South Pasadena, $100/obo. 626/287-9433.

OPERA TICKETS, 2, Los Angeles Opera at the Dorothy Chandler Pavilion, "The Girl of the Golden West," with Placido Domingo, Sat., Sept. 7, at 7:30 p.m., mid-orchestra, Row R, Seats 21-22, $256. 626/449-8392.

PIANO, upright, quite old but in good cond., $500/obo. 626/584-1164.

PRINTER, Apple color StyleWriter 4100, almost new, needs ink cartridges, complete with software and cables, $40/obo. 323/255-8635.

SOFA, exc. cond., $350; DINING SET, table and 6 chairs, good cond., $150; RECLINER, good cond., $75; other items. 626/445-5071.

SOFA AND LOVE SEAT, good cond., beige, $120/ obo; VCR, Samsung, 3 yrs. old, needs repair, broken belt on fast forward/plan mode, every-thing else works, $40/obo. 626/794-4921, Bert.

SOFA SLEEPER, makes into qn. bed, abstract black, blue and mauve design, good cond., $300; BICYCLES, 4, children's, need TLC, $15/ea.; LADDER, metal, $50. 626/357-8210.

TELESCOPE, 8", Meade, 2080 Schmidt-Cassegrain, with clock drive, equatorial wedge, tripod, 26 mm Meade Super Plossl eyepiece, viewfinder, white light solar filter, carrying case, $700. 248-7331.

TYPEWRITER, IBM Wheelwriter, $20. 626/585-8213.

VENDING MACHINES, table top, 9 slots, holds approx. 114 pieces of candy, manual, no elec., Nione (9) machines, $1,000. 661/816-7799, Stan.

WINDOW AWNINGS, seven, metal, $100/obo for set. 626/287-9433.

Vehicles/Accessories

'01 AUDI TT coupe, 225/quattro, performance package, Bose premium stereo option, 49K miles, raven blk, gray interior, excellent cond., $29,900/obo or take over payments. 909/633-5117.

'89 BAYLINER Capri boat, 19 ft., 4 cyl., inboard/ outboard, very good cond., approx. 44 hours on engine, geat family ski/fish boat, am/fm/ cass., many extras incl. skis, vests, life jackets, etc., trailer has new tires, ready for summer, photo at www.mogensigns.com/boat.htm, $6,500/obo. 352-4102.

'96 BMW 328I, Sport Package, white with gray leather, auto, 2.8L, 6 cyl., 83K mi., all power seats, PS, PW, PDL, CC, sunroof, dual temp controls, trip and maintenance computer and more, exc. cond., $15,900. 661/294-3857.

'80 BMW 633 CS, good cond., ~125,000 mi., white, 2-door coupe, $2,500/obo. 790-6185, Tim.

'95 CHEVORLET Camaro, silver, t-tops, V6, 5 spd. manual, 80K mi., exc. cond., $8,000. 352-2380.

'01 FORD Escape XLT, 4 x 4, 3.0L V6, all options except side step bars, mocha inter/ext., 27K mi., exc. cond., 2 new tires, $19,900. 626/584-3841.

'98 FORD Ranger XLT, great cond., wht, 2 dr., V6, 4.0, 83K mi., 6" body lift, off road tires, custom brush guard, pwr. everything, a/c, ABS, am/fm/cass., bedliner, tow hitch, spotlight, e-mail code3media@crownvic.net for link to photos, $13,000/obo. 822-6465.

'87 FORD F-250 PU, 460cid, V8, 4:10-1 diff. auto, a/c, am/fm, PS/PB, cruise, new tires, 5th wheel hitch/bed cover, 43K mi., good cond., strong tow veh., records available, renewed lic.-Jan. cab top air foil, smog test, $5,000/obo. 626/963-5727.

'68 FORD Ranchero, 390 w/auto, GT package, red w/blk interior, bucket seats, console, 95% restored, incl interior, paint, engine, trans, suspension, GT wheels and stripes, $6,700/obo. 952-8984.

'67 FORD Mustang 390, 4-speed S Code coupe, Ford Blue exterior, new interior, great cond., must see, $6,500/obo. 626/339-9353, Greg.

'00 HONDA Civic SI, black, OEM high wing, 19K mi., $17,000/obo. 661/255-5645.

'00 HONDA Odyssey LX V6, 3.5, beige, auto, a/c, am/fm/cass, 44,700 mi., exc. cond., $21,000. 626/447-0466.

'00 HONDA Odyssey EX, 3.5 V6, auto, A/C, in-dash CD, CD changer, electric rear doors, 44,400+ mi., $23,500. 661/816-7799.

'73 HONDA XR75, runs, up to date license, spark arrestor, new rings, $595/obo. 541-1858.

'00 HYUNDAI Accent GL, 31K mi., perfect service records, under warranty until 12/04, exc. cond., $7,800. 626/578-1459.

'91 INFINITI G20, fair cond., $2,800. 957-3675.

'91 ISUZU Trooper LS, V6, 2.8L, 4WD, white, 5 sp. manual, a/c, am/fm/cass, p/s, p/w, cruise cntrol, orig. owner, 90,000 miles, new trans and clutch, VG cond., $3,500. 626/398-0921.

'93 KAWASAKI Ninja, 600cc, black with purple, turquoise stripe down side, black leather tank cover, 16K mi., $3,200/obo. 501-8161.

'85 KOUNTRY Lite 5th wheel trailer, 30 ft., orig. owner, aluim. frame, 13.5K mi., A/C, side bath, microwave, TV/VCP avail, new tires & water pump, sleeps 6., exc. cond., renewed lic.-Mar., $8,000/obo. 626/963-5727.

'97 LINCOLN Mark VII coupe, 2 dr., perfect cond., black, all options,CD player/changer, leather dual power seats, premium wheels, 56,000 mi., make offer. 949/632-8632, Linda.

'96 MAZDA B2300, white, 5 spd., pick-up shell, exc. cond., 51K mi., Blue Book $4,975/obo. 626/794-9200.

'92 NISSAN Maxima M2000, 4 dr., 113K mi., $7,000. 562/463-0692, Cruz.

'96 RANGE ROVER 4.0 SE, black with tan inter, exc. cond., have all service records including a new computer module, $19,000. 626/797-8929.

'86 SAAB 900 turbo, black, 5 spd., a strong performer on the road, a/c, moonroof, Nakamichi stereo, new tires, passed smog check, license till Aug., 2003, $2,500. 626/312-5422.

'96 TOYOTA Corolla DX, 4 dr., 5 spd., all amenities, new tires, exc. cond, 137K mi., $5,600/obo. 760/246-3825.

'89 TOYOTA Camry, sedan, 4 dr., automatic, 1 owner, A/C, front wheel dr, 4 cyl., 2.0 liter, good cond., clean. $2,800/obo. 626/282-1821.

'99 VOLKSWAGEN Passat GLS, 4-dr. sedan, 1.8L Turbo, Tiptronic automatic, 51K mi., green metallic ext, beige leather int, CD stacker, sunroof, PW, PS, PDL, heated seats, great family car, below low Blue Book, $16,000/obo. 790-3717, Jason or Gayle.

'87 VOLVO GLE 740, blue, 4 dr. sedan, power, cruise, runs well, in good cond., $2,900. 789-0139.

Wanted

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

VOLLEYBALL PLAYERS, coed, no beginners please, Tuesday nights 8 to 10:00 at Eagle Rock High School, $3/night. 956-1744, Barbara.

Free

MULCH, save water, gd. for weed control & composting, Fire Dept. approved, great in gardens, builds healthy soil, free delivery to local JPL area, have tons. 626/798-6405, after 6.

For Rent

ALTADENA, condo for lease, min. from JPL, 2 bd., 1.75 ba., nice closets with organizers, fireplace, central a/c & heat, community pool, storage room, 2-car garage (carport), tile counter top and marble floor in kitchen, large patio with landscape, planters and oriental garden with waterfall and spa, end unit with windows on three sides, cable on, $1,200. 626/398-1988.

ALTADENA house, 3 bd., near Lab north of Woodbury and east of Lincoln, redecorated and painted throughout, washer/dryer and stove, $1,300, water and trash included. 323/871-1043.

ALTADENA apt., 5 min. from JPL, spacious 2 bd., stove and frig., A/C, $1,100. 626/791-7355, Norman.

ALTADENA duplex, 3 mi. from JPL, large 2 story townhouse, 2 large bd., 1.5 ba., formal dining room, storage space, laundry hook ups, asking $1,200. 626/791-7355, Norman.

GLENDALE, share 2 bd., 1 ba. house with fellow JPLer, laundry, yard, quiet neighborhood, 10 mi. to JPL, $600 + 1/2 utilities. 507-5632.

LA CANADA/FLINTRIDGE, room, private bathroom, kitchen privileges, pool, BBQ, parking, 2 mi. to JPL. 952-5430.

LA CRESCENTA house, extra nice, 2 bd., 1 ba., fireplace, 5 min. from JPL, central heat, formal dining room, water and gardener inc., no smoking or pets, $1,495. 805/659-1742.

MONROVIA HILLS, charming 2nd level of house w/a view, 2bd., 1.5 ba., kitchen w/refrigerator & electric stove, dining rm, living rm., master bd. w/walk-in closet, laundry rm. area, $1,200 w/two-car garage or $1,000 w/out garage. 626/256-0015.

NORTH ALHAMBRA studio, on 2nd St., water and electric included, $600. 626/379-3503 or 626/688-1527.

NORTH ALAHAMBRA, 3 bd., 1 ba., living room, 2 car parking, walk to Main St., $1,100. 626/379-3503.

PASADENA, 1 bd. in a 2 bd., 1 ba. house, all privileges, male preferred, no pets allowed, quiet area, walking distance from Caltech and PCC, $325 deposit & 1st month rent is required, $375 + utilities. 626/844-0425.

PASADENA condo, 2 bd., 2.5 ba., Caltech and Old Town, 1,350 sq. ft., sub-teran. parking, wash/dry hook-up, $1,650. 626/836-9108.

PASADENA condo, 2 bd., 2 parking places, 125 Blanch Street, $1,700. 626/798-3969, before 10:00 a.m. or after 8:00 p.m.

PASADENA, fully furnished, townhome-style apartment, 2 bd., 1.5 ba., with A/C, new carpet and flooring, small patio, laundry facility and parking, $1,250 plus utilities; 2 bd., PASADENA apt., 1.5 ba., to share with student, furnished, a/c, laundry facility, parking, $625 plus utilities, both are close to Caltech & PCC, 7 mi. to JPL. 626/351-9641.

PASADENA guest house, above Eaton Cyn. golf course, beautiful setting, about 1,000 sq. ft., washer & dryer, ideal for 1 person with a very quiet lifestyle, $895 plus util. 626/798-4056.

PASADENA, large condo in centrally located complex, 2 bd, 2 ba, office, separate kitchen, 1 mile from Caltech, furnished, 1-yr. lease, available 9/1, $2,500. 626/793-1473.

PASADENA, near Caltech, very nice, large, 2 bd., 2.5 ba., hardwood floors, fireplace, patio, a/c, washer/dryer, refrig, stove, new carpet, 2 car parking, $1,600. 626/441-6955.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beaut. inter., bright ktch., prof. landscape, ctrl. air/heat, close to shops/schools, cozy l/r w/FP, end unit, frml. d/r, hdwd. flrs., immac. cond., $1,750. 626/396-9024.

SIERRA MADRE, small, charming 2 bd. home, 1 ba., carpeted, stove, laundry room, storage, fenced yard, flowers, great neighborhood, water and trash included, 15 min. from JPL, avail. Aug. 15, $1,275. 626/355-3492

SIERRA MADRE, townhouse-style apt. to share, nr dwntwn, large patio, 12 x 12 ft. pvt. Bd., quiet tree-lined street, garage pkg, no smoking, no pets, $650 + 1/2 util. 626/796-2070, Heather.

Real Estate

ALTADENA, for sale by owner, 3 bd., 1 ba., 1,108 sq. ft., 7668 sq. ft. lot, 2 car detached garage w/laundry facilities, $285,000 or make offer. 800/836-8750 ext. 10020.

CLAREMONT house, 4 bd., 2.5 ba., 2,600 + sq. ft., 3-car attached garage, located north of Baseline, recently upgraded kitchen, $446,500. 909/624-1051.

COLORADO, 10+ level acres near Rio Grande, NM border, two adjacent 5-acre lots on St. Hwy. 248, sell one or both for $1K/acre obo. 626/254-1550.

GLENDALE, East Ridge Estates (Eagle Rock area), 1,979 sq. ft., 5,700 sq. ft. lot, 3 bd., 2.5 ba., dining/living view of pool, kitchen, breakfast area, family room facing patio, tile roof, central air/heat, alarm auto sprinklers, cable, etc., built in 1963. 323/256-0535.

PASADENA, Rose Bowl area, 1910 Craftsman/ Victorian transitional, 5 bd., 2 ba., large attics, Cal basement, dual zone, a/c, lg. kitchen, many built-ins, fully restored, $585K. 626/584-3841.

Vacation Rentals

BALBOA ISLAND, fully furnished, 2 bd., 1 ba., sleeps 4, dishwasher, microwave, TV, covered patio, parking, laundry facilities, steps to bay, quiet location, available weekly during the summer, $1,200-$1,500/week. 626/351-9641.

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

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

HAWAII, Kona, ocean front on Keauhou Bay, house and guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing and beautiful, swimming, snorkeling, fishing, spectacular view, near restaurants, golf and other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., 4/15-12/14 $105/nite/2, 12/15-4/14 $120/nite/2, $15/nite/ add'l person. 949-348-8047, jackandrandy@cox.net.

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

OCEANSIDE condo, fully furn.. 2 bd., 2 ba., fireplace, full kitch., quiet, relaxing, beautiful beachside setting; BBQ, pool, spa, game rm.; great ocean view, easy walk to pier / restaur., sleeps 8, avai. weekly or monthly. 909/981-7492 or dfhauge@yahoo.com, Darlene.

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

PUERTO VALLARTA, Villa del Mar, lg. studio, sleeps 4 max, rooms have microwave, kitchen, phones, cable TV, private patio, 3 pools, 3 restaurants, spa, private beach, charming town, top-rated resort. available only 12/28/02 - 1/4/03, on-site New Year;s Eve Fiesta, see at http://www.myuvc.com/puerto_vallarta.shtm. 541-1340.

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.

Universe

Jet Propulsion Laboratory

August 16, 2002
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Inside

California's capital hosts NASA anniversary celebration and exhibit

California's diverse landforms are highlighted in this three-dimensional image taken by the Shuttle Radar Topography Mission during its 11-day flight aboard Space Shuttle Endeavour in February 2000.

theme EARTH

California As Seen From Space

"California As Seen From Space," a collection of breathtaking imagery as seen through the eyes of JPL missions and instruments, highlights a free public exhibit commemorating 40 years of planetary exploration on display at California's State Capital in Sacramento.

The California images illustrate some of the ways spacebased imaging is being applied to improving life on Earth, such as creating topographic maps, conducting climate and land surface studies and monitoring dynamic conditions. The images were obtained from the Shuttle Radar Topography Mission, Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar, and the Multi-angle Imaging SpectroRadiometer and Advanced Spaceborne Thermal Emission and Reflection Radiometer on NASA's Terra spacecraft.

The overall exhibit, entitled "Journey to the Planets and Beyond," showcases JPL's work in Earth science, solar system and universe exploration and technology development. Special displays commemorate the 40th anniversary of the Aug. 27, 1962 launch of NASA's Venus probe Mariner 2 — the first successful interplanetary spacecraft — and the 25th anniversary of the launch of the Voyager 1 (Aug. 20, 1977) and Voyager 2 (Sept. 5, 1977) spacecraft to our solar system's outer planets.

At a reception for state legislators and other invited guests at the Capital, JPL Director Dr. Charles Elachi said the accomplishments of Mariner 2, Voyager and other JPL-managed planetary missions laid the groundwork for many of today's missions to study Earth that have benefited Californians.

Stardust reaches for cosmic dust

On a mission to collect and return the first samples from a comet, on Aug. 5 Stardust began to collect tiny specks of solid matter, called interstellar dust grains, that permeate the galaxy.

"If you look at the Milky Way on a dark night you may see a black band stretching along the center. The band is interstellar dust blocking the light from distant stars. These are the particles that Stardust will be collecting," said Dr. Don Brownlee, an astronomy professor at the University of Washington, Seattle, and the principal investigator of the Stardust mission.

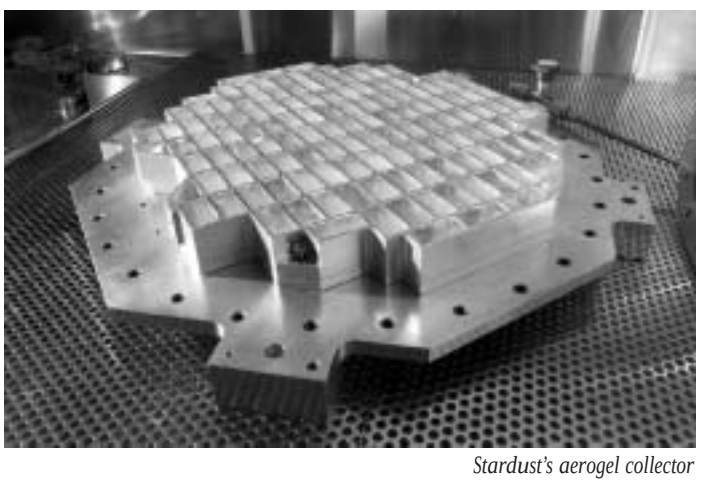
This dust, passing through the solar system like a wind, is made of particles smaller than one-hundredth the width of a human hair. The particles are made of varying amounts of most of the elements in the periodic table. The Stardust mission will use its special formulation of aerogel, the world's lightest solid, to try to capture these small solid particles as the spacecraft travels in the same direction as the dust stream until Dec. 9, 2002.

"Stardust's tennis-racket-shaped particle collector has shoulder and wrist joints that will point one side of the aerogel collector material into the dust stream to collect interstellar dust," said Tom Duxbury, the project's manager. "When Stardust encounters comet Wild 2 in early 2004, the reverse side of the collector will trap particles from the gas and dust escaping from the inside of the comet. When the dust samples return to Earth in 2006, we will extract and analyze the particles,"

The Stardust mission collects both ancient and young dust. Comets are made of interstellar particles that clumped together with ices more than 4.5 billion years ago. When the spacecraft flies past comet Wild 2, it will attempt to collect ancient dust samples stored for billions of years in, effectively, a deep freeze.

On Aug. 5, the mission began collecting a younger type of stardust: the free-flowing interstellar dust that was produced by the current generation of stars. Comparing the ancient and newer types of dust may provide clues to the evolutionary changes in the galaxy and the composition of the early galaxy. This is the second and final time Stardust will collect these dust particles. It previously collected samples during a six-week period in 2000.

Comet Wild 2 is a particularly good example of preserved interstellar dust because its path through space brings it no closer to the Sun than Mars' orbit, about 228 million kilometers (about 141 million miles) from the Sun. Before 1974, the closest Wild 2 came to the Sun was Jupiter, Brownlee said.



Stardust's aerogel collector

Galileo and Ulysses spacecraft both detected a stream of dust particles flowing between stars and into the solar system. The particles did not come from the Sun, but from another direction that showed their origin was outside the solar system.

Interstellar dust may have played a role in bringing the building blocks of life -- carbon and other organic materials -- to the young Earth. Similarly, comet impacts may have also brought these elements to Earth. Brownlee expects to find a lot of carbon in the interstellar dust particles. "When Earth-like planets form, comets and interstellar grains may bring carbon and organic material," he said.

The interstellar dust stream differs from the solar wind in that the solar wind is made of individual atoms, while the interstellar dust is made of small particles of rocks with complex compositions.

More information on the Stardust mission is available at *http://stardust.jpl.nasa.gov.*

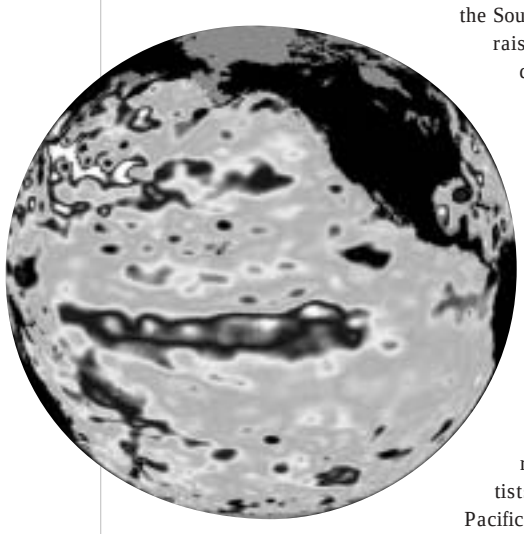
Mariner 2, a quarter of a century after launch

Mariner 2, the first spacecraft to fly by another planet, successfully launched on a mission to Venus on August 27, 1962. It flew by Earth's neighbor in December of that year.

News Briefs

Eyes on a possible "mild" El Nino

This Topex/Poseidon image of sea-surface heights was taken during a 10-day collection cycle ending August 7, 2002. Sea-surface heights are a measure of how much heat is stored in the ocean below to influence future planetary climate events. Since May 2001, there have been a series of warm Kelvin waves--eastward-moving ocean waves that cross the equatorial Pacific in about two months. A sizable one arrived at the South American coast last February, raising the ocean temperature by 2 degrees Celsius (3.6 degrees Fahrenheit) and triggering the National Oceanic and Atmospheric Administration's forecast for a mild El Nino in 2002. There was another wave in June, followed by the current large pool of warm water in the tropical Pacific that is now moving toward the coast of South America at a speed of 215 kilometers (134 miles) a day and will arrive there in three to four weeks, raising ocean temperatures. Scientists will continue to monitor the Pacific closely for further signs of El Niño formation and intensity.



Groundbreaking for the new Flight Hardware Logistic Program's home

Ground was broken in late July on a new facility that will support JPL's Flight Hardware Logistics Program (FHLP) as well as electromagnetic compatibility testing.

The FHLP's current Bonded Stores provides a centralized facility to more efficiently transfer residual flight hardware from past to future projects. Due to the increase in projects, the amount of residual flight hardware is increasing and, there is a greater possibility of and need for reutilization, according to Ken Van Amringe, FHLP residual inventory project element manager.

To be located between Buildings 148 and 248, the new FHLP Bonded Stores facility (Building 325) will have more than 4,000 square feet to receive post-launch residual hardware for staging, review, disposition, storage, and inventory management. The facility will include a 300-square-foot Class 100,000 clean room for hardware review required by projects.

A portion of the new building—a pre-fabricated structure due to be delivered in September and operational in October—will be dedicated to an Electromagnetic Compatibility Shield Room facility. The radio frequency shield room will supplement the smaller Electromagnetic Compatibility facility now in Building 179, which continues to be the prime home of the Office 513 Electromagnetic Compatibility test lab.

"For many years there has been a need to test larger items than can be accommodated in the Building 179 area; Building 325 finally meets that need," said Albert Whittlesey, EMC test lead. "For the past three years, the modular demountable shield room has been located in the Building 144 dynamic lab and more recently in the 179 high bay. Both those areas, however, have only been temporary homes to the shield room. Building 325 will provide a permanent home, permitting electromagnetic compatibility testing of larger hardware elements such as High Energy Solar Spectroscopic Imager, Microwave Limb Sounder, and Thermal Emission Spectrometer, and also complete spacecraft such as CloudSat."

In the past 18 months, FHLP has collected more than 6,000 residual hardware items from projects, most of which have launched and no longer need the hardware for their mission, said Van Amringe, who valued the hardware at $123 million. During that time, he said, the program has delivered more than 500 items from its inventory to new or current projects, subcontractors or university partners.

To help JPL achieve its goal to provide critical hardware to projects faster and more efficiently, the FHLP also brokers common flight procurements, develops anticipatory buys and supplier agreements, and provides information to projects and proposers about flight hardware availability and information. FHLP's on-line website and catalog at http://fhlp provides Lab-wide access to the FHLP inventory and other inventories on Lab.

Photo by Dutch Slager / JPL Photolab

From left: Joe Solomon, Facilities Project Manager; Kevin Clark, FHLP Program Manager; Tom Gavin, Associate Director Flight Projects; Al Whittlesey, EMC Testing Manager; Jeff Leising, Project Planning Office; and Ron Ploszaj, Project Support Office.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

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

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

Friday, August 16

TIAA/CREF Enrollment—This monthly meeting is designed to assist employees who are newly eligible for Caltech/JPL Retirement Plan participation in selecting investment options and completing enrollment forms. To be held at noon in T1720-137.

Tuesday, August 20

Investment Advice—One-on-one counseling appointments are available with Fidelity. For an appointment, call (800) 642-7131.

Thursday, August 22

JPL Story—"The True Story Behind the Mars Pathfinder Success," presented by Rob Manning, flight system chief engineer, Brian Muirhead, flight system manager, and Richard Cook, mission manager. from 4-5 p.m., in the Library, west end of building 111.

Thu.–Fri., August 22–23

Von Kármán Lecture Series—Blaine Baggett, executive manager of JPL's Office of Communications and Education, will present"Journey to the Planets and Beyond: Space Exploration and the Visual Arts" Thursday in von Kármán Auditorium and Friday in the Vosloh Forum at Pasadena City College 1570 East Colorado Blvd. Both lectures begin at 7 p.m. For more information, log on to *http://www.jpl.nasa.gov/events/lectures/aug02.html* or call Public Services at ext. 4-0112.

Wednesday, August 28

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Roger Carlson at ext. 4-2295 for information.

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

Thursday, August 29

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

Thu. - Fri., September 5-6

IEEE/JPL Descanso sponsors a two-day workshop on wireless communications and networking in Pasadena. The meeting's emphasis is on power efficient wireless ad hoc networks. Dr. Charles Elachi, JPL Director and general chair of the workshop, will open the meeting with welcome and opening remarks. The agenda includes keynote speakers, Dr. Andrew Viterbi, Qualcomm co-founder, and Prof. Deborah Estrin, UCLA; a panel discussion featuring industrial panelists; education outreach opportunity for local universities. Participants include Caltech, UCLA and USC. The full program and registration details can be viewed at *http://dsp.jpl.nasa.gov/cas/Organizers*. Fees are $250 for IEEE members, $300 for non-members, and $125 for students. For more information, contact: Marvin Simon 4-3955 or Tsun-Yee Yan, 4-3016,

Ongoing

JPL Tennis Club—A round robin is held Saturdays at 9 a.m. at El Molino School Tennis Courts, at the corner of Del Mar Boulevard and El Molino Street. Parking is available. For information, call Gordon Blackhall, ext. 4-6981 or Jorge Vazquez, 4-6980.

ISO has improved life at the lab

Many of JPL's work processes have improved as a result of ISO 9001 implementation. Benefits received from improving the way we identify and resolve process problems range from improved mission success to the avoidance of dangerous situations.

The Corrective Action Tool is available online

ISO 9001 requires that JPL investigate and implement improvements to eliminate the causes of problems. To comply, JPL has created a web tool where problems are tracked. Once identified, a written notice is entered into the JPL "Corrective / Preventive Action Tools" website at *https://problemreporting/cpa.htm* and is followed to solution. These notices are either a Corrective Action Notice (CAN) or a Preventive Action Notice (PAN). A CAN addresses a problem that has already occurred and a PAN addresses the potential for a problem that could occur.

Anyone can issue JPL corrective and preventative actions

The majority of CANs are opened as the result of an internal assessment or external audit. However, anyone can open a CAN or PAN at the web site.

How CANs and PANs have benefited JPL

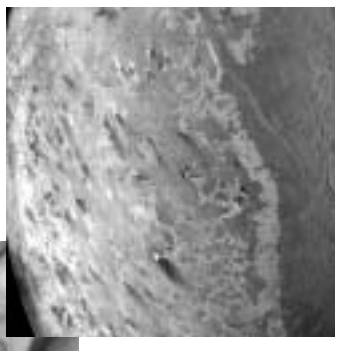
One example is the promptness with which we responded to the Mars Failures using the corrective action methodology. It allowed us to address and deal with the failures quickly and improve our mission success as evidenced by the superb navigation of Mars Odyssey.

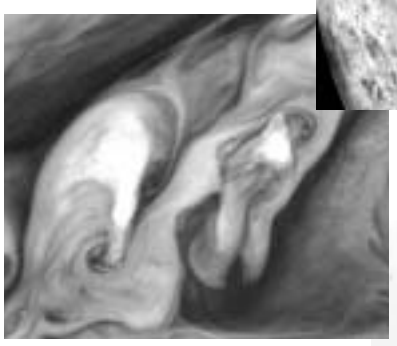
Another CAN resulted in a vast improvement in how we handle calibrated equipment. Precipitated by an ISO audit corrective action finding, this CAN allowed us to remove unnecessary requirements that had been placed on scientists and researchers. Instead, it now focuses on requirements for calibrated equipment on flight projects. The new learning management system and improved ECAP process are also results of CANs.

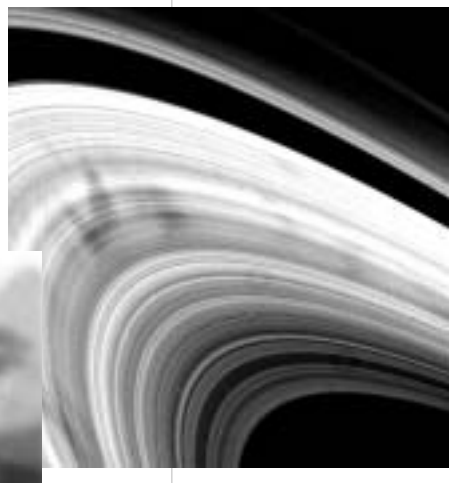
In addition, a PAN initiated by Willis Chapman, Division Manager of Logistics and Technical Information, looked at how JPL received unscheduled explosive material deliveries. He noted that there was no common link between logistics, procurement and security and one was put into place. Now we know how to handle hazardous materials that arrive unscheduled, avoiding potentially dangerous situations.

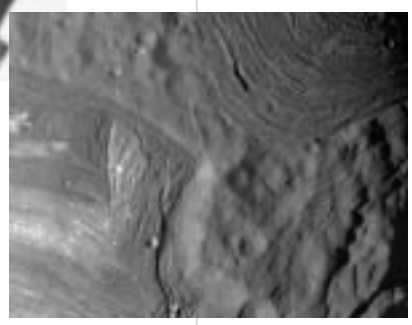
For more information about ISO, contact the ISO representative in your organization, listed at *http://iso/help/list-orgreps.html*.

A quarter-century after NASA's twin Voyager spacecraft departed Earth to visit outer planets, the historic mission is flying a race against time.









25 YEARS LATER

VOYAGER KEEPS PUSHING the SPACE ENVELOPE

by Guy Webster

DURING THE FIRST 12 YEARS AFTER LAUNCH in 1977, the Voyagers chalked up a wealth of discoveries about four planets and 48 moons, including fast winds on Neptune, kinks in Saturn's rings and volcanoes on Jupiter's moon Io. As scientists and engineers mark the mission's silver anniversary, they hope at least one Voyager will pass beyond the boundary of the Sun's influence before the onboard nuclear power supply wanes too low to tell us what's out there. Voyager 1 is now the most distant human-made object, about 85 times as far from the Sun as Earth is. Voyager 2 is now about 68 times the Sun-Earth distance.

"After 25 years, the spacecraft are still going strong," said Dr. Edward Stone, Voyager project scientist since 1972 and former JPL director. "Back in 1977, we had no way to know they would last so long. We were initially just on a four-year journey to Jupiter and Saturn."

The Voyager team at JPL still receives information almost daily from the durable spacecraft traveling beyond all the planets. The Voyagers are examining the far reaches of the solar wind, a gusty flow of particles hurled outward by the Sun. The eventual goal is to become the first spacecraft to taste interstellar space. Voyager 1, which launched on Sept. 5, 1977, flew past Jupiter and Saturn, then angled northward out of the plane of the planets' orbits. After Voyager 2 launched on Aug. 20, 1977, and completed its tour of Jupiter and Saturn, NASA extended its adventure with flybys of Uranus in 1986 and Neptune in 1989.

"A radio signal traveling at the speed of light takes nearly 12 hours to travel between Voyager 1 and Earth. That raises operational concerns," said Ed Massey, Voyager's project manager at JPL. "If something went wrong on board, at least a full day would lapse before a signal revealing the problem could reach Earth and commands to fix it could be returned. It could be too late." So the project team tries to anticipate any emergencies and program the spacecraft's computers with advance instructions on how to react to them, he said.

Both spacecraft are studying the vast bubble the Sun inflates around itself by outward pressure of the solar wind. The bubble has a boundary, called the heliopause, where this outward pressure is counterbalanced by inward pressure of the interstellar wind in our neck of the galaxy. The interstellar wind outside that boundary is a flow of atoms and other particles blasted from explosions of dying stars. The location of the heliopause varies with the level of solar activity during the Sun's 22-year sunspot cycle and with changes in the interstellar wind, Stone said.

Some scientists suggest that, on a much longer time scale, the interstellar wind may occasionally press the boundary far enough inward to sway Earth's climate.

"We would really like to evaluate our theoretical models by determining how far it is to the edge of interstellar space," Stone said. Voyager 1 is rushing toward the heliopause at about 1.6 million kilometer (1 million miles) a day. Whether it gets there before about 2020, while it still has adequate electrical power, depends on how far away the heliopause is. Recent estimates are that, depending on that distance, it would take Voyager 1 between seven and 21 years to reach the heliopause.

Voyager 1 has already discovered that the outbound solar wind around it is slowing from effects of inbound interstellar particles leaking through the boundary. A much better prediction of the boundary's location will come when the spacecraft encounters the termination shock, the zone where the solar wind begins piling up against the heliopause. That encounter may come within the next three years, Stone estimates.

Whatever their future holds, Voyager 1 and Voyager 2 have already earned a prominent place in the history of exploration. Among their big surprises: Jupiter's moon Io has active volcanoes. Jupiter's atmosphere has dozens of huge storms. Saturn's rings have kinks and spoke-like features. The hazy atmosphere of Saturn's moon Titan extends far above the surface. Miranda, a small moon of Uranus, has a jumble of old and new surfacing. Neptune has the fastest winds of any planet. Neptune's moon Triton has active geysers.

"Voyager has become the icon of exploration." Stone said. "It saw more new worlds for the first time than any mission ever has, and probably ever will. It was an incredible journey of discovery."

That the discoveries turned out to be so surprising only added to the fun.

"It's very hard to break out of preconceptions. Time after time, no matter what we thought we knew, nature tricked us," Stone said. "One thing that made it so exciting was the fact that it could have been very boring. All those moons could have been ancient, heavily cratered objects, but they aren't. We found that nature was incredibly inventive in the way it used the basic laws of nature to create all of these diverse, distinct worlds."

Long after they fall silent, the Voyager twins will keep speeding away from our solar system, each carrying an "interstellar outreach program" of recorded sounds and images from Earth. Further information about Voyager's past discoveries, current interstellar mission and messages from Earth is available at http://voyager.jpl.nasa.gov .

Clockwise from the top: Triton's south polar terrain; Saturn's rings with 'spoke' features in B-ring; unusual "Chevron" figure seen on approach to Miranda; Voyager team with Dr. Stone, center of picture; area left of red spot on Jupiter.

Activities to Celebrate Voyager

Sept. 3: 11:30 a.m. – 1 p.m.

Music on the Mall

Sept. 4: 11:30 am –1:00 pm

Voyager Movie
Von Kármán Auditorium

Anniversary Cake

Sept. 5

Voyager Panel Discussion
Von Kármán Auditorium

Pre-launch, Launch and Encounter Project Managers, Operations Manager, Navigation Team Chief and Experiment Reps. tell of mission facts, mishaps, success, and experiences with light hearted anecdotes.

Sept. 5 and 6: 7 p.m.

"Voyager's Exploration of the Solar System," presented by Dr.Ed Stone, project scientist, and David Morrisroe, Caltech physics professor — von Kármán Lecture Series.

Passings

CHARLES (Chuck) K. WITHAM, 33, member of the engineering staff in the Power and Precision Conversion Systems and Technology Section 346, died Aug. 6 of injuries from a bicycle accident near the East Gate.

Witham received both his Master's (in 1995) and Ph.D. (in 2000) in materials science from Caltech. His work at Caltech resulted in three U.S. patents and he authored or co-authored 26 publications in the scientific literature.

He then joined the Lab as a postdoctoral research associate and became a Member of the Engineering Staff in January 2001. He was a key member of the Section's fuel cell team.

At Caltech, Witham was an avid cyclist and environmentalist. As a member of the Caltech Environmental Task Force he helped organize a computer-recycling program in conjunction with the Caltech Y; helped reduce paper usage by promoting e-mailed campus announcements; promoted xeriscaping; organized Earth Day fairs; and campaigned for the installation of more campus bicycle racks.

He is survived by his sister, Nita-Lyn Roth of Fort Lauderdale,Fla.; his mother, Linda Witham of Aventura, Fla.; his father, Charles M. Witham, New Jersey; a grandmother, Anita Berzin of Aventura; and an uncle, Barry Berzin, Miami. A memorial service was held at his Pasadena home on Aug. 10.

Donations may be made to organizations he supported such as the Los Angeles County Bicycle Coalition or Tree People, which will group donations together into a "grove" in his name.

JAMES MOONEY, 88, a retired administrative group supervisor in Section 662, died July 21.

Mooney worked at JPL from 1955–77. He is survived by his wife, Rosemarie, and son Jack.

Services were private.

ZVI SHIPPONY, 54, an atmospheric scientist in Section 3284, died of cancer July 25.

Shippony had worked at the Lab since 1989. He is survived by his wife, Ilana, son Elan and daughter Tamar.

Services were private.

Letters

On behalf of my dad and my self, I would like to thank everyone for their condolences after the passing of my mom. Thanks also to the JPL Store for the beautiful plant. Thank you all

Chris Tippit
Virgil Tippit

View this and previous issues of Universe online

http://universe.jpl.nasa.gov

Universe

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Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission. Ads must be submitted on ad cards, available at the JPL Store and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

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

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

Classifieds

For Sale

BABY ITEMS: soft front carrier, Evenflo, $7; car seat w/base, Century, rear-facing, $40; bathtub carrousel, Safety1st, $7; all in superb cond., prices are obo. 626/791-6101.

BABY SWING, Graco, 3 speed, battery operated, blue/green plaid, good cond., $25. 626/256-6606.

BACKPACK, GVP gear G4, forest green, brand new never used, $55. 626/398-3649.

BASEBALL CARDS, Topps 1986 Traded series, box of 100/132 ct., unopened, Barry Bonds included, $50. 805/967-7725.

BED, Trundle, dark wood exterior, great addition to any kid's room, 1 mattress avail., $50/obo. 831-3998.

BED, antique oak & rod iron, queen size w/rails, $80; SKI SET, used women's Head 170s GALA, radial & poles, Salomon boots, size 7 & bindings, see pictures @ JPL Store, $80. 626/744-9064.

BIKE SEAT, child's, Rhode Limo, good cond., includes rear rack, $50; CHILD CARRIER, Kelty-Kids Country model, good cond. $50; MTN BIKE, Diamondback Apex 1991 model, dark green, 21-speed, large (20") frame, $50. 626/794-8720, Andy or Lisa.

BREAST PUMP, Medela Pump In Style Breast Pump, complete with all parts & accessories, good cond., $150. 626/256-6606.

CELLULAR PHONE, SprintPCS, model TP2200, dual-band, charger, manual, 10 months old, $80/obo. 626/644-7361, day or 626/345-0413, eve.

CHANDELIER, southwestern style, $50; SKIL-SAW, 3400 10" table saw, good cond., $50; MATTRESS, queen, good cond., $30; WINE RACK, small, wooden $5; TORCHIERE, halogen, brown, ~6 ft. high, $5. 626/794-8720, Andy or Lisa.

CHRISTMAS TREE, white with lights, 6.5 ft. tall. 998-5712, after 6 p.m.

COFFEE MAKERS: Krups, 10-cups, white/gray, like new, $40/obo; Braun, 10-cups, white/black, like new, $30/obo. 626/791-6101.

COLLECTOR PLATES, in individual boxes, sold as a set or individually, $75. 626/359-7666.

COMPUTER MONITOR, 21 in., .25 dpi, ViewSonic P810, Mac/PC, in original box, $350/obo; KVM SWITCH, 2 port, USB, for control of 2 computers using 1 keyboard/ monitor, Mac/PC, $75. 790-7129, Bill.

DOG HOUSES, beds and other supplies. 998-5712, after 6 p.m.

ESTATE SALE: bedroom set, very nice, queen size, fruit wood, double dresser mirror, 2 bedside tables, exc. cond., $300; recliner, well-built, brown, leather-like, $50; desk chair, tapestry seat, wood, good cond., $25; air cleaner, Hepa, $70; TV, old, color, 19", $15; tables, lamps, misc., no calls until 8/18. 626/355-6923.

LOVE SEAT, with convertible bed, good cond., white, $195/obo. 323/256-0535.

MATTRESS, queen size, Sealy Posturepedic, 3.5 yrs old, $75. 626/395-8659.

MOVING SALE: entertainment center, 3 piece, light oak, $785; dining table with 6 matching chairs, $495; sofa and loveseat, $680; stereo system, $99; TV, RCA, 32 inch, $435; coffee table, $235;VCR, $35; computer chair, $80; CD case, $15; 909/971-9604

OVEN, Kitchenaid, self-cleaning, electric, $50; STOVETOP, Décor, 5 burner, gas, $50. 790-2915.

PICNIC TABLE, redwood, 42 in. round w/4 benches, needs refinishing, $40. 626/447-7584.

PORTABLE COMPUTING SYSTEM, HP 75C, w/manuals, accessories and cables, extras include leather carrying case, ac adapter and overlay set, HP82162A thermal printer comes with manual, ac adapter, cables, 9 rolls paper, in orig. box, exc. cond. 661/274-8446.

SCANNER, brand new, Visioneer OneTouch 5800 USB 48-bit color, 600 x 1200 dpi, supports Windows 98/2000/Millennium/XP, $40. 956-3745, Steve.

SERVER RESOURCE KIT, Microsoft Windows 2000, 8 volume set, new, shrink wrapped, $130; Exchange 2000 resource kit also available, $30. tcfs@aprelix.com.

SOFA and LOVE SEAT, Broyhill, camel back, green, great cond., $500/obo. 626/319-7234, lv. msg.

SOFA SLEEPER, makes into queen bed, abstract black, blue and mauve design, good cond., $300; BICYCLES, 4, children's, need TLC, $15/ea.; LADDER, metal, $50. 626/357-8210.

TABLE SAW, Black & Decker, 8", with owner's manual and book, $135. 323/256-0535.

TYPEWRITERS, 3, two Royal portables (circa early 40s), one Underwood (circa 1938), all three $100. 848-0904.

VIDEO, Disney "Aladdin & the King of Thieves" VHS, new, sealed, $17; OTHER DISNEY VIDEOS, brand new, also available. 562/420-2313.

VIOLINS, 2, inherited, owned by professional violinist, ea. appraised at $1,500, will consider offers. 626/794-1716.

WASHER/DRYER combo, super efficient and quiet European design saves water, electricity, front loading, washes then dries in same unit, does not need to be vented, perfect size for apartment or closet, see http://www.specializedappliances.com/index.htm for product photos and info, exc. cond., used 1 yr, $400. 323/223-7652.

Vehicles/ Accessories

'94 BAYLINER Trophy 20' power boat, 150hp Mercury outboard, trailer, cuddy cabin, porta potti, 2 fish wells, live well, depth finder, marine radio, stereo/cassette player, auxiliary motor mount, vg cond., motor recently serviced, $12,000/obo. 248-7331, eves.

'00 BMW Roadster convertible, 2.8 liter engine, 5-spd., silver w/black top, custom red/black leather interior, premium sound system with Karman speakers, dealer-installed alarm system, dealer-maintained, just warmed up at 36,000 miles, reduced to $27,500. 323/533-2490.

'95 CHEVROLET Camaro, sliver, t-tops, V6, 5 spd. manual, 80K mi., exc. cond., $8,000. 352-2380.

'93 CHEVROLET pick-up, 1/4 ton, teal green, 2-dr., extended cab, short bed, Duratrunk and liner, towing and 5th wheel ready, good cond., 70,000 mi., $9,000. 661/297-8544.

'81 CHEVROLET Corvette coupe, silver over charcoal/black interior, glass tops, rare 4-spd, a/c, par. brakes/windows/door locks/steering, 6-way pwr., driver's seat, alloy wheels $4,200. 661/299-4999.

'95 EAGLE Summit Wagon, (twin of Mitsubishi Expo), 85K, SUV space w/car-like ride, efficiency, auto, all power, a/c, good mileage, clean, needs trans. work, $1,750/obo. 661/424-1420.

'94 DODGE Stealth, exc. cond., 92,000 mi., black interior, $7,500. 909/989-7563.

'01 FORD Escape XLT, 4 x 4, 3.0 L, V6, all options except side step bar, mocha int./ext., 27K mi., exc. cond., 2 new tires, $19,500/obo. 626/584-3841.

'98 FORD Mustang Cobra, 52,000 mi., engine is all aluminum, dual overhead cam, 32 valve, 305 HP v8, 5 spd., manual transmission, black exterior, tan interior, comprehensive extended warranty. $19,500/obo. 434-0425, Greg.

'98 FORD Ranger XLT, great cond., wht., 2 dr., V6, 4.0, 83k mi, 6" body lift, off road tires, custom brush guard, pwr. everything, A/C, ABS, AM/FM/cass., bedliner, tow hitch, spotlight, email code3media@crownvic.net for link to photos, $11,000/obo. 822-6465.

'91 FORD Taurus, white, 4 dr., fully loaded, A/C, cassette, needs body work on bumper only, runs great, 168K mi., $1,750/obo. 805/583-5129, Jill.

'89 FORD Bronco XLT, full-size, 4 X 4, 5.8L, V8, auto, a/c, ps/pb, roof rack, am/fm/CD $3,200/obo. 661/254-8012.

'87 FORD F-250 PU, 460cid, V8, 4:10-1 diff. auto, A/C, AM/FM, PS/PB, cruise, new tires, 5th wheel hitch/bed cover, 43K mi., good cond., strong tow veh., records available, renewed lic.-Jan. cab top air foil, smog test, $4,600/obo. 626/963-5727.

'87 FORD F150, V8, 5.0, a/c, power everything, auto., cruise control, _ cab & long bedliner, tow ball, HD springs, good cond., $3,000/obo. 951-3653.

'83 FORD 250 XLT, diesel with camper shell, good cond., $1,200/obo. 626/577-2882.

'94 HONDA Nighthawk, 250cc, 2500 miles, exc. cond., kept in garage, $1,500. 562/693-1136.

'91 HONDA Civic DX, 5 spd. man., air, AM/FM stereo/cassette, org. paint/int., new tires, new catalytic converter, $4,000/obo. 213/229-2980, Hunaid.

'89 HONDA Accord LXi hatchback coupe, gray with wine interior, a/c, pwr. windows/ mirrors, AM/FM/cassette stereo, good commuter, 35 mpg hwy., $2,000. 661/299-4999.

'85 KOUNTRY Lite 5th wheel trailer, 30 ft., orig. owner, alum. frame, 13.5K mi., A/C, side bath, microwave, TV/VCP avail, new tires & water pump, sleeps 6., exc. cond., renewed lic.-Mar., $7,200/obo. 626/963-5727.

'91 NISSAN Infiniti G-20, fair cond., $2,600/obo. 957-3675.

'98 TOYOTA Camry LE, exc. cond., automatic, a/c, power locks/windows, AM/FM/cassette, sage, 12 mo. of warranty remaining, 64,000 mi., Blue Book $13,000/obo. 626/797-6388.

'96 TOYOTA Corolla DX, 4 dr., 5 spd., dual air bags, A/C, AM/FM, cassette, CD, all power, tilt wheel, new tires, exc. cond., 137K mi., $5,600/obo. 760/246-3825.

'96 TOYOTA Corolla DX, 28K mi., pwr. windows, pwr. locks, spoiler, exc. cond., $5,500. 909/599-3230.

'88 TOYOTA Corolla, 4 dr., white, new tires, a/c, battery, beautiful cond., $2,800/obo. 626/379-3503.

'86 TOYOTA Celica GT, new paint, sunroof, must sell, $2,300. 626/379-3503.

'01 VOLKSWAGEN Beetle GLS, silver/black leatherette, 5 spd., pwr. locks, windows, & mirrors, cruise, alloys, AM/FM cass, CD changer, fog lights, ABS, remote keyless entry, 8K mi., $16,800. 626/449-0997.

'87 VOLKSWAGEN Syncro Vanagon, 4 WD, 5 spd., white, A/C, am/fm/cass., 130K mi., very good cond., $4,500. 687-3915 or 790-8702, eve.

'97 YAMAHA Virago motorcycle, black with saddle bags, 5,100 miles, exc. cond., $5,000/obo. 805/338-1942, John.

Wanted

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

COMPUTER, laptop at a reasonable price. 626/379-7288, Jasmine.

GUEST HOUSE, in La Canada, excellent references. 951-7305.

ROOM, (bedroom) for $400 a month including utilities, will use it from 2 - 4 nights/week, no Fri., Sat., Sun. or holidays. 535-1286, Charlie.

TAPE RECORDER, reel-to-reel audio, in working condition, should play audiotape reels up to 7 inch in diameter. shugars@juno.com

TILE SAW, wet, 7 or 10 inch diamond blade, good cond. or better only, must be complete. 661/297-0219.

VOLLEYBALL PLAYERS, coed, no beginners please, every Tuesday night from 8 to 10 at Eagle Rock High School, $3 per night. 956-1744, Barbara.

Free

BABY FOOD JARS, glass, great for crafts. 562/420-2313.

BICYCLE, boy's 19" Nishiki Olympic, needs new tires. 952-0474, eves.

PRINTER, Apple Imagewriter dot matrix, ribbons, manual, tractor feed paper, good for banners. 952-0474, eves.

Lost & Found

Lost: FLOWER ARRANGEMENT, "purple iris", silk, from Bldg. 111, Room 150" P", please return, great sentimental value. 4-3500.

For Rent

ALTADENA, condo, minutes from JPL, 2 bd., 1.75 ba., nice closets with organizers, fireplace, central A/C & heat, community pool, storage room, and two car garage (carport), tile counter top and marble floor in kitchen, large patio with landscape, planters and oriental garden with waterfall and spa, end unit with windows on three sides, cable on, $1,200. 626/398-1988.

PASADENA, guest house, above Eaton Canyon golf course, in a beautiful setting, about 1,000 sq. ft., washer & dryer, ideal for one person with a very quiet lifestyle, $895 plus utilities. 626/798-4056.

PASADENA, apt. to share, 2 + 2 + loft, in luxury security complex near Colorado and Lake, living room, loft and kitchen fully furnished, DSL/balcony/pool/Jacuzzi/gym, $750/month. 626/644-5431.

PASADENA, fully furnished, town home-style apartment, 2 bd., 1.5 ba., with A/C, new carpet and flooring, small patio, laundry facility and parking, $1,250 plus utilities; 2 bd.,

PASADENA, 1.5 ba., apt. to share with student, furnished, A/C, laundry facility, parking, $625 plus utilities, both are close to Caltech, & PCC, 7 mi. to JPL. 626/351-9641.

PASADENA, large condo in centrally located complex, 2 bd., 2 ba., office, separate kitchen, 1 mile from Caltech, furnsh., $2,500, 1-yr. lease, available 9/1 626/793-1473.

PASADENA, charming guest house, near Caltech, 1 bd., 1 ba., formal dining room, ornamental fireplace, includes stove and fridge, wall A/C and ceiling fans, laundry room with washer/dryer hookups plus storage room, no pets, $1,050. 626/844-6425.

PASADENA, spacious 2 story condo, 3 bd., 2.5 ba., prestigious community, beaut. inter., bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy l/r w/FP, end unit, frml. d/r, hdwd. flrs., immac. cond., close to schls, $1,750. 626/396-9024.

SAN MARINO, house, 3 bd., 2 ba., 2-car garage with automatic garage opener, newly painted, remodeled kitchen, dishwasher, a/c, laundry hookups, spacious family room overlooking yard, living room with fireplace, close to bus, excellent neighborhood and school district, $2,690. 626/576-7333.

SHADOW HILLS, 3 bd., 2 ba., horse ranch, 1,400 sq. ft. on 5.5 acres, fireplace, view, balcony, pets ok, 13 mi. to JPL, avail. 8/26 $1,595. 626/584-6526, Fred.

SIERRA MADRE, townhouse style apt to share, large patio, 12 x 12 foot bedroom, quiet tree-lined street, garage parking, no smoking, $650 + 1/2 util. 626/355-4838.

SUNLAND, Sunland Village condo, 15 mins./JPL, 2 bd., 1.5 ba., washer & dryer, fireplace, balcony, refrig., stove/oven, dishwasher, garbage disposal, attached oversized double garage with ample storage, 2 pools, Jacuzzi, tennis court, 210 freeway & shopping close by, many JPLers live here for car pooling, $1,100. 951-3653 or 352-0786.

Real Estate

PASADENA, Rose Bowl area, 1910 Craftsman/Victorian transitional, 5 bd., 2 ba., large attics, Cal. basement, dual zone, a/c, large kitchen, many built-ins, fully restored, $585K. 626/584-3841.

SILVERLAKES, Calif., resort, golfer's dream, 4 weeks free golf anytime each year, vacation club membership, 2 bd. condo for up to 6 people, two lakes, many amenities, private PGA rated course with driving range and putting greens, less than 2 hours from Pasadena, exchange rights with 3,000 resorts, reduced to sell due to illness, $15,000. 805/967-7725.

Vacation Rentals

BALBOA ISLAND, fully furnished, 2 bd., 1 ba., sleeps 4, dishwasher, microwave, TV, covered patio, parking, laundry facilities, steps to bay, quiet location, available weekly during the summer, $1200-$1500/week. 626/351-9641.

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

CABO SAN LUCAS, on the beach, two pools, gym, tennis, volleyball, beach grill, short walk to town, one bedroom and sleeper couch, sleeps 4, full kitchen, air conditioning, $750/week. tcfs@aprelix.com.

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

HAWAII, Kona, ocean front on Keauhou Bay, house and guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing and beautiful, swimming, snorkeling, fishing, spectacular view, near restaurants, golf and other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., 4/15-12/14 $105/nite/2, 12/15-4/14 $120/nite/2, $15/nite/add'l person. 949-348-8047, e-mail jackandrandy@cox.net.

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

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

OCEANSIDE condo, fully furnished, 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, in beautiful setting, located at beachside, with barbeque, pool, spa, game room, and great ocean view, easy walk to pier and restaurants, sleeps 8, available weekly or monthly. 909/981-7492 or dfhauge@yahoo.com, Darlene.

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.

Universe

Jet Propulsion Laboratory

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Inside

theme MARS

Rover science team gets ready

By Mary Hardin

Photo by Bob Brown / JPL Photolab

The Fido rover, above at a secret desert location for 10 days of field tests in August. Below are science team members Dr. Eddie Tunstel (left), the rover's lead engineer, and engineer Ashitey Trebi-Ollennu, who worked on operations from JPL.

With less than a year to go before the launch of JPL's Mars Exploration Rover mission, scientists have spent the last few weeks at a high-tech summer camp, rehearsing their roles for when the spacecraft take center stage.

"The purpose of this test is really to teach the science team how to remotely conduct field geology using a rover, rather than to test the rover hardware," said Dr. John Callas, science manager for the Mars Exploration Rover mission at JPL. "We sent one of our engineering development rovers out to a distant, undisclosed desert location, with the science team back at JPL planning the operations and sending commands, just as they'll do when the actual rovers are on Mars."

The 10-day blind test, which ran from Aug. 10 to 19, used the Field Integrated Design Operations testbed, called Fido, which is similar in size and capability to the Mars Exploration Rovers. Although important differences exist, the similarities are great enough that the same types of challenges exist in commanding these rovers in complex realistic terrain as are expected for the rovers on Mars.

"The scientific instruments on this test rover are similar to the Athena science payload that will be carried by the Mars Exploration Rovers," said Dr. Steve Squyres, principal investigator for the Mars Exploration Rover mission at Cornell University, Ithaca, N.Y. "We're using the test rover now to learn how to do good field geology with a robot. When we get to real Mars rover operations in 2004, we'll be able to use everything we're learning now to maximize our science return."

"The test rover has received and executed daily commands via satellite communications between JPL and the remote desert field site," said Dr. Eddie Tunstel, the rover's lead engineer at JPL. Each day, they have sent images and science data to JPL that reveal properties of the desert geology."

The Mars Exploration Rovers will be launched in May and June 2003. Upon their arrival at Mars in January 2004, they will spend at least three months conducting surface operations, exploring Mars for evidence of past water interaction with the surface and looking for other clues to the planet's past.

The science team of more than 60 scientists from around the world will tell the rovers what to do and where to go from the mission control room at JPL. The August test is one of several training operations that are planned before landing.

The rovers are currently being built at JPL and will be shipped to the Kennedy Space Center in Florida early next year to begin preparations for launch. Shortly before the launch, NASA will select the landing sites.

More information about the mission is available online at *http://www.jpl.nasa.gov/news/fact_sheets/mars03rovers.pdf or http://mars.jpl.nasa.gov/mer.*

A description of the Fido rover is available at *http://fido.jpl.nasa.gov.*

For more information about the Mars Exploration Program, log on to *http://mars.jpl.nasa.gov.*

Photo by Dutch Slager / JPL Photolab

Family Day set for Sept. 21

Family members of JPL employees and contractors will have a unique opportunity to get a close-up view of the Laboratory and its activities during JPL Family Day, scheduled for Saturday, Sept. 21.

The event will be held from 10 a.m. to 3 p.m. Tickets are required for JPL staff and their guests, and will be available from Sept. 3–13 at the following locations:

- JPL Store (Building 114-104)
- Credit union (218)
- Employee Services and Recognition (310-203)
- Public Services (186-113)
- Mechanical prototype and hardware fabrication (170-115C)
- Mars Exploration Program (T1722-146)
- Human Resources (180-200).

"Family Day is a great way for JPL families to see where and how work gets done on Lab, something they normally can't do when they visit," said Nancy Kapell of the Employee Services and Recognition Office.

Astronaut Dr. John Grunsfeld will give 25-minute presentations in von Kármán Auditorium starting at 10 a.m. The multimedia presentation "Welcome to Outer Space" will be shown in von Kármán every half hour starting at 1 p.m.

Additional presentations will be offered by the Mars Exploration Program (Buildings 303, 317, 179), Mechanical Prototype and Hardware Fabrication (170), Space Flight Operations Facility (230), Regional Planetary Image Facility (202), Solar System Ambassadors (167), von Kármán visitor center (186) and Telescopes In Education (near credit union, Building 218).

In addition, the Child Educational Center will offer children's activities on the mall; the credit union will be open on the mall to offer new accounts to JPL family members; and the JPL Store will be open for JPL and NASA souvenirs.

Free lunch will be served on the mall from 10:30 a.m. to 2:30 p.m. The menu will include hamburgers, hot dogs, a variety of sandwiches, ice cream, snacks and beverages.

JPL staff must wear their JPL picture badge and must escort their family at all times. Parking is available in the West Lot and Blue Lot only. Staff and their families will bring their tickets to Guest Services on the mall for registration, at which point they will be provided with an event program and lunch ticket.

For more information, call Kapell at ext. 4-9432.

News Briefs

TPF study contracts awarded

NASA has awarded contracts to four companies to study how to build a primary mirror for a coronagraph, one of two possible mission architectures for the planned Terrestrial Planet Finder mission, managed by JPL. The two architectures would use different means to block light from a parent star in order to see the much smaller, dimmer planets that may be orbiting it.

A large optical telescope with a coronagraph is one possible architecture. The system would collect starlight and the very dim reflected light from orbiting planets. This would enable astronomers to detect and obtain spectral information from the planet. The coronagraph and special optics help to reduce the visible starlight, which is typically more than 1 billion times more intense than the reflected light from the planet.

The four companies, each receiving a $250,000 contract, are Eastman Kodak, Commercial and Government Systems., Rochester, N.Y.; Goodrich Corp., Optical and Space Systems Division, Danbury, Conn.; Brashear LP, Pittsburgh; and SSG Precision Optronics, Inc., Wilmington, Mass., with its subsidiary, Tinsley Division, Richmond, Calif.

NASA plans to select one or more mirror concepts in December, and the designated company or companies will then build and test the mirror. The outcome of that process will help NASA decide whether to use the coronagraph as the final mission architecture for the Terrestrial Planet Finder.

The alternative to the coronagraph would be an infrared interferometer, where multiple small telescopes on a fixed structure or on separated spacecraft flying in precision formation would simulate a much larger, more powerful telescope, reducing the starlight by a factor of 1 million, thus enabling the detection of the very dim infrared emission from the planets.

Other mission goals would include characterizing the surfaces and atmospheres of newfound planets, and looking for the chemical signatures of life.

The mission may launch by the middle of the next decade. For more information, visit *http://tpf.jpl.nasa.gov.*

Future planetary scientists visit

Two groups of students spent a week each on Lab in August to participate in the Planetary Science Summer School for future planetary scientists and principal investigators.

Thirty-six Ph.D. students and postdocs participated in team activities to gain insight into developing a mission proposal using the JPL Project Design Center.

Both groups spent time designing mock missions to Mars. The first group designed a scout mission they named the Mars Atmospheric Boundary Layer Explorer. The other group took on an ambitious lander mission, the Mars Water Analysis & Local Radar Underground Survey. At the end of the week both groups presented their proposals to a panel of JPL scientists and engineers for feedback.

The NASA Planetary Science Summer School was started in 1989 by JPL's NEIL NICKLE at the request of DR. JURGEN RAHE of NASA's Office of Space Science. "The first 10 years were a lecture format, but then one of our advisors, DR. JIM HEAD of Brown University, suggested we provide a 'boot camp' for future planetary scientists, an immersion in things it took him a career to learn about planetary missions," said task manager ANITA SOHUS. The response has been tremendous."

Attendees noted that the Caltech and JPL speakers and staff were inspiring, extremely helpful and a great source of information. Some also said the experience helped put their work in perspective and gave them a sense of "the big picture." Their only complaint was that a week was not nearly long enough.

The Planetary Science Summer School was organized by Sohus and ROBERT GERSHMAN.

Sign up now for September fitness

The next six-week session of fitness classes at JPL's Wellness Place is set to begin on Sept. 9. Classes offered are yoga (including advanced), Tai Chi (including mini-sessions), pilates, and aerobics (ultimate gluts and abs, body sculpting and kickboxing).

Visit the Wellness Place website at *http://eis.jpl.nasa.gov/hr/esr/wellness/schedule.htm* for class schedule and registration procedures.

Lab's Aura instruments up to the test

Photo courtesy of Kirk Seaman

Photo courtesy of Dennis Flower

Two JPL instruments that will fly onboard NASA's Earth-orbiting Aura spacecraft underwent environmental testing in August, the first time two instruments on one mission were tested at the same time. Above, technician Chuck Foehlinger checks out the Tropospheric Emission Spectrometer during thermal balance and system level tests in Building 306. At left, instrumentation engineer Doug Perry and thermal engineer Eug-Yun Kwack work on the Microwave Limb Sounder's system thermal vacuum tests in Building 248. Aura is scheduled for launch in January 2004.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

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

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

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Tuesday, September 3

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

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

Music on the Mall—JPL's Ka-Band will perform three selections from the Voyager "Golden Record." Guest speakers Robert Picardo and Patrick Stewart from the Star Trek TV series will also appear. Festivities will be held from 11:30 a.m. to 1 p.m.

Wednesday, September 4

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

Voyager Movie—A new movie with Voyager highlights will be played from 11:45 a.m. to 1:30 p.m. in von Kármán Auditorium. Voyager anniversary cake and punch will be provided for attendees.

Thursday, September 5

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

Voyager Stories and Discussion—Key players in the history of the Voyager mission will comprise a panel discussion from 11:30 a.m. to 1 p.m. Speakers include Bud Schurmeier, pre-launch project manager (1972– 76); Ray Heacock, spacecraft systems manager (1972–79) and deputy project manager (1978–81); John Casani, project manager (1976–78); Charley Kohlhase, mission design manager (1975–89); Dave Linick, sequence team chief (1975–79); Ellis Miner, assistant project scientist (1978–90); and George Textor, project manager/mission director (1989–97).

Bud Schurmeier

Thurs.–Fri., Sept. 5–6

IEEE/JPL Workshop—JPL's Deep Space Communications and Navigation Systems Center of Excellence sponsors this two-day event on wireless communications and networking at the Doubletree Hotel in Pasadena. The meeting's emphasis is on power-efficient wireless ad hoc networks. JPL Director Dr. Charles Elachi will open the meeting with welcome and opening remarks. The agenda includes keynote speakers Dr. Andrew Viterbi, Qualcomm cofounder, and UCLA Prof. Deborah Estrin; a discussion featuring industrial panelists; and education outreach opportunities for local universities, including Caltech, UCLA and USC. See the full program and registration details at *http://dsp.jpl.nasa.gov/cas*. Fees are $250 for IEEE members, $300 for non-members, and $125 for students. For more information, call Marvin Simon, ext.4-3955 or Tsun-Yee Yan, 4-3016.

Von Kármán Lecture Series—Dr. Ed Stone, Caltech physics professor and retired JPL director, will present "Voyager's Exploration of the Outer Solar System" at Thursday in von Kármán Auditorium and Friday at Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Both lectures begin at 7 p.m. The Voyager project scientist will discuss the twin Voyagers' exploration of Jupiter, Saturn, Uranus, and Neptune, which revealed distinctive worlds with many surprises. For more information, see *http://www.jpl.nasa.gov/events/lectures/sep02a.html* or call Public Services at ext. 4-0112.

Dr. Ed Stone

Friday, September 6

Folk Music—The Scottish quintet Old Blind Dogs will appear at 8 p.m. in Caltech's Dabney Lounge. Tickets are $15 for adults and $5 for children under 12. For more information, call (626) 395-4652 or check the Folk Music Society web site at *http://www.cco.caltech.edu/~folkmusi.*

Tuesday, September 10

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

Wednesday, September 11

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

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Roger Carlson at ext. 4-2295 for information.

ALSO SEE LISTING BELOW.

Lab to remember Sept. 11

Flags at JPL will be flown at half-staff on Wednesday, Sept. 11, as the Lab will observe the one-year anniversary of the terrorist attacks on the United States.

JPL will broadcast a memorial from NASA Headquarters, scheduled to air from 7:20 to 8 a.m. Pacific time on Channel 39 of the Lab's TV monitors. This will include an agency-wide moment of silence at 7:29. In addition, a JPL honor guard comprised of the Lab's security guards and firefighters engine will be present on the mall. A JPL fire engine and security car will be in place to commemorate first responders to the Sept. 11 attacks. A moment of silence will be observed at noon.

Staff members may visit von Kármán Auditorium any time during the day for periods of silent refection.

Anyone who feels the need to speak with a counselor is welcome to call the Employee Assistance Program at ext. 4-3680.

Let's Work Together

JPL, Marshall Space Flight Center seal collaboration deal, one of a number of agreements the Laboratory has throughout the agency

By Mark Whalen

A RECENTLY SIGNED COLLABORATIVE AGREEMENT between JPL and NASA's Marshall Space Flight Center is the fourth such alliance JPL has forged with other NASA centers in the past 15 months.

JPL Director Dr. Charles Elachi joined Marshall Director Arthur Stephenson in signing the agreement in early August. The objective is to build an interdependent relationship for infusing Marshall's research and technology development capabilities into JPL's Space and Earth Science flight missions.

Also participating in the signing at the Huntsville, Ala. center were Leslie Livesay, manager of the Avionic Systems and Technology Division; Phil Garrison, manager of the Mechanical Systems Engineering and Research Division; and Jack Stocky, chief technologist for the New Millennium Program.

The Lab had previously agreed to similar alliances with Ames Research Center in northern California, Glenn Research Center in Ohio and Langley Research Center in Virginia.

"We and our alliance partners in NASA can now proactively look for new initiatives in space research and development," noted JPL's Art Murphy, who manages NASA Intercenter Alliance Development.

The collaborations match the centers' expertise in their areas of "core competencies"—in JPL's case, robotic spacecraft; large apertures, interferometry, wavefront sensing and control; sensors, detectors and microdevices; and in-situ life detection—for the centers' mutual benefit. While JPL commits to having the alliance centers' personnel and technology participate in the Lab's future flight missions, the partner institutions commit to having JPL participate in early fundamental research and technology in their core technology areas.

The JPL/Marshall alliance focuses on the areas of autonomous rendezvous and docking, in-space propulsion, avionics and risk modeling. The integration of JPL's and Marshall's capabilities will provide NASA with an aligned approach to in-space transportation technologies and the development of scientific flight missions. The alliance will also incorporate JPL's expertise in unmanned guidance, navigation and control with Marshall's capabilities in rendezvous and docking systems that support human exploration. The centers also will cooperate to enable a more comprehensive assessment and understanding of the risks related to the development of new space transportation systems.

The other JPL alliances, with each center's areas of specialty, are:

• Langley: materials and structures, atmospheric flight technology, system analysis

• Ames: engineering of complex systems, mission data systems, information technology, bio-nanotechnology

• Glenn: electric power, propulsion, spacecraft communications and risk models

While there is sometimes an overlap in centers' responsibilities, "It's here where we can develop new and exciting opportunities, working as one NASA," Murphy said. "It's planned cooperation rather than our past competition.

Marshall Space Flight Center Director Art Stephenson, left, and JPL Director Dr. Charles Elachi sign an alliance agreement between the two centers.

"JPL and the other NASA centers will in the future present to NASA headquarters joint technology program proposals."

In fact, Murphy said, JPL and Langley are developing a joint proposal to NASA and the Department of Defense for research and development of a spacecraft technology called Intronics. The alliance with Ames has resulted in that center's development of a software planning/visualization tool for the Mars Exploration Rovers once they land, and Ames has also provided significant contributions to JPL's Mission Data System activities.

JPL's alliance with Glenn Research Center is presently being directed at future electric propulsion and other fundamental propulsion system technologies.

To augment the existing agreements, plans are underway to develop new JPL alliances with Dryden Flight Research Center at Edwards Air Force Base and Stennis Research Center in Mississippi.

JPL's intercenter agreements are reviewed about every six months by Elachi or Deputy Director Eugene Tattini. "It's almost like a review of a major mission or project," Murphy said. He added that JPL technical leaders who have signed "sub-agreements" to aid in carrying out the alliances also report achievement milestones to Elachi every six months.

This story was adapted in part from an article in Marshall Space Flight Center's Marshall Star. Thanks to writer Lynnette Madison and editor Jonathan Baggs.

Service awards

The following JPL 2002 third quarter Service Award recipients celebrating 20 or more years of service were invited to attend a luncheon and ceremony in their honor on Sept. 20.

45 years: John Casani, Jay Schmuecker.

40 years: John Beedy, Arvydas Kliore, Gary Kunstmann, Richard Parker, Frederick Stuhr, Dale Thornton, Donald Wetton.

John Casani

35 years: Bruce Conroy, James Miller, Ellis Miner, Richard Nonaka, John Rohr, W. Van Snyder, James Stultz, David Swenson, William Weber III.

30 years: Camille Hayes, George Purcell Jr., E.M. Standish Jr., Bruce Tsurutani, Kathleen Ulrich, Gene Wester, Chen-Wan Yen.

25 years: Robert Barry, William Blume, James Collier, Minoo Dastoor, Govind Deshpande, Jean Dickey, Robert Easter, Martha Hanner, Satish Khanna, Bruce McLaughlin, Larry Preheim, Ronald Reeve, Annie Richardson, Eddy Shalom, Robert Staehle, Jan Tarsala, Catherine Yee, Jose Zavala.

20 years: Susan Argenio, Michael Blakely, David Brinza, Magdi Carlton, Michael Coryell, James Dillon, Carolina Flores-Helizon, Frank

EMPLOYEE SERVICES & RECOGNITION

Kuykendall, Robert Laskin, Roger Lighty, Farzin Manshadi, Richard W. Markley, Laurence Reinhart, Jerry Suitor, Arthur Thompson, Robert Treuhaft, Duc Vu, Leslie White, Brian Wilcox.

Calling all Mariner 2 team members

The Public Services Office is trying to locate members of the Mariner 2 project for a special JPL event in December.

Mariner 2, the first spacecraft to fly by another planet, launched in August 1962 and flew by Venus on Dec. 14 of that year. The JPL event will commemorate the Venus encounter.

What was once merely speculation about distant planets was verified by Mariner 2's abundant science return. Mariner 2 carried six instruments, including a microwave radiometer, an infrared radiometer and a cosmic dust detector. In addition to being the first spacecraft to cruise interplanetary space, it also measured solar wind for the first time. This elusive stream of charged particles emanating from the Sun could hold keys to the formation of the universe.

Mariner 2 team members are asked to call Public Services at (818) 354-0112.

A Mariner 2 team member gives the spacecraft a final check in one of the high bays.

View this and previous issues of Universe online

http://universe.jpl.nasa.gov

Universe

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Notice to Advertisers

Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission. Ads must be submitted on ad cards, available at the JPL Store and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

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

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

Classifieds

For Sale

BABY ITEMS: soft front carrier, Evenflo, $7; car seat w/base, Century, rear-facing, $40; bathtub carrousel, Safety1st, $7, all in superb cond., prices are obo. 626/791-6101.

BABY TOYS, Activity Garden, Little Tykes, includes plastic vegetables, mail and mailbox, birds, and some flowers on the side, for 6m - 2y, $25/obo; Angel Fish Rocker, very cute, yellow, $15; Little Smart Peek-a-Boo Apple Acres, by VTech Electronic, new, $10/obo; Alphabet Apple, by VTech, ages 3-5 years, for learning the ABCs and phonics, $9/obo; Nursery Rhyme, 6m-2y, $10/obo. 952-0328.

BARBECUE, gas, high quality, gd. cond., $50. 790-7372.

BBQ, gas, incl. 5-gal. tank, $20/obo; BASKETBALL HOOP, backboard & mount for wall/ garage, $15/obo; both items gd. cond. 626/ 791-7645.

BED, king, solid wood bed frame w/nightstand, vg cond., picture avail., must see, $600/obo; MATTRESS, vg quality, king, $500/obo; PIANO, upright, quite old but in gd cond., $500/obo. 626/584-1164.

BELLY DANCE COSTUMES, sparkly nightclub styles, med. sizes; black/multicolor, $500; pink/black $400; purple/silver, $375. 323/258-7037.

CAMCORDER, Sony Hi-8, model CCD-TR81, remote, carry case, 8 blank tapes, works well, $155/obo. 687-8627.

CAMERA, Mamiya M645 SLR, A & E prism, 220 back, w/120 & 220 roll film holders & inserts, deluxe power motor dr. lenses, 45 mm, 80 mm & 105-210 zoom, Sunpak auto flash, mod. 555, alum. case, $2,000. 323/257-7668.

CATAMARAN, Hobie 16, 1982, exc. cond., would like to share the use with a person or group willing to provide parking or share the cost of storage. 323/227-7799 or martin_ regehr@yahoo.com, Martin.

CHAIRS, 2, patio lounge, beige vinyl straps, exc. cond., $25/both. 626/359-7666.

CHILDREN'S ITEMS: rocking horse, antique, hand-made, walnut, 40" tall, $70; highchair, walnut, perfect cond., will negotiate, $40. 323/469-2816.

CRIB, beautiful wood, w/Sealy mattress, exc. cond., $100. 790-7372.

COFFEE MAKERS: Krups, 10-cups, white/gray, like new, $40/obo; Braun, 10-cups, white/ black, like new, $30/obo. 626/791-6101.

CURIO, Italian imported, black lacquer, 3 x 8 ft., glass double door, beautiful, elegant, exc. cond., $650. 323/256-0535.

DINING TABLE, beautiful Italian imported lacquer, 6.8 ft. long, enlarges to 8 ft., w/elegant high-back chairs (white upholstery) in exc. cond., complete set $1,400. 323/256-0535.

DRYER, Kenmore, heavy duty, gas, 4 cycles, 8 temperatures, good cond., $100/obo. 626/797-9846, after 6 p.m.

ENTERTAINMENT CENTER, Ikea, holds 32" TV, VCR, stereo and more, $80/obo; CD TOWER, holds 350 CDs, $30/obo. 626/791-8161.

FAUCETS, one kitchen, two bathroom (one single handle, one double handles), all in like-new cond.; DRAWER/CABINET PULLS, chrome, never used. 626/296-1537, Ed.

FISH TANK, 60 gal. w/ stand and hood, fresh water, filters, pumps, gravel, heater, plants, etc, $120/all. 353-4400.

FURNITURE: loveseat and ottoman, $350; loveseat, Italian leather, $450; dining set, corner nook, $350, sell separately or all for $1,000/obo. dbljo7@yahoo.com or 626/535-9645, Jo Anne.

KITCHEN DOORS, 2, from So. Pas. mansion, solid wood, elaborate decoration, beveled glass, no finish on wood, $1,200 obo. 626/287-9433.

MEAT SLICER, electric, like new,$20/obo; EXERCISER, Fitness Flyer, no impact, displays elapsed time, calories and count of repetitions, like new, $100/obo. 249-8079.

MOVING SALE: chair, elegant, Queen Anne, overstuffed; loveseat, burg., velvet; coffee table, beautiful, octagonal, marble; end tables, walnut tables; exercise bike, Healthrider; electric typewriter, portable, full-sized, Smith-Corona; all exc. cond.; priced to sell; will negotiate. 323/469-2816.

PLAY EQUIPMENT, outdoor, Little Tikes, Castle Climbing Structure with tower and slide, $80; small slide, $15; Cozy Coupe Car, $25; desk w/chair and compartment storage, $45. 626/797-9846, after 6 p.m.

PIANO, Clavinova digital, Yamaha CLP 411, exc. cond., black, with bench, $1,200/obo. 626/475-5790.

PIANO, upright, quite old but in good cond., $500/obo. 626/584-1164.

PLATES, 20-25, porcelain, collectible, $75/ set; LOUNGE CHAIRS, 2, beige, vinyl, strapped, exc. cond., $20/both; BIKES, 2, exc. cond., l boy's, 1 girl's, $15/ea. 626/359-7666.

PLAYSET, Step 2, child slide and swing combo, $125. 790-7600.

SCANNER, brand new, Visioneer OneTouch 5800 USB 48-bit color, 600 x 1200 dpi, supports Windows 98/2000/Millennium/XP, $40. 956-3745, Steve.

SKI SET, used women's Head 170s Gala radial & poles, Salomon boots, size 7 and bindings, see picture at JPL Store, $80. 626/744-9064.

SOFA, makes into queen-size bed, abstract black, blue & mauve design, gd. cond., $300; LADDER, $50; REFRIGERATOR, GE side-by-side, beige, 17 years old, $75. 626/357-8210.

SOFA, gd cond., black, blue, mauve, gold; std. sz.; $200; DINETTE TABLE, glass circular top, 40" diam., wood base; REFRIGERATOR, 18 cu. ft., Frigidaire Crown, exc. cond., white, top freezer, auto defrost, $300; CHAIRS, 4, $60. 323/478-0105.

SOFA, sectional, beige, very comfortable, matching pillows, $200/obo; DINING TABLE SET, dk. brown wood w/forest green trim, very nice, comes w/6 chairs, $200/obo. 952-0328.

VACATION CLUB MEMBERSHIP, Silverlakes, Calif., resort, golfer's dream, 4 weeks free golf anytime each year at private PGA-rated course w/driving range and putting greens, 2 bd. condo for up to 6 people, 2 lakes, many amenities, less than 2 hrs from Pasadena, exchange rights with 3,000 resorts, reduced to sell due to illness, $15,000. 805/967-7725.

VIOLIN, Suzuki, 1/2 size, w/case, gd. cond., $350. 248-4551.

Vehicles / Accessories

'95 ACURA Integra "Special Edition," black, 4 door, w/body kit, 18" wheels, black leather interior, 5-speed stick, a/c/heat, std. stereo, only 134,000 miles, exc. cond., picture in JPL Store, $8,500/obo. 323/276-6778.

'97 BMW 328i convertible, silver w/black soft top, gray leather int., 12,800 miles, in mint cond., loaded with sport package, 6-disc CD changer, dual-zone climate control & more, must see to believe, $24,500/obo. 952-5689.

'97 BMW 528i, dk. blue leather, 87K miles, 6 cyl., 2.8L, auto, rear wheel drive, premium pkg. a/c, p/s, c/c, 4-wheel ABS, tilt wheel, alarm, traction control, alloy wheels, sunroof, like new, Kelley Blue Book price $24,775, now $18,500. 626/222-8864.

'95 CHEVROLET Camaro, silver, T-tops, V6, 5-speed manual, 80K miles, exc. cond., $8,000. 352-2380.

'94 CHEVROLET Astro cargo van, V6, auto trans, a/c, p/s, p/b, airbags, ABS, am/fm stereo, cust. whls, exc. cond., new paint, tires, shocks & brakes, Cargo King bedliner, all records, 125K mi., $5,000/obo. http:// www.stonehillnews.com/astro, astro@ stonehillnews.com, 626/399-6276, Jeremiah.

'81 CHEVROLET Corvette coupe, silver over charcoal/black interior, glass tops, rare 4-spd, a/c, pwr. brakes/windows/door locks/ steering, 6-way pwr. driver's seat, alloy wheels, $4,200. 661/299-4999, Michael.

'99 FORD F-250 Lariat, super-duty crew-cab pickup, 4 dr., 2 w/d, tow pkg., loaded, 5.4L V8, 37,500 mi., dk. green, custom pin striping, buckskin leather interior, matching SnugTop canopy w/custom carpet kit inside, must see, $21,500/obo. 661/424-9441, after 5 p.m.

'99 FORD Taurus wagon, metallic silver, great family car, 12-valve V6 3.0 L engine, 80K mi., exc. cond., $8,300/obo. 626/584-1164.

'97 FORD Explorer XLT, only 40K mi., very clean, exc. cond., garage parked, 100% dealer servicing, am/fm/cass., new tires/brakes, $10,500. 626/355-5631, Tim, eve. before 10 p.m.

'94 FORD T-Bird, red, auto, pwr. steering/ brakes/doors/windows/seat, tilt wheel, cruise control, AM/FM radio, cassette, new tires, alarm w/keyless entry, 1 owner, all maint. records, exc. cond., $3,900. 909/596-8117.

'68 FORD Mustang Classic Calif. Special GT/CS, hi-perf. 302 cid, 75K orig. mi., auto, fac. A/C, PS, AM radio, metallic gold paint, black interior, GT hood, trunk, fogs and wheels, no rust, turns heads. $13,250/obo. 626/963-5727.

'96 HONDA Civic LX, 4 cyl., 1.6L auto, green, 4 dr., exc. cond., a/c, power steering/windows/ door locks, ABS, tilt wheel, cruise cont., dual front airbags, auto alarm, tinted windows, $5,800. 661/252-6539.

'93 HONDA Accord SE, 4 dr., 129K mi., automatic, leather, sunroof, dk. green/champagne, all power, new tires/breaks, am/fm/cass. stereo, Bose speakers, alarm, great cond., clean title, well maint., serviced regularly, must sell. 216-0410 or ytka98@yahoo.com.

'91 HONDA Civic DX, 5 spd. man., air, am/fm/ stereo cass., org. paint/int., new tires, new catalytic converter, $4,000/obo. 213/229-2980, Hunaid.

'89 HONDA Accord LXi hatchback coupe, gray w/wine interior, a/c, pwr. windows/mirrors, am/fm/cass. stereo, 5-spd., gd commuter, 35 mpg hwy, $2,000. 661/299-4999, Patty.

'91 JEEP Cherokee Laredo, 2-wheel dr., 4 wheel dr. compass, temp., cruise cont., loaded, all power, $3,000/obo. 323/256-6634.

'91 JEEP Cherokee Laredo, 4x4, blue ext., beige interior, 149,041 mi., 4.0L straight 6, power windows/door locks/seats/mirrors, cruise cont., tinted windows, tow pkg., alarm, AM/FM CD player w/removable face and prem. sound, Smittybilt running boards, alloy wheels, 3" Rancho suspension lift w/shocks, Borla exhaust header, roof rack, new battery, very well maintained w/maint. records, see to appreciate, $4,500/obo. 626/798-3566.

'01 LEXUS ES300, 11,200 mi., exc. cond., all options, 60K warrantee and 3-year interior/ exterior Auto Armor, $31,000. 661/296-7979.

'87 MERCEDES BENZ 300SDL, fair cond., $5,500. 626/797-8845.

'90 MERCURY Capri, convertible white/black top, manual transmission, 90,000 miles, $2,000/obo. 323/662-0257, Willy/Joyce.

'95 NISSAN Sentra, vg cond., auto, a/c, power windows/locks, am/fm/cass., silver ext., $2,800/ obo. 626/796-9098.

'91 NISSAN Infiniti G-20, fair cond., $2,600/ obo. 957-3675.

'67 OLDS Toronado parts: hub caps, brake drum, front wheel opening moldings, distributor cap, headlight switch, air cleaner housing, bumperette, $75; '86 or earlier CHEVY Suburban parts: full size p/u, 454: new fuel pump, front bumper, 4 steel factory 8-lug wheels & hub caps, 3 new thermostats, mirrors, starters, alternator repair manuals and more, everything for $150/obo. 249-8079.

'01 TOYOTA Tacoma, w/shell, loaded, less than 7,000 miles, must sell, price negotiable. 213/ 413-0928, Norma.

'96 TOYOTA Corolla DX, auto, 23K miles, power windows/locks, spoiler, a/c, exc. cond., $5,000. 909/599-3230.

'96 TOYOTA Corolla DX, 4 dr., 5 spd., dual air bags, a/c, am/fm/tape, CD, tilt wheel, new tires, all pwr., 137K mi., exc. cond., $5,600/ obo. 760/246-3825.

'94 TOYOTA 4Runner, V6, 4x4, auto, loaded, champagne w/tan cloth interior, 120,000 miles, 40,000 on new engine, alloy wheels, $10,700/obo. 242-6655.

'94 TOYOTA Camry LE, beige, automatic, 4 dr., dual air bags, a/c, am/fm/cass., pwr. steering/ locks/windows/mirrors, tilt wheel, cruise cont., exc. cond., very low mi. 47K, $6,800. 468-6558.

'90 TOYOTA Camry LE, V6, auto, 4 dr., 130K miles, sun/moon roof, cruise control, all power, am/fm/cass./CD, smog checked, new tires, $3,200/obo. 310/313-0284.

'87 TOYOTA Supra, turbo, lift back, 2 dr., straight body, new 16" tires, blown head gasket, other parts new, must sell ASAP, $650/obo. 909/596-8117.

'01 VOLKSWAGEN Beetle GLS, silver/black leatherette, 5 spd., pwr. locks, windows, & mirrors, cruise, alloys, AM/FM/cass., CD changer, fog lights, ABS, remote keyless entry, 10K mi., $16,800. 626/449-0997.

Wanted

APT. / HOUSE, 2 bd. in Pas./S.Pas./ Glendale area before Oct 1. 626/345-0241, eves.

FITNESS STEP, for step aerobics, large Reebok or equivalent. 626/345-0681.

GLASS SOLAR FILTER, to fit discontinued Orion 8" Deep Space Explorer reflector. 626/345-0241, eves.

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

SQUARE DANCERS, new class starting Monday nights, Sept. 9 in Glendale, beginners and dancers who want to learn modern, Western Square Dancing, also those who want to brush up on their skills. 957-7554, Bob or 248-1772, Diane.

Free

DUCKLINGS, white ducks, hatched Aug 4, 2002. 626/795-4537, Bob.

FIREWOOD at house near JPL. 790-6395.

GARAGE DOORS, barn style, must take all four. 626/287-9433.

KITTENS, 8, adorable, healthy & friendly. 626/287-9433.

PUPPY, 8 weeks old, Charpe mix, all black, has first set of shots. 626/287-9433.

Lost & Found

Found: RING, 10K gold, w/stones, on Aug. 1 on 9 a.m. bus from East lot. Ext. 3-7268.

For Rent

LA CANADA, 2 bd., 1 ba. house above Foothill, fireplace, beamed ceilings, cent. air/heat, washer/dryer, no pets, $1,500, 249-9577.

LA CANADA, private rm. w/bath in lovely home, some kitchen priv., util. pd., garage, JPLer preferred, no smoking, $450. 952-3382.

LA CRESCENTA house, above Foothill, 3 bd., 2 ba., 2 fp, fruit trees, fenced yard, patio, quiet cul-de-sac, easy fwy access, 10 min/JPL, $1,950. 957-7554.

MONTROSE, sm. studio cottage, bed., lv. rm., kitch. in one room and full ba., avail. Oct 1, very private, trees, Briggs area. 248-7499.

PASADENA, guest house, above Eaton Cyn. golf course, beautiful setting, about 1,000 sq. ft., washer & dryer, ideal for one person with a very quiet lifestyle, $895 plus utilities. 626/798-4056.

PASADENA, spacious furnished condo, 2 bd., 2 ba. & office, large living/dining room with balcony, immaculate condition, centrally located, 1 mile from Caltech, available 10/1, $2,300/neg. 626/793-1473 or 626/585-9971.

PASADENA, elegant one-level Spanish style house south of Ritz Carlton on beautiful tree-lined st., 3 bd., 3 ba. with patio, deck, fruit trees, and lots of roses, appliances and gardener included, no pets or smokers, asking $3,700. 626/844-4670, Sandie or Mike.

PASADENA area, 3 bd. to share, 1 rm. avail. Sept. 1, 1,950 sq. ft. apt. on Madison betw. California & Del Mar, gar. prkng incl., on-site laundry facilities, pool & Jacz., lg. shared liv. rm., bd. unfurn-ished, month to month lease, $565 + $800 deposit. 626/449-5882 .

PASADENA, fully furn., townhome-style apt., 2 bd., 1.5 ba., with a/c, new carpet and flooring, small patio, laundry facility and parking, $1,250 plus util.; PASADENA, 2 bd., 1.5 ba., apt. to share w/student, furn., a/c, laundry facility, parking, $625 + util., both are close to Caltech & PCC, 7 mi. to JPL. 626/351-9641.

PASADENA, spacious 2 story condo, 3 bd., 2.5 ba., prestigious community, beaut. inter., bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy l/r w/FP, end unit, frml. d/r, hdwd. flrs., immac. cond., close to schls, $1,750. 626/396-9024.

PASADENA apt., charming 1 bd., 1 ba., 2 blocks/ PCC, new paint, carpet, fixtures, plumbing & electrical, $1,000 w/basic util. incl. 590-2793.

PASADENA, walk to Lake Ave. shopping & Caltech from charming 1920s apt. w/2 bd., 2 ba., LR, DR w/fplc., office & lg. front enclosed deck area, 1,450 sq. ft., cov. parking for 2 cars, water/trash/gardener paid. 249-3602 or 626/398-8865.

SAN GABRIEL, house to share, fully furnished 2 bd., 1 ba., no pets, utilities included, $450. 626/292-8042.

SAN MARINO house, 3 bd., 2 ba., 2-car gar. w/auto. gar. opener, newly painted, remodeled kitch., dishwasher, a/c, laundry hookups, spacious fam. rm. overlooking yd., liv. rm w/ fireplace, close to bus, exc. neighborhood and school district, $2,580. 626/576-7333.

SIERRA MADRE, townhouse-style apt. to share, large patio, 12 x 12 ft. bd., quiet tree-lined street, garage parking, no smoking, $650 + 1/2 util. 626/355-4838.

TEMPLE CITY, 1928 Tudor home, lease/rent, complete remodel, 2 bd., 1 ba., hdwood/ travertine flrs, 2 decks, lg yard, office, loft, bonus room & more. 626/287-9433.

TEMPLE CITY, rear home lease or rent, complete remodel, 1 bd., 1 ba., ceramic tile/Berber flooring, huge patio, auto gate for parking & more. 626/287-9433.

Real Estate

MONROVIA house, 3 bd., 1.75 ba., 1,559 sq. ft., raised hearth stone frplc., lots of custom oak cabinets, master suite w/dressing area/ vanity, only 12 yrs old, new paint. 952-6007.

PASADENA townhouse, great loc. betw. S. Lake Ave. / Caltech, 2 bd., 2.5 ba., + office or den, wood-burning fireplace, security gate & priv. 2-car gar., laundry in unit, patio, vw. of garden & beautiful tree-lined st., $389,000. 626/844-4670, Sandie or sandiesz@pacbell.net.

POMONA, Phillips Ranch area, nice 2-story pool home, with 3 bd., 2.5 ba., new paint, upgrades throughout, finder fee $315K. 909/623-4063 or 726-1632, cell.

Vacation Rentals

BALBOA ISLAND, fully furn., 2 bd., 1 ba., slps. 4, dishwasher, microwave, TV, covered patio, parking, laundry facilities, steps to bay, quiet location, available weekly during the summer, $1,200-$1,500/week. 626/351-9641.

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

HAWAII, Kona, ocean front on Keauhou Bay, house & guest house comfortably slp. 6, 3 bd., 2 ba.; rustic, relaxing, beautiful; swim-ming, snorkeling, fishing, spectac. view, near restaur., golf, other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd w/loft, compl. furn., phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., 4/15-12/14 $105/nite/2, 12/15-4-14 $120/nite/2, $15/nite/ add'l person. 949/348-8047, jackandrandy@ cox.net.

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

OCEANSIDE condo, fully furn., 2 bd., 2 ba., fireplace, full kitch.,, quiet, relaxing, beautiful beachside setting; BBQ, pool, spa, game rm., great ocean view, easy walk to pier & restaurants, slps 8, avail. weekly or monthly. 909/ 981-7492 or dfhauge@yahoo.com, Darlene.

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

PUERTO VALLARTA, Villa del Mar, lg. studio, sleeps 4 max, rms have microwave, kitch., phones, cable TV, priv. patio; 3 pools, 3 restaur., spa, priv. beach, charming town, top-rated resort; avail only 12/28/02 - 1/4/03, on-site New Year's Eve Fiesta, see at http://www.myuvc.com/puerto_vallarta.shtm. 541-1340.

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.