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Inside

Odyssey measures water ice on Mars

By Mary Hardin

USING INSTRUMENTS ON JPL'S 2001 MARS ODYSSEY SPACECRAFT, SURPRISED SCIENTISTS HAVE FOUND ENORMOUS QUANTITIES OF WATER ICE BURIED JUST UNDER THE SURFACE OF MARS — ENOUGH TO FILL LAKE MICHIGAN TWICE OVER.

"This is really amazing," said Dr. William Boynton of the University of Arizona, principal investigator for Odyssey's gamma ray spectrometer suite. "This is the best direct evidence we have of subsurface water ice on Mars. We were hopeful that we could find evidence of ice, but what we have found is much more ice than we ever expected."

Scientists used Odyssey's gamma ray spectrometer instrument suite to detect hydrogen, which indicated the presence of water ice in the upper meter (three feet) of soil in a large region surrounding the planet's south pole. "It may be better to characterize this layer as dirty ice rather than as dirt containing ice," added Boynton. The detection of hydrogen is based both on the intensity of gamma rays emitted by hydrogen, and by the intensity of neutrons that are affected by hydrogen. Odyssey's high-energy neutron detector and the neutron spectrometer observed the neutron intensity.

The amount of hydrogen detected indicates 20 to 50 percent ice by mass in the lower layer. Because rock has a greater density than ice, this amount is more than 50 percent water ice by volume. This means that if one heated a full bucket of this ice-rich polar soil it would result in more than half a bucket of water.

The gamma ray spectrometer suite is unique in that it senses the composition below the surface to a depth as great as one meter. By combining the different type of data from the instrument, the team has concluded the hydrogen is not distributed uniformly over the upper meter but is much more concentrated in a lower layer beneath the top-most surface.

The team also found that the hydrogen-rich regions are located in areas that are known to be very cold and where ice should be stable. This relationship between high hydrogen content with regions of predicted ice stability led the team to conclude that the hydrogen is, in fact, in the form of ice. The ice-rich layer is about 60 centimeters (two feet) beneath the surface at 60 degrees south latitude, and gets to within about 30 centimeters (one foot) of the surface at 75 degrees south latitude.

"Mars has surprised us again," said Dr. Steve Saunders of JPL, Odyssey's project scientist. "The early results from the gamma ray spectrometer team are better than we ever expected. In a few months, as we get into Martian summer in the northern hemisphere, it will be exciting to see what lies beneath the cover of carbon dioxide dry ice as it disappears."

"The signature of buried hydrogen seen in the south polar area is also seen in the north, but not in the areas close to the pole," noted Dr. William Feldman, principal investigator for the neutron spectrometer at Los Alamos National Laboratories, N.M. "This is because the seasonal carbon dioxide (dry ice) frost covers the polar areas in winter. As northern spring approaches, the latest neutron data indicate that the frost is receding, revealing hydrogen-rich soil below."

PIA03803

This diagram shows a possible configuration of ice-rich (lower layer) and dry soil in the upper meter (three feet) of Mars.

"The big questions we are trying to answer are, 'Where did all that water go?' and 'What are the implications for life?'" said Dr. Jim Garvin, Mars Program Scientist at NASA Headquarters. "Measuring and mapping the icy soils in the polar regions of Mars, as the Odyssey team has done, is an important piece of this puzzle, but we need to continue searching, perhaps much deeper underground, for what happened to the rest of the water we think Mars once had."

Another new result from the neutron data is that large areas of Mars at low to middle latitudes contain slightly enhanced amounts of hydrogen, equivalent to several percent water by mass. The team's preliminary hypothesis is that this relatively small amount of hydrogen is more likely to be chemically bound to the minerals in the soil, than to be in the form of water ice.

For images of the water ice findings, as well as more information about Odyssey and the gamma-ray spectrometer, visit *http://mars.jpl.nasa.gov/odyssey*.

Odyssey exposes rock layer history

By Mary Hardin

THERE ARE TANTALIZING INDICATIONS EMERGING FROM THE THOUSANDS OF INFRARED IMAGES TAKEN SO FAR BY NASA'S MARS ODYSSEY SPACECRAFT THAT MARS EXPERIENCED A SERIES OF ENVIRONMENTAL CHANGES DURING ACTIVE GEOLOGICAL PERIODS IN ITS HISTORY.

PIA03806

Infrared imaging from Mars Odyssey shows signs of layering exposed at the surface in Mars' Terra Meridiani region.

"We knew from Mars Global Surveyor that Mars was layered, but these data from Odyssey are the first direct evidence that the physical properties of the layers are different," said Dr. Philip Christensen, principal investigator for Odyssey's camera system and professor at Arizona State University. "It's evidence that the environment changed over time as these layers were laid down. "The history of Mars is staring us in the face in these different layers, and we're still trying to figure it all out."

"I expect that the primitive geologic maps of Mars that we have constructed so far will all be redrawn based on Odyssey's new information," said Dr. Steve Saunders of JPL, Odyssey's project scientist .

A mosaic of daytime infrared images of the layered Terra Meridiani region shows a complex geology with craters and eroded surfaces, exposing at least four distinct layers of rock. Though the image does not include the infrared "colors" of the landscape (showing surface mineral composition), it does map the temperatures of the features, with surprising results.

"With these temperature data, Odyssey has already lived up to our expectations, but Mars, in fact, has exceeded our expectations," Christensen said. "It would have been entirely possible for the rocks of Mars to have been very similar and thus give us all the same temperatures, but Mars has a more interesting story to tell and we have the data to tell it."

The images can be seen at *http://www.jpl.nasa.gov/images/mars/index.html*.

Christensen presented his findings at the spring meeting of the American Geophysical Union.

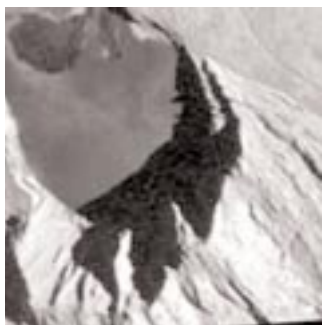
"When we look at these distinct layers we see that the temperatures are very different, indicating that there are significant differences in the physical properties of the rock layers," he said.

The differences in surface temperature could be caused by the fundamental differences in either the size of the rock fragments in the layer, the mineral composition or the density of the layers.

Odyssey's imaging team is working on fully processing the infrared images, a complex and difficult task. When finished, the data will help them test some important theories about what causes the layers on Mars by examining the mineral composition of the specific layers. Plausible explanations include a history of volcanic activity depositing layers of lava and volcanic ash; a history of different processes that created the layers through wind and water; or a history of climate change that varied the nature of the materials deposited.

Christensen theorizes that the layers are caused not by surface effects, but by changes in the planet's subsurface water table. The presence or absence of water and the minerals carried in it can significantly affect how sediment particles are cemented together. With no clear evidence for surface water, precipitation or runoff, Christensen believes that changes in levels of underground water percolating through layers of buried sediments could account for differences in rock composition between layers. More complete infrared data will help to confirm or disprove this and many other hypotheses concerning Mars' geology.

News Briefs



This newly released Galileo image of Jupiter's moon Io shows details of the mountain called Tohil Mons, a small dark-floored volcanic crater. New images were taken soon after sunrise at Tohil, with a resolution of 50 meters (160 feet) per picture element to reveal details never seen before.

Galileo delivers diverse Io images

The final images are in, and the resulting portrait of Jupiter's moon Io, after a challenging series of observations by JPL's Galileo spacecraft, is a peppery world of even more plentiful and diverse volcanoes than scientists imagined before Galileo began orbiting Jupiter in 1995.

Now that Galileo's observations of Io have ended, scientists are focusing on trying to understand the big picture of how Io works by examining details.

Thirteen previously unknown active volcanoes dot infrared images from Galileo's final successful flyby of Io, JPL volcanologist DR. ROSALY LOPES reported last month at the spring meeting of the American Geophysical Union.

That brings the total number of known Ionian hot spots to 120. Galileo images revealed 74 of them.

"We expected maybe a dozen or two," said DR. TORRENCE JOHNSON, Galileo project scientist at JPL. That expectation was based on discoveries by JPL's Voyager spacecraft in 1979 and 1980, and subsequent ground-based observations.

Galileo's latest images, which also show tall slopes crumbling and surface deposits from two eruptions' recent giant plumes, are available online at *http://www.jpl.nasa.gov/images/io.*

Four JPLers on Mars '03 science team

Four JPL scientists are among 28 selected by NASA to participate in the 2003 Mars Exploration Rover Mission. The mission consists of two separate, though identical, rovers scheduled for launch in mid-2003 and arrival at separate destinations on Mars in early 2004.

The selected proposals were judged to have the best science value among 84 proposals submitted to NASA last December in response to the Mars Exploration Rover Announcement of Opportunity.

Each selected investigation will work with the Mars Exploration Rover Program Office at JPL, and will become full mission science-team members, joining previously selected scientists as part of the Athena payload science team.

"The breadth, scope, and creativity of the scientists selected is very encouraging," said DR. ED WEILER, NASA associate administrator for space science. "By directly participating in NASA's next mission to the surface of Mars, they will help bring us closer to the long-term objective of our Mars Exploration Program—understanding Mars as a planet and determining whether life ever existed there."

The JPL scientists selected and their investigations:

• WILLIAM FOLKNER: Measurement of Mars Rotation Changes with the Mars Exploration Rovers;

• MATTHEW GOLOMBEK: Directing Long Range Rover Traverses using Orbital Surface Predictions and Mars Exploration Rover Ground Truth;

• TIMOTHY PARKER; Sedimentary Stratigraphy and Geomorphology of the rover A and B Landing Sites;

• ALBERT YEN: Soil Formation without Liquid Water: An Assessment of the Meteoritic Contribution to the Martian Surface.

The rover mission science objectives include: (1) study rocks and soils for clues to past water activity; (2) investigate landing sites that have a high probability of containing evidence of the action of liquid water; (3) determine the distribution and composition of minerals, rocks and soils surrounding the landing sites; (4) determine the nature of local surface geologic processes; (5) calibrate and validate data from orbiting missions at each landing site; and (6) study the geologic processes for clues about the environmental conditions that existed when liquid water was present, and whether those environments were conducive for life.

For a list of the other selected investigators, log on to *http://www.jpl.nasa.gov/releases/2002/release_2002_124.html.*

Heritage Week coming up

JPL's 22nd annual American Heritage Week will be celebrated Monday, June 10 to Thursday, June 13. Sponsored by JPL's Advisory Committee on Minority Affairs, the event is themed "Continuing the Tradition of Our Heritage."

The festivities open Monday at 11:30 a.m., when introductory remarks will be followed by a multicultural fashion show. Music and dance will be featured each day through Thursday from 11:30 a.m. to 1 p.m.

The following ethnic groups are scheduled to participate: African American, Arab, Armenian, Asian Indian, Chinese, Filipino, German, Iranian, Japanese, Korean, Latino, Native American, Polynesian and Vietnamese.

As always, the highlight of the week promises to be International Cuisine Night on Thursday from 4:45 to 7 p.m., as booths featuring 15 varieties of food will offer free samples.

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.

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

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.

Saturday, June 8

Folk Music—Singer/songwriter Katy Moffatt will appear in Caltech's Dabney Lounge at 8 p.m. Tickets are $12 for adults, $4 for children under 12. Call (626) 395-4652 or check the Folk Music Society website at *http://www.cco.caltech.edu/~folkmusi.*

Tuesday, June 11

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

Wednesday, June 12

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

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Guests welcome. Call Joy Hodges at ext. 4-7041 for information.

Friday, June 14

TIAA/CREF Enrollment Meeting—Employees newly eligible for Caltech/JPL retirement plan participation can come to T1720-137 at noon for help in selecting investment options and completing enrollment forms.

Saturday, June 15

Aero Association of Caltech—The Caltech/JPL Flying Club, which has a fleet of six aircraft, will hold a barbeque and open house in the Fast Aviation hanger at El Monte Airport from noon to 3 p.m. No charge, but RSVP and get directions from Albert Haldemann ext. 4-1723. Flying Club members, families and Caltech or JPL community members are welcome. Demo flights will be available.

Tuesday, June 18

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

Tues.-Wed., June 18–19

Investment Advice—One-on-one counseling is available with TIAA/CREF in T1720-131. For an appointment, call (877) 209-3140, ext. 2614.

Thursday, June 20

"The Importance of Credit Scores"—This Caltech Employees Federal Credit Union–sponsored seminar will be held from 5:30 to 7 p.m. at Caltech's Sharp Lecture Hall. Admission is free. Call Pattyl at (818) 952-4444, ext. 273, to reserve your seat.

Thurs.,-Fri., June 20-21

Von Kármán Lecture Series—JPL's Dr. Don Yeomans, head of NASA's Near Earth Objects Program Office, will present "Comets, Asteroids and the Interplanetary Shooting Gallery" 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. Yeomans will discuss how comets and asteroids brought the building blocks of life to the young Earth and later caused worldwide extinctions. The JPL lecture will be webcast live and will be available after the event at *http://www.jpl.nasa.gov/events/lectures/jun02.html.* For more information, call Public Services at ext. 4-0112.

Ongoing

Social Security—Call the Benefits Office at ext. 4-3760 for an appointment with a representative in July.

Kids learn about comets by making tasty treats

JPL's Maura Rountree-Brown (right) helps second-graders Sydney (left) and Joie create "ice cream comets" during the girls' May 29 visit to the Lab with their Arcadia Christian School classmates. They used cookies, peanuts, coconut and candy to represent the elements that make up a comet, and combined those ingredients with ice cream mix, salt and a bag of ice to make real ice cream. JPLers Art Hammond, Marla Thornton and Reid Thomas also helped the visitors put together the treats and learn about JPL's Stardust mission, en route to a planned rendezvous with comet Wild-2 in early 2004.

Photo by Dutch Slager / JPL PhotoLab

Software Architect candidates sought

JPL's Center for Space Mission Information and Software Systems (*http://csmiss.jpl.nasa.gov*) seeks candidates for its Software Architect Program. The goal of the program is to help train the next generation of software architects who will design and implement software for future JPL missions.

Software Architects will provide a system-level view of software across a project or program. They will ensure that a consistent software architecture is utilized across missions, that all top-level software parts fit together, and that the appropriate methodologies, tools, practices and technologies are applied and utilized. They will be an important part of the interface between technical (software engineers, software developers and testers, data engineers, data archive team, etc.) and managerial (customers, managers, scientists, hardware engineers, mission architects, etc.) aspects of a program or project.

The Software Architect Program is a half-time, one-year, paid internship. At least two candidates will be chosen each year to participate. The training, internship, and other activities are funded by CSMISS.

CSMISS seeks applicants with strong technical and problem-solving skills, leadership in technical innovation, communication and mentoring skills, and software engineering, software management, and/or flight project experience. Selection of participants in the program will be determined by the individual qualities of the candidates and their fit into the overall goals of the program.

Applicants must be full-time, benefit-based JPL employees, hold a bachelor's degree or equivalent experience and have a minimum of five years of work experience that includes a significant software engineering background and/or flight project experience.

Applicants for the FY 2003 program must submit a resume and a one- or two-page letter—with concurrence by their division manager, stating why they should be considered—to Brian Vickers, mail stop 171-264, by Friday, June 28. Applicants and their division manager should retain copies.

Interviews will be conducted throughout July, and all candidates will be informed of the selection decision by the end of August.

For more information, call Trisha Jansma at ext. 4-0647.

Behind the Scenes

SCRIBES AND GUIDES PLAY A KEY ROLE IN SUCCESSFUL ISO AUDITS

JPL WAS AWARDED ISO CERTIFICATION in April 1999. To maintain this certification, the Laboratory is audited twice a year by an external auditing company. This April the Lab successfully completed an ISO audit that combined a three-year certification review and a certificate transfer from JPL's original external auditing company, DNV, to the current company, National Quality Assurance USA.

Many JPLers have never experienced an ISO audit and are curious about how it works. To get a bird's eye view, Universe interviewed three JPL employees who served as "guides" and "scribes" for audits. Representing various organizations across the Lab with a solid understanding of how the Lab works, they help external auditors find their way around JPL, meet the employees they are scheduled to audit and ensure that a written account of the interaction between the auditors and the JPLers interviewed is recorded.

Guides and Scribes are selected by the Enterprise Process and Standards Program Office (108) for their ability to coordinate logistics and problem-solve during the audit. They are typically an ISO Internal Assessor or an ISO Organizational Representative, and are chosen for their active listening skills, responsiveness, flexibility, and being well-networked across the Lab. They are responsible for keeping both the interviewees and Office 108 informed of new developments during the audit and are essentially the people who make the audit a "win-win" situation for both JPL and the external auditors.

To get a better idea of what occurs during an external audit and see how effectively they think ISO is working at JPL, Universe talked with ISO scribes **NICK THOMAS**, a 34-year JPL employee who works in the JPL Systems Management Office (520) and is responsible for resource assessments and archiving; **BUD LOVICK**, Technical Group Supervisor for the Spacecraft Telecommunications Equipment Section 336; and **SCOTT MORGAN**, Technical Group Supervisor for the Front End Controller Group in the Communications Ground Systems Section 333.

Anyone who is interested in becoming an ISO internal assessor after reading these experiences should contact Peter Barry of the Enterprise Process and Standards Program Office at ext. 4-0704.

Photos by Bob Brown / JPL Photolab

By Vicki Laidig
and Mark Whalen

How did you become involved in being a "scribe?"

NT I became involved very early on as the Space and Earth Sciences Programs Directorate's ISO representative. I was coordinating ISO assessments and audits of the projects in the directorate, and as part of my education on the subject I attended a week-long ISO lead auditor class sponsored by NASA. After that, I participated in internal ISO assessments as a lead auditor on two occasions and as an auditor on one.

BL I'm the Division 33 ISO representative and have been involved with setting up ISO audits and resolving ISO Corrective Action Notices after audits.

SM I took the ISO 9000 auditor class out of curiosity, wondering what the ISO standard was all about and how it would impact JPL. Following the class, I was selected to lead teams of JPL auditors during the Lab's internal assessments. This caused me to wonder how the professional, external auditors handled the audit process and dealt with the same issues we would encounter on the internal audits. I asked to be a scribe for the original certification audit and have participated in many of the external surveillance audits in this capacity.

Describe the experience. Did you help the auditor, or help JPLers being audited, or both?

NT My responsibilities were to record the key points of the audits; for example, who, what, where, when, etc.

BUD LOVICK

We had 11 interviews and talked to approximately 15 people. The interviews varied in length from 10 minutes to one hour. After the interviews were complete, I prepared a daily report for the ISO group.

BL The audit was a learning session for all the participants. The auditor described the objective and the methods to be used. The questioning led to responses about the organization, the product and the process being audited. As the audit progressed we learned the reason behind the line of questioning, and the auditor gave suggestions on improvements whenever a problem was encountered. Each visit was about 30 minutes, and with note-taking and walking time between visits, there were about eight visits per day.

SM Besides recording discussions between the external auditor and JPL interviewees, I also noted areas where the auditor discovered potential issues with JPL's implementation of processes that might be noted as a "non-conformance" to the ISO 9001 standard. The scribe or guide can sometimes function as a translator for the auditor and explain some of JPL-unique terminology. Interviews with the eternal auditors lasted from as little as a few minutes to an hour, depending on the area the auditor is exploring and the role the JPL employee plays in that area. The external auditors who I have worked with all present their questions in a very non-confrontational, friendly manner.

NICK THOMAS

As a result of your participation, did you gain a greater appreciation of ISO?

NT Yes. Anytime one is involved in a process, whether it's designing or building a product or the ISO process of auditing our processes, it gives one a better understanding and appreciation of JPL and its employees.

BL The term "ISO" was hardly mentioned, but I do have a greater appreciation for having simple procedures, for following those procedures, for keeping good records and for the folks who were audited who did all of the above. There were a quite a few suggestions and even some minor "observations" by the auditor, but there were no major findings on any of the audit sessions.

SM In discussions with the external auditors between interviews, I gained a much greater appreciation for the various methods that other companies have used to meet the ISO requirements. For instance, if we encountered an area where JPL was not in compliance with the ISO standard, we would discuss some examples that the external auditor had seen in other organizations and try to map them to the JPL environment.

What did you learn about JPL by doing this? Do you see the Lab a bit differently now?

NT The main thing I learned was really just a reinforcement that JPL employees are very dedicated to the success of their activities and to those who work for and with them.

BL The idea of using procedures and processes in everyday JPL activities seems to be working. There were no major JPL complaints about procedures or following procedures or about keeping records, and as a matter of fact, it all seemed to be quite routine. I do, indeed, see the Lab differently. I have a better understanding and appreciation of work and operations in other areas of JPL.

SM I have learned a great deal about how various areas of JPL operate that I would never have come in contact with otherwise. Having spent my career at JPL in software development, I was amazed at the scope of the effort involved in areas such as procurement, flight hardware, and even the Surface Simulation Lab, where they create samples of the surface of other planets and comets for testing surface sensing instruments and rovers.

SCOTT MORGAN

Overall, was this a good experience for you?

NT Yes. I think every employee should participate in the assessment and auditing processes both as an interviewee and an interviewer. My hope is that all JPL section managers become trained as ISO lead auditors, thus educating the responsible line managers in the ISO process and providing JPL with an unlimited resource of lead auditors for our internal assessments.

BL Yes, this was a good experience and the audit passed very quickly. The wide variety of destinations on the audit agenda—from science labs where original research is being conducted to program management and operations management offices—made the experience worthwhile.

SM Being an internal auditor and a scribe for external has been a very rewarding experience. I have learned a lot about JPL in meeting with employees and discussing their work. The exposure I received has provided a greater appreciation for the breadth of work that goes on to make JPL operate effectively.

Award for Excellence

The following winners of JPL's Award for Excellence were honored during May 23 ceremonies.

EMPLOYEE SERVICES & RECOGNITION

Individual Awards

Exceptional Business Operations
Eric Fuller, Joanne Kennedy, Tu-Anh Phan.

Exceptional Leadership
Larry Bergman, Scott Bolton, Samuel Gulkis, Fred Hadaegh, Candice Hansen, Brian Paczkowski, Jack Patzold, Richard Rainen, Ida Young.

Exceptional Quality
Gil Clark, Zareh Gorjian, Randy Herrera, Kenneth Lawrence, Kenneth Van Amringe, Nancy Van Wickle.

Exceptional Technical Excellence
Edward Kopf, Timothy McElrath.

Team Awards

Exceptional Business Operations
• *Human Resources Information Systems and Human Resources Integration Systems:* For significant contributions in the design and development of the Advanced Benefits Module and the Web Organization Chart Directory, including the online signature authorization delegation lookup.
• *Knowledge Management & Document Data Management:* For significant achievement in the upgrade of the DocuShare Project and Line Organization Electronic Document Libraries.

Exceptional Technical Excellence
• *Advanced and Second-Generation Precipitation Radar Technology Development:* For significant achievement in the development of advanced specialized rain radar technologies to identify precipitation events within a hurricane.
• *Cryobot:* For significant achievement in the design, construction, test and operation of a vehicle for melting and exploring polar ice caps on Earth, Mars, and the icy outer satellites.
• *Deep Space 1 Comet:* For significant achievement in planning and conducting Deep Space 1's extraordinarily complex and flawless encounter with comet Borrelly, yielding the highest quality scientific data on a comet ever obtained.
• *Mars Odyssey Tiger Team for Spacecraft/Telecommunications:* For significant achievement in identifying and solving the Electromagnetic Compatibility problems and demonstrating solutions for a desensitized UHF communication subsystem for the Mars '03 mission.
• *Cassini Jupiter Encounter:* For significant achievement in the planning, development and execution of the science observation sequence for the Cassini Jupiter flyby.
• *Galileo Science Planning & Operations:* For significant achievement in the planning and management of the science data return for the Galileo encounters with the Jupiter system.
• *Galileo SSI Recovery:* For significant achievement in the diagnosis and implementation of corrections to the solid state imaging camera anomalies in support of the Io 32 flyby.
• *Huygens Recovery Task Force:* For significant achievement in the recovery from the relay receiver design flaw in support of the scientific data capture from the Huygens probe.
• *SIM System Testbed:* For significant achievement in the assembly and demonstration of the world's first three baseline interferometer.
• *SIM Metrology Beam Launcher Development:* For significant achievement in the concept, design, construction, and demonstration of two beam launcher prototypes.

Exceptional Quality
• *AVIRIS Overflight of the World Trade Center:* For displaying outstanding dedication in acquiring and analyzing data from the Airborne Visible/Infrared Imaging Spectrometer in response to the World Trade Center disaster.
• *Cassini Attitude & Articulation Control Subsystem:* For outstanding dedication in resolving anomalies that resulted in meeting all Jupiter science objectives.
• *Documentation Services Proposal Support:* For displaying outstanding dedication in providing customer service and quality to the JPL proposal process.
• *JPL Education & Public Outreach Office/Solar System Exploration Forum FY 2001:* For outstanding dedication, coordination and support of the JPL programs reporting to Headquarters.
• *Proposal Center:* For outstanding customer service to meet sponsor requirements in completing NASA and non-NASA proposals.

Exceptional Business Operations
• *Human Resources Information Systems and Human Resources Integration Systems:* For significant contributions in the design and development of the Advanced Benefits Module and the Web Organization Chart Directory including the online signature authorization delegation lookup.
• *Knowledge Management & Document Data Management:* For significant achievement in the upgrade of the DocuShare Project and Line Organization Electronic Document Libraries.

For more information on these awards and others in the Reward and Recognition Program, log on to *http://eis/sec614/reward.*

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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 ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

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

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

Passings

RALPH LUTWACK, 79, a retired member of the tehnical staff in Section 342, died of heart failure April 26.

Lutwack worked at JPL from 1964–92. He is survived by his wife, Phyllis. Services were private.

Retirees

The following JPL employees retired in June: A. Earl Cherniack, 44 years, Section 160; Raymond Freeman, 43 years, Section 357; James K. Johnson, 40 years, Section 350; Jimmie Tomey, 40 years, Section 387; Harry Detweiler, 34 years, Section 500; Kenneth McGraw, 34 years, Section 313; Lanny Miller, 29 years, Section 450; James Gerschultz, 23 years, Section 312; Lloyd Nessler, 23 years, Section 352; J. Donald Lafontan, 14 years, Section 320; Tony Reichert, 12 years, Section 272.

Classifieds

For Sale

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

BED, antique oak & rod iron, queen size w/rails, $150/obo (see picture @ERC). 626/744-9064.

BIKE, Trek Multitrack 700, like new, Shimayo gears, clip on lights, lock, helmet, removable fenders, toe clips, many accessories incl., well maint., exc. cond., $200/obo. laurel@ekit.com.

CABINETS, Ikea, free standing, all fully assembled, solid construction, like new, base cab. 57" w x 25" d x 35" h, $300; high cab., 27" w x 25" d x 70" h, $300; child's wardrobe, 25" w x 60" h x 21" d, $150. 626/345-9386.

CARGO CONTAINER, rooftop, Sears, $50; LUGGAGE RACK, rooftop, $20. 626/797-6982.

CARTRIDGE DRIVE, Syquest, 44MB, $15; cartridges, 44MB, $1 apiece; CD JEWEL cases, 50, $10; DIET TAPES, Jenny Craig, set of 14, $50; COMPUTER PWR. CONTROL CTR., 5 pwr switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, $20; ORGAN, Yamaha 415 electronic console w/13 pedals, 3 keyboards, 144 rhythm patterns, pd. $7,500, sacrifice for $3,000. 790-3899.

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

COMPUTER, Power Mac, 7500/100 w/monitor, keyboard/mouse and personal printer-Laser Writer, $450/obo. 626/797-1310, leave msg.

COMPUTER, used Compaq Pentium, 64 MB RAM, 15" monitor, CD-ROM, new 56K modem, mouse, keyboard, great for Internet, warranty, $325. 626/486-0999.

DINING TABLE, round, 4 swivel chairs, dark blue upholstery, $100. 626/447-6423.

DINING TABLE, Broyhill, solid wood, 6 chairs w/arm rest, extendable w/2 inserts, $250; ENTERTAINMENT CENTER, oak, w/glass panels and drawers, $75. 626/799-7593.

DRESSES, size 12, shoes, purses; TV; AIR CONDITIONER, much more. 626/797-2720.

GOLF CLUBS, Adams Tight Lies, 3W and 5W, graphite shafts, exc. cond., headcovers included, $50/ea. or $80/both. 952-7472.

HIDE-A-BED sofas, 2, gd. cond., $135/ea.; BUNK BED MATRESSES & BOARD, like new, $65; STEREO & SPEAKERS, lg., $50/pr.; MISC: lamps, child's desk, revamped computer, great cond., gd for student, like new, $550. 626/797-2720.

KITCHEN TABLE, butcher block style w/white turned legs, + 6 Windsor-style chairs, table top needs refinishing, otherwise solid, $190; CLOTHING, boys, slacks, shirts, blazer sizes 10-12, nice cond. 952-8455.

LADIES CLOTHING: evening dress, elegant, knee length, short sleeve, beaded all over, plum colored, sz. 14-16, never worn, tags still attached, bought for $100, best offer; swimsuit, 1 piece, black, size 16W, slimming style, never worn, tags still attached, bought for $23, best offer. 687-9812.

MONITOR, 20", Apple scan, color, exc. cond., $200. 661/273-3229.

PAINTING, large, oil, seascape, in nice frame, 32" x 56", $35; MATTRESS, twin, box spring and frame, $15; INFLATABLE SHARK for pool, $1; LAMPSHADES, $2/ea.; LAMPS, 2, with shades, $2; WALKING CANE with 4 prongs, $3. 248-4647.

PATIO FURNITURE, by Tropitone, 2 sets of a table & 4 chairs each, exc./like-new cond., cocoa brown, $300 ea. set, $525/both. 626/339-5511.

REFRIGERATOR, narrow, about 4' tall, 7.1 cu. ft., excellent space saver, $75. 957-7742.

REFRIGERATOR, Kenmore, auto defrost, top mount freezer, ice maker, 18.1 cu. ft., energy eff., quiet, like new, $450. 626/345-9386.

SCANNER, brand new and unopened, Memorex 6142u, color flatbed, USB for Windows 98/2000/ME, 600 X 1200 DPI, 42-bit color, 9600 dpi enhanced resolution, $37. 956-3745, Steve.

SKI SET, used women's Head 170s, Gala radial & poles; Salomon boots, size 7 & bindings, $150/obo (see picture @ERC). 626/744-9064.

STEMWARE, Fostoria crystal, pattern "Wedding Band", simple design featuring platinum band at top of glass, 8 goblets, 5 champagne, 3 wine, exc. cond., $125 for all. 626/355-3886, Rosemary.

TELEVISION, Sharp, color, 19", with stand, $20; COT, folding, with mattress, $7; BACKPACK, boys, $5; DESK, metal, 20" x 40", $25; LAWNMOWER, push, 18" with catcher, $30; MATTRESS, inflatable, $5, MIRROR, 20" x 40", $2. 248-4647.

TICKETS, Dodgers, various games throughout the season, 2 seats on loge (orange) level near first base, $23 per ticket. 626/296-1253.

TYPEWRITER, Silver Reed, electric, new cond., $75/obo. laurel@ekit.com.

Vehicles/Accessories

'89 BAYLINER Capri boat, 19 ft., 4 cyl., Cobra inboard/outboard, vg cond., approx. 40 hours on engine, grt family ski/fish boat, AM/FM cass., many extras: skis, vests, life jackets, etc., trailer has new tires, photo at www. mogensigns.com/boat.htm, ready for summer, $6,800/obo. 352-4102.

'95 BMW 325i, white with tan interior, 2 dr, 5-speed, new tires, CD changer, LoJack, excellent cond., $16,750. 626/795-6538.

'89 BMW 525i, black on black, sunroof, leather, almost-new Michelins, 5 spd. manual, 105,000 mi., Kelly $6,645, sell $6,200/obo. 679-4724.

'02 CHEVY Avalanche 1500, 2 WD, V8, 4-speed automatic, 6,300 miles, loaded, + Star, Lo-Jack, running boards, $29,900. 779-8481, George.

'96 CHEVROLET Impala SS, dk. cherry, all options plus LoJack, CD, 100K warranty, 80K mi., exc. cond., $16K/obo. 790-0828.

'99 DODGE Ram 1500 truck, 5.2L V8, 8' bed, locking shell, 41K miles, must sell, $12K. 909/593-6379, eves.

'97 DODGE Caravan, 7 pass., 4 cyl, a/c, pwr. steering, dual airbags, dark green, 2nd owner, exc. cond., sold because moving out of U.S., 76K mi., $6,000/obo. 626/795-2409.

'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, code3media @crownvic.net for link to photos, $13,000/obo. 822-6465.

'97 FORD Taurus GL sedan, 83K mi, V6 auto., 4 dr., a/c, pwr. steering/window/door locks/ABS brakes, dual airbags, cruise control, metallic silver, super clean, Michelin tires, $4,995. 626/798-1765.

'96 FORD Escort LX, 2-dr. hatchback, stick shift, a/c, stereo, only 60K mi., great commuter car, exc. cond., $4,650. 909/985-6806.

'95 FORD Explorer Ltd., V6, 4 w/d, lt. green w/lt, beige leather interior, 6-disc CD changer, cass., LoJack, roof rack, tow package, pwr. seats/locks/ABS, dual airbags, rear air, cruise ctrl, gd cond., 170K mi., orig. owner, $9K/obo. 909/469-6131.

'95 FORD Windstar XL minivan, rear air, quad seating, console, plus many more features, 87K mi., one owner with all records, runs great, $5,700. 626/447-6423.

'92 FORD Explorer, 4 w/d, 87K, leather int., tilt, sunroof, Alpine CD, $4,200. 626/797-3917.

'63 1/2 FORD Galaxy 500 big engine, classic, 1 owner, $3,995. 626/793-8562.

'94 HONDA Nighthawk, 250cc, 2,500 mi., exc. cond., kept in garage, $2,000. 562/693-1136.

'92 HONDA Accord EX sedan, 4 door, 106K mi., gd. cond., white w/blue int., auto., 4 cyl. 2.2 ltr., front whl dr., a/c, p/s, p/w, p/dl, cruise cont., ABS, tilt whl., sun/moon roof, am/fm anti-theft stereo/cassette, gd. tires, $5,500. 626/296-9073.

'81 HONDA Interstate SilverWing, shaft drive, water cooled, Prolink suspension, just over 6K mi., garage kept, 2nd seat for passenger, near mint, http://home.attbi.com/~macmaven/sw/index.htm for pictures, $2,250. 353-2103.

'99 JEEP Wrangler SE, exc., black, soft top, under 23K miles, 4W drive, extras, like new, $11,000. 957-7742.

'93 JEEP Grand Cherokee Laredo, burgundy, V8, all-wheel drive, 103K mi., tow package, LoJack, velour interior, $6,500. 626/441-2150.

'94 MAZDA 626ES sedan, 4 dr., black w/gray leather interior, V6, auto, 6-CD changer, pwr seat, ABS, moonroof, low miles, $5,700. 642-4253.

'93 MAZDA MX6, red w/tan interior, 5-spd., sunroof, alarm, new CD player, pwr. windows/ locks, a/c, 115K miles, vg cond., $3,900. 323/221-9691.

'72 MERCEDES Benz 280 SE 4.5, tan, 4 dr., 4.5 liter V8, a/c, recent brake work, tires, battery, 87K mi., runs exc. needs cosmetics, minor work, $3,500. 714/840-3688.

'97 MERCURY Villager GS, minivan, 7 passenger, CD player, vg cond., $8,900. 661/286-1038.

'92 PONTIAC Transport, V6, 3.8L, ABS, front and rear air, well-maintained engine, 102,000 mi., $3,500. 626/799-7593.

'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.

'73 VOLKSWAGEN Bug, good mechanical, body and interior cond., $3,200. 626/793-2320.

'66 VW Bug, exc. cond., good engine, must see to appreciate, in Sierra Madre. 626/355-7961.

'91 VOLVO 240 GL, 127,000 mi., silver, sun roof, good cond., service maintenance on schedule, $5,200. 626/524-5701.

'81 YAMAHA Seca motorcycle, XJ550RH, 550 cc, 4 cyl. in-line, 6-speed, 15K mi. Metz front/IRC rear tires, Kerker pipe, K&N air filter, tank bag, easy on gas and fun, vg cond., $700/obo. 626/794-7343.

Lost & Found

FOUND, coffee mug in 167 cafeteria, identify and it's yours. 323/935-3432, Allan.

Free

KITTENS: five, 8 wks. old, 2 black, 3 gray Tabbys, litter trained. 626/287-9433.

Wanted

CALCULATOR, TI-89, for student, will pay bottom dollar. 626/799-2909.

JPL COLLECTOR PLATES, 2, sold in ERC a few years ago; 1 was for Mars Pathfinder, 1 one for Cassini; came in gold gift box w/plexiglass plate stand, individually numbered on back of plate; final sale price was $5/ea.; need one of each variety at reasonable price, prefer mint cond., new in box, as purchased. 626/358-4722, Suzan.

NATIVE GERMAN SPEAKER, for conversation practice, will pay $20/hr. 395-6804, leave msg.

POCKET/RAILROAD WATCH, vintage, whether it runs or not, top price paid. pierce@earthlink.net.

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

TELESCOPE, used, to buy, $300-$500. rkelly8814@aol.com.

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

For Rent

ALTADENA, charming, freshly painted 2 bd., 1 ba., house near Christmas Tree Lane, hardwood floors, fireplace, appliances, whole-house fan, fenced backyard, fruit trees, roses, $1,650, negotiable (includes water, gardener, trash), www.alumni.caltech.edu/~chrisc or 626/794-9579.

LA CRESCENTA, 3 bd., 2 ba. home, 3 yrs. old, lg. yd, quiet wooded neighb'h'd, $2,400. 249-2990.

MID-WILSHIRE area, lg. duplex to share, 1 lg. bd. w/ a/c, office, priv. ba.; share house w/fellow JPLer, avail. July 1, $850/mo., 6-mo. lease, will consider month-to-month. 323/931-7085.

MONTROSE, detached bachelor apt., 10 min./JPL, $495. 626/445-0884.

PASADENA, 2,000 sq. ft., 3 miles/JPL, 3 bd., 2 ba., large master bd., large tiled kitch., fireplace, formal din. room, also incl. washer, dryer and refrigerator, asking $1,850. 626/794-8517.

SOUTH PASADENA/L.A. border, 1-bd., 1-ba. apt., 1/2 mile from 110 fwy., 10 minutes/JPL; perfect for student or JPLer; nice quiet neighborhood surrounded by hills; satellite cable TV provided; $675 + first mo. security deposit. 323/344-9503.

SOUTH PASADENA rear house, 1 bd., 1 ba., appliances and util. incl., living/dining area, no smoking or pets, male preferred, avail. July 1, $775. 323/258-4464 or 323/256-1031.

Real Estate

ALTADENA, sale by owner, 3 bd., 1 ba., 1,108 sq. ft., 7,668 sq. ft. lot, 2-car detached garage w/laundry facilities, $285,000/make offer. 800/836-8750 ext. 10020.

COLORADO, 10+ level acres near Rio Grande, NM border, 2 adjacent 5-acre lots on St. Hwy 248, sell one or both for $1K/acre/obo. 626/254-1550.

LA CRESCENTA, part of Glendale, great area/schools, 10 min./Lab, 4 bd., 2 ba., 1,436 sq. ft., backyard spa, fireplace; new: central air & heat/copper plumbing/kitchen appliances/roof, detached 2-car gar., $375,000. 541-6632, clarkx2@earthlink.net.

SHOW LOW, Ariz., 3 bd. house, .43 acres w/ponderosa pines, nat'l gas, sewer, in town subdivision, close to skiing and fishing, great investment property, house nds. help, $30K/obo. Randall.Mielke@fijivillage.com.

WILLIAMS, Ariz. area, (10 mi. away), 43 acres w/2-rm house, seasonal pond, wildlife everywhere, house on top of cliff w/great views, 4-mi. dirt road access year round, great investment, $42K cash/obo. Randall.Mielke@fijivillage.com.

Vacation Rentals

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

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.

LAKE TAHOE, N. Shore condo, 2 bd., 2.5 ba., slps 6, pool, priv. beach, all amenities, convenient loc.n, 2 mi./ casinos, avail. by the week only, special JPL discount. 626/355-3886, Rosemary/Ed.

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

PACIFIC GROVE house, 3 bd., 2 ba., f/p, cable tv/vcr, stereo/CD, well eqpd. kit w/microwv, beaut. furn, close to golf, bches, 17 Mile Dr., Aquarium, Cannery Row, JPL discnt. 626/441-3265.

SAN FRANCISCO, elegant Nob Hill honeymoon suite, sleeps 2 max., full kitchen, maid service, concierge, reserve early, $145/nite, $870/week. 626/254-1550.

SILVERLAKES, Calif., resort, golfer's dream, 4 wks free golf/yr. at priv. PGA-rated course w/driving range & putting greens, 2-bd. condo for up to 6, 2 lakes, many amenities, less than 2 hrs from Pasadena, exchange rights w/3,000 resorts, reduced to sell due to illness, $15,000. 805/967-7725.

Universe

Jet Propulsion Laboratory

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Inside

theme SOLAR SYSTEM

Lab to assist on comet mission

Contour prepares for July 1 launch

Set to visit and study at least two comets, NASA's Comet Nucleus Tour (Contour) should provide the first detailed look at the differences between these primitive building blocks of the solar system, and answer questions about how comets act and evolve. The mission is being prepared for a July 1 launch from Kennedy Space Center.

JPL will provide navigation and Deep Space Network support for the mission, and JPL astronomer Dr. Don Yeomans, manager of NASA's Near Earth Objects Program Office, is a Contour science team co-investigator.

Contour is scheduled to lift off on a three-stage Boeing Delta II expendable launch vehicle during a 25-day launch window that opens July 1 at 2:56 a.m. Eastern time. The spacecraft will orbit Earth until Aug. 15, when it should fire its main engine and enter a comet-chasing orbit around the sun.

Contour's flexible four-year mission plan includes encounters with comets Encke, Nov.12, 2003, and Schwassmann-Wachmann 3, June 19, 2006. Contour will examine each comet's "heart," or nucleus, which scientists believe is a chunk of ice and rock, often just a few kilometers across and hidden from Earth-based telescopes beneath a dusty atmosphere and long tail.

"The Contour mission will be NASA's second mission dedicated solely to exploring these largely unknown members of our solar system," said Dr. Colleen Hartman, director of the Solar System Exploration Division at NASA Headquarters in Washington. "Contour joins our other operating mission, Stardust, which is on its way to bring a sample of a comet back to Earth, and Deep Impact will launch next year. These missions all help us find answers to the fundamental questions of how our planet may have formed and evolved, and how life may have begun on Earth and perhaps elsewhere in the Universe."

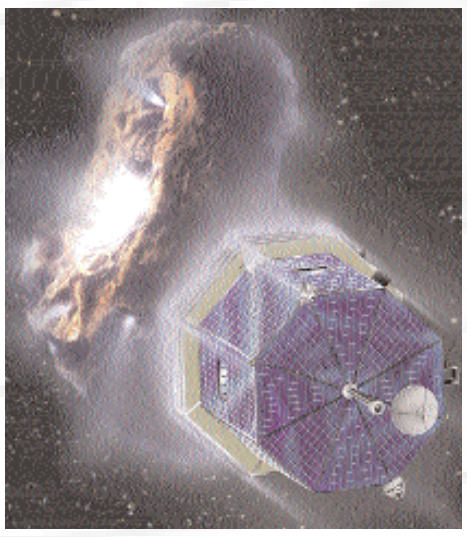
Comets are "the remnants of the outer solar system formation process," Yeomans said in a prelaunch briefing. The instruments on Contour, he added, will determine the chemical composition of the comet—helping in turn to determine whether a comet might have brought much of the Earth's oceans and its atmosphere, as well as carbon-based molecules, to the Earths' surface.

Yeomans said the "genius" of the Contour mission design is that "we're not chasing comets around the solar system; we're using Earth swingbys to allow them to come to us." The encounters are taking place very close to Earth (less than 50 million kilometers or 31 million miles), which, he said, "makes communications easy, but it also allows professional, ground-based astronomers, as well as amateur astronomers and the public, to participate in a very meaningful way." The comets will be bright enough to be seen with binoculars about the same time as Contour is looking at the comet's nucleus, he said.

Members of the JPL navigation team include Tony Taylor, Bobby Williams, George Lewis, Cliff Helfrich, Eric Carranza, Don Han, Ramachand Bhat and Jamin Greenbaum.

The eight-sided, solar-powered craft will fly as close as 100 kilometers (62 miles) to each nucleus, at top speeds that could cover the 56 kilometers between Washington and Baltimore in two seconds. A five-layer dust shield of heavy Nextel and Kevlar fabric protects the compact probe from comet dust and debris.

"Comets are the solar system's smallest bodies, but among its biggest mysteries," said Dr. Joseph Veverka, Contour's principal investigator from Cornell University, Ithaca, N.Y. "We believe they hold the most primitive materials in the solar system and that they played a role in shaping some of the planets, but we really have more ideas about comets than facts. Contour will change that by coming closer to a comet nucleus than any spacecraft ever has before and gathering detailed, comparative data on these dynamic objects."



Contour's four scientific instruments will take pictures and measure the chemical makeup of the nuclei while analyzing the surrounding gases and dust. Its main camera, the Contour Remote Imager/Spectrograph, will snap high-resolution digital images showing car-sized rocks and other features on the nucleus as small as 4 meters (about 13 feet) across. The camera will also search for chemical "fingerprints" on the surface, which would provide the first hard evidence of comet nuclei composition.

Encke has been seen from Earth more than any other comet; it's an "old" body that gives off relatively little gas and dust but remains more active than scientists expect for a comet that has passed close to the sun thousands of times. Schwassmann-Wachmann 3, on the other hand, was discovered just 70 years ago and recently split into several pieces, intriguing scientists with hopes that Contour might see fresh, unaltered surfaces and materials from inside the comet.

Contour is the sixth mission in NASA's Discovery Program of lower cost, scientifically focused exploration projects. Johns Hopkins University's Applied Physics Laboratory manages the mission, and also built the spacecraft and its two cameras. NASA's Goddard Space Flight Center provided Contour's neutral gas/ion mass spectrometer and von Hoerner & Sulger, GmbH, Schwetzingen, Germany, built the dust analyzer.

For more information, visit *http://www.contour2002.org*.

JPL's Dr. Don Yeomans, Contour science team co-investigator.

Presidential commission visits Lab

Photo by Dutch Slager / JPL Photolab

In the Mars Exploration Rover assembly area, rover system engineer Jennifer Trosper, left, chats with commission members. Next to Trosper is JPL Director Dr. Charles Elachi; from left are Bob Cox, assistant director for reimbursable programs, Earth Science and Technology Directorate; Bob Parker, head of the NASA Management Office at JPL; Commander Sue Hegg, U.S. Navy; Paul Piscopo, committee staff director; Charlie Gordon, commission staff; and commission member and former astronaut Buzz Aldrin.

JPL Director Dr. Charles Elachi on June 12 hosted the Commission on the Future of the U.S. Aerospace Industry, a group formed in 2001 to study the future of the U.S. aerospace industry in the global economy—particularly in relationship to U.S. national security—and to assess the future importance of the domestic aerospace industry for the economic and national security of the United States.

The commission, which will prepare and issue a final report to the President and Congress no later than Nov. 27, 2002, is to recommend a series of public policy reforms that will permit the U.S. aerospace industry to "create superior technology, excel in the global marketplace, profit from investments in human and financial capital, benefit form coordinated and integrated government decision-making, assure national security, access modern infrastructure, and give the U.S. a capacity throughout the 21st century to reach for the stars."

The commission visited JPL to understand the operations of a federally-funded research and development center such as JPL; to understand the relationship between JPL, Caltech and NASA; and to determine how technology developed at JPL is transferred into the private sector.

Elachi took commission members on a tour of several JPL labs and facilities.

News Briefs

Science Advisory Group names chair

DR. CAROL RAYMOND, an Earth and planetary geophysicist, has been appointed as the new chair of JPL's Science Advisory Group, which meets quarterly and serves as an important advocate for the JPL scientific and technology research communities.

The JPL Science Advisory Group succeeds a similar body within the Space and Earth Sciences Programs Directorate, which DR. MICHAEL WERNER chaired from 1999 to 2001.

The group reports to JPL Chief Scientist DR. TOM PRINCE. It advises Prince of issues of concern to the JPL research community and work towards their resolution. The group also strives to improve the quality of life for JPL researchers—by publicizing and exploiting existing opportunities and by creating new ones—and invites researchers' participation and input.

The group was instrumental in establishing the EDWARD C. STONE Award for Outstanding Research Publication, and has encouraged the development of a JPL researchers' web page as well as an "Introduction to JPL" course to help new hires get started in the Lab's research environment.

For more information, including membership and meeting minutes, visit *http://div32.jpl.nasa.gov/SAG.html.*

IEEE honors JPLers' research papers

A paper co-authored by DR. MARVIN SIMON and DR. DARIUSH DIVSALAR of Section 331 has been selected as one of the 50 key research papers published by the Institute of Electrical and Electronics Engineers (IEEE) Communications Society society over the past five decades. IEEE is celebrating its 50th anniversary this year.

"Multiple Bit Differential Detection of MPSK," published in the March 1990 issue of the IEEE Transactions on Communications, has been cited more than 65 times in subsequent publications aside from having spawned a number of other research offshoots.

Simon, a JPL principal scientist, has worked at the Lab for 34 years, performing research applied to the design of NASA's deep-space and near-Earth missions resulting in the issuance of nine patents and 23 NASA Tech Briefs. He has published more than 165 journal/conference papers and nine textbooks on subjects dealing with digital communications, and is the recipient of a number of NASA and IEEE awards.

Divsalar, currently a JPL consultant, joined the Lab in 1978 and has developed state-of-the-art technology for advanced deep-space communications systems for future NASA space exploration, with particular emphasis on coding, digital modulation and turbo codes. He has held academic appointments at UCLA and Caltech, and has published more than 100 papers, co-authored one textbook, and received 20 NASA Tech Brief awards along with seven U.S. patents.

Radio clubs to have a field day

The JPL and Caltech Amateur Radio Clubs will join forces in the annual Field Day activity the weekend of June 22 from atop Mount Gleason. This activity demonstrates radio amateurs' readiness to provide help to the public during times of emergencies, when normal communications services are either out of commission or overtaxed.

The clubs plan to operate seven stations, and the effort will include voice, Morse code, digital and satellite communications. For the first time, tutored operation by non-radio amateurs will be available for those wishing to make few contacts via ham radio.

Mount Gleason is located 30 miles north of JPL by car and can be reached via Angeles Crest Highway.

The public is welcome to the event, said JPL Radio Club member BOB POLANSKY, who urges visitors to bring their camera, as the road offers good photo opportunities.

Operations start at 11 a.m. on June 22 and run for 24 hours. For more information, call Polansky at ext. 4-4940 or JAY HOLLADAY at ext. 4-7758.

CEC enrolling for summer camp, fall

Enrollment is still open for the JPL/Caltech Child Educational Center's Summer Camp, "Exploring Our Natural World," for children completing kindergarten through 6th grade. The program is held June 24–Aug. 28 at three locations: on Michigan Avenue near Caltech, in La Canada at the Oak Grove site near JPL, and at Palm Crest Elementary School. The Oak Grove site will also offer a summer program for children entering kindergarten in the fall. Full summer or weekly sessions are available.

The camp offers swimming, arts and crafts, drama, music, creative writing, sports, gardening, water play, science exploration, and numerous field trips.

In addition, fall enrollment is now open in both the Infant/Toddler, Preschool and School-Age Programs, serving children two months of age through the 6th grade. Initiated by JPL 23 years ago, the center provides high-quality childcare with the fundamental purpose of assisting children in learning to live successful, creative and productive lives.

Tuition assistance is available for qualifying JPL and Caltech families. For more information, to obtain a brochure and application, or to schedule a site visit, call the center at ext. 4-3418 or visit *http://www.ceconline.org.*

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.

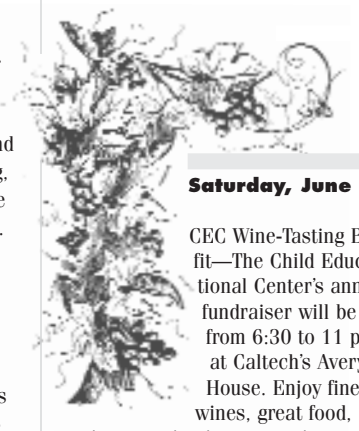
Gay, Lesbian and Bisexual Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

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

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.

Friday, June 21

Von Kármán Lecture Series—JPL's Dr. Don Yeomans, head of NASA's Near Earth Objects Program Office, will present "Comets, Asteroids and the Interplanetary Shooting Gallery" at 7 p.m. in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Yeomans will discuss how comets and asteroids may have brought the building blocks of life to the young Earth and later caused worldwide extinctions. For more information, call Public Services at ext. 4-0112.



Saturday, June 22

CEC Wine-Tasting Benefit—The Child Educational Center's annual fundraiser will be held from 6:30 to 11 p.m. at Caltech's Avery House. Enjoy fine wines, great food, unique auction items, gaming and live music from the Chad Edwards Quartet. Admission is $30, with special Connoisseur Table tickets at $60, which includes 10 tastes of premium wines along with knowledgeable information and the finer points of wine tasting. Tickets are available at the JPL Store, Caltech Book Store or CEC office, and may be purchased at the door the evening of the event for an additional $10 per ticket. For more information, call ext. 4-3418.

Tuesday, June 25

Investment Advice—One-on-one counseling is available with Fidelity Investments in T1720-131. For an appointment, call (800) 642-7131.

Wednesday, June 26

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Guests welcome. Call Joy Hodges at ext. 4-7041 for information.

Thursday, June 27

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

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

Saturday, June 29

Folk Music—Irish quartet Téada will appear at 8 p.m. in Caltech's Dabney Lounge. Tickets are $12 for adults, $4 for children under 12. For information, call (626) 395-4652 or visit *http://www.cco.caltech.edu/~folkmusi.*

Tuesday, July 2

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

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

Wednesday, July 3

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

Ongoing

Social Security—Call the Benefits Office at ext. 4-3760 for an appointment with a representative in July.

Prince to discuss new research and technology program June 27

JPL Chief Scientist Dr. Tom Prince will discuss the Laboratory's new Research and Technology Development Program at an all-hands meeting Thursday, June 27, from 9 to 10 a.m. in the Building 167 conference room. The presentation will also be webcast at *http://dailyplanet.*

In concert, Prince has issued a call to solicit strategic research proposals. Approximately $2 million to $2.5 million will be reserved for proposals of less than $150,000. Proposals for funding in excess of this amount must be coordinated with the relevant technical division(s) and program offices. Proposals can range up to $1 million.

Proposals are sought in the areas of basic research, applied research, development and systems and other concept formulation studies. For information on the strategic focus areas that must be addressed within the proposals, as well as constraints and requirements, log on to *http://rtd.jpl.nasa.gov/call03.html.* Full proposals are due Friday, July 26.

The main purpose of the Research and Technology Development Program, Prince announced this week, will be to enhance JPL's ability to address the future objectives and missions of JPL and NASA consistent with the strategic direction and long-term vision.

For questions, e-mail *Katherine.A.Dumas@jpl.nasa.gov.*

Seven JPLers win SFA honors

Seven JPL employees earlier this month received NASA's Space Flight Awareness award, earning a trip to Kennedy Space Center for the scheduled June 5 launch of Space Shuttle Endeavour.

Honorees, in photo below, left to right (front row): Katherine Levister, Chau Buu; back row: Jan Martin, Eric Gurrola, Astronaut Mark Kelly, Jerry Clark, Wolfgang Fink, Son Ho, along with guest John Beckman, Engineering and Science director, received a VIP tour of KSC as part of the award. Unfortunately, weather conditions delayed the launch of the shuttle.

At JPL, the Space Flight Awareness Program is administered by the Employee Services and Recognition Group. For more information, visit *http://eis/sec614/reward/#sfa.*

Correction

An article in the June 7 issue of Universe on visiting students creating "ice cream comets" should have indicated that the outreach effort was sponsored by the Deep Impact mission, not by Stardust.

SIRTF will PHONE HOME from SOUTH AFRICA

X-band antenna will track space observatory following January launch

By Charli Schuler

IMMEDIATELY AFTER the JPL-managed Space Infrared Telescope Facility launches from Kennedy Space Center, Fla., in January 2003, mission planners anticipate a four-hour communication gap when their tracking system won't be able to "talk" to the observatory. This could be a nerve-wracking time for those who have worked so hard on the mission, an infrared telescope that will study the early universe, old galaxies and forming stars, and detect dust disks around stars where planets may be forming.

The solution to their problem lies within the Council for Scientific and Industrial Research Satellite Applications Center, a satellite tracking facility in South Africa formerly used by NASA. Located in Hartebeesthoek, 60 kilometers (37 miles) north of Johannesburg, the Satellite Applications Center will track the spacecraft for up to four hours, or until the Deep Space Network's tracking station near Madrid, Spain, acquires a signal.

"No one wants to sit on pins and needles for four hours," said Pat Beyer, telecommunications and mission systems manager for the Space Infrared Telescope Facility at JPL. "So we contracted with Hartebeesthoek, which has a smaller antenna that can't track in deep space as well, to fill in the gap."

The Deep Space Network is an international network of antennas that supports interplanetary spacecraft missions. The network has three tracking stations: at Goldstone, Calif., in the Mojave desert; at Robledo de Chavela, Spain, 60 kilometers (37 miles) west of Madrid; and near the Tidbinbilla Nature Reserve, 40 kilometers (25 miles) southwest of Canberra, Australia.

The Satellite Applications Center in South Africa uses smaller antennas than the Deep Space Network. The larger the antenna, the better the ability to track objects in deep space. The Space Infrared Telescope Facility will use the South African facility's 5.4-meter (18-foot) and 12-meter (39-foot) antennas. The Deep Space Network antennas being used measure 34 and 70 meters (111 and 230 feet). Deep Space Network facilities can track spacecraft traveling more than 16 billion kilometers (10 billion miles) from Earth.

The Deep Space Network tracking facilities use antennas that continuously compensate for the Earth's rotation. Once a spacecraft reaches space, it does not rotate with earth, but at its own pace. A spacecraft is only in the "line of sight" with one facility for a maximum of 10 to 12 hours a day before being handed off to another facility.

"The Space Infrared Telescope Facility is a different animal than we've dealt with in the past because it's an observatory, not an orbiting planetary mission," Beyer said.

Normally, when a spacecraft launches, it travels through the sky in a southeast direction, from Kennedy Space Center to Canberra. But the Space Infrared Telescope Facility will move so slowly in this direction that the rotation of the Earth will overtake it. Its resulting course will veer to the west before reaching Australia. The Madrid tracking station will not be able to track the observatory until after four hours have elapsed.

The Space Infrared Telescope Facility is the first new mission of NASA's Origins Program, which strives to answer the questions "Where did we come from?" and "Are we alone?" It is also the fourth and last of NASA's Great Observatories, a program that also includes the Hubble Space Telescope, the Chandra X-Ray Observatory and the Compton Gamma Ray Observatory.

"In the field of astronomy and physics, it is always inspiring for people to discover phenomena that will help us explain why we are here and how the solar system evolved," said Johnny Kwok, mission design manager for the Space Infrared Telescope Facility. Kwok developed the mission concept for the spacecraft, including what the spacecraft has to do, the path it has to take, and how it communicates information back to Earth. "With the Space Infrared Telescope Facility, we can look back in time and study the history to this early formation of the universe. That's exciting, and it satisfies our curious nature."

During its 2.5-year mission, the Space Infrared Telescope Facility will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space between wavelengths of 3 and 180 microns (1 micron is one-millionth of a meter). Most of this infrared radiation is blocked by the Earth's atmosphere and cannot be observed from the ground.

Consisting of a 0.85-meter telescope and three cryogenically-cooled science instruments, the facility will be the largest infrared telescope ever launched into space. Its highly sensitive instruments will provide a unique view of the universe and allow scientists to peer into regions of space that are hidden from optical telescopes. Many areas of space are filled with vast, dense clouds of gas and dust which block the view from Earth. Infrared light, however can penetrate these clouds, allowing a view into regions of star formation, the centers of galaxies, and into newly forming planetary systems. Infrared also provides information about the cooler objects in space, such as smaller stars that are too dim to be detected by their visible light; extrasolar planets; and giant molecular clouds. Also, many molecules in space, including organic molecules, have their unique signatures in the infrared.

As for preparations for the mission's launch, the Space Infrared Telescope Facility on June 17 began about four weeks of thermal vacuum and thermal balance testing to ensure that it will function properly in a space environment. Afterward, it will undergo about two months of mission scenario testing, which will determine how well the observatory can operate in flight. The observatory's software and hardware must work together with ground operation commands before it can be shipped to Kennedy Space Center in late November. Once at the launch site, engineers will spend 45 days making sure the facility functions properly after the move, and preparing for the launch.

At top, from left: artist's rendering of the Space Infrared Telescope Facility; an image, taken last month at Lockheed Martin in Sunnyvale, Calif., showing SIRTF's newly-attached solar array integrated with the rest of the observatory; the X-band antenna that will track SIRTF following launch as it flies over South Africa. Bottom image shows the Satellite Applications Centre, Hartebeesthoek, South Africa.

Enjoying a rare sight

Photo courtesy of Andrea Donnellan

Children at Woodbury Village Preschool, left, got a chance to view the rare solar eclipse June 10 with the help of JPL's Telescopes In Education project, which also brought telescopes to the Child Educational Center and the Five Acres Boys and Girls Home. Meanwhile, astronomer Jim Young of JPL's Table Mountain Observatory offered this image of the eclipse, as photographed from the Wrightwood facility with a 10-inch, full-aperture filter.

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 ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

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

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

Passings

VIRGINIA LANE, 92, a retired JPL employee from the former Section 710, died May 7.

Lane joined JPL in 1969 and retired in 1977. Services were private.

KURT CARTER, 47, an electronics technician in Section 335, died of a heart attack May 12.

Carter had worked at JPL since 1991. He is survived by his wife, Helene.

A memorial service will be held in von Kármán Auditorium July 24 at 11:45 a.m.

FREDERIC BILLINGSLEY, 80, a retired member of the technical staff in Section 384, died of respiratory failure May 31.

Billingsley worked at JPL from 1962–91. He is survived by his wife, Evelyn, three children and seven grandchildren.

Services were private.

DR. NASSER GOLSHAN, 59, Division 33 representative the Deep Space Mission Systems' Engineering Program Office, died of a brain aneurysm June 6.

Golshan had worked at the Lab since 1989. He is survived by his wife, Maryam-Mahtash Esfandiari, and sons Hooman and Ali.

Memorial services were held at Westwood Memorial Park.

SHARON BARR, 33, a staff engineer in Section 313, died June 12.

Barr had worked at JPL since 1994. She is survived by her husband, James, and daughter Jessica.

Services will be held June 24 at 11 a.m. at Rose Hills Memorial Chapel in Whittier.

Letters

Thanks to all of the people at JPL who have offered kind and thoughtful words, written cards, or sent me a plant after the passing my father. Your condolences during this time of mourning was a much-appreciated comfort for me and my family. Thank you.

Matthew Bennett

I would like to thank my colleagues and friends both at JPL and at LMA, for their support and kindness following the recent death of my father. I would like to thank JPL for the gift of a beautiful plant, which we will care for in his memory.

Todd Bayer

Classifieds

For Sale

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

BABY ITEMS; Bellini crib & mattr., white, $300; Bellini changing table/hutch, 3 drawer, $300; jogger, $100; all in exc. cond., prices are obo. 626/351-1131.

BED, antique oak & rod iron, queen-size, w/rails, picture at JPL Store, $150/obo. 626/744-9064.

BICYCLE, women's, 29" Centurion Comp TA road bike, equipped with Shimano 600 derailleur, etc, terrific cond., $60. 956-3745, Steve.

CAMCORDER, Sony Hi-8, model: CCD-TR81, remote, carry case, 8 blank tapes, works well, $175/obo. 687-8627.

CAMERA, Mamiya M645 SLR, A & E prism, 220 back, w/120 & 220 roll film holders and inserts, deluxe power motor dr. lenses, 45 mm, 80 mm & 105-210 zoom, Sunpak auto flash, mod. 555, aluminum case, $2,200. 323/257-7668.

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

DINETTE SET, round table, four chairs, 2 ext. to make table oval, $75. 626/355-2957.

EXERCISE EQUIPMENT: treadmill, $75, Cardio-glide, $50; DINING TABLE, round with four swivel chairs, leather upholstery, $100. 626/447-6423.

FISH TANK, 40 gal., new stand, heater, pumps & other accessories, must sell, $173/obo. 626/405-9701, leave msg.

METAL DETECTOR, for door security, Garrett, includes battery kit, earphone, belt loop and holder, 100/ea. picadogeorge@hotmail.com.

MOVING SALE: typewriters, 2, antique, $50/ea.; hammock, enormous, white nylon, $75; Sony dual tape cass. player, $50; Martin 00016 acoustic guitar, $800/firm; NordicTrack skier, $100/obo; Mini tape recorder, like new, $15. 626/577-0778.

POOL TABLE, 8 ft, w/Slatron bed, like new, only 6 mo. old, brass light bar w/4 red shades, 10 cue corner rack holds balls, drinks, and talc, comes w/spill proof table cover, balls, 2 cues, 8 ball and 9 ball racks, $900/obo. 626/405-9701, leave msg.

REFRIGERATOR, off-white 18 cu. ft. Kenmore Coldspot, less than 1 yr. old w/1 year of warranty remaining, avail. Aug., $400/obo. 626/289-6359.

REFRIGERATOR, narrow, about 4' tall, 22" wide, 7.1 cu. ft., excellent space saver, $75. 957-7742.

SCANNER, brand new Memorex 6142u color flatbed, never been used, 600 x 1200 dpi, supports Windows 98/2000/ME, 9600 dpi enhanced resolution, $37. 956-3745, Steve.

SKI SET, used women's, Head 170s, Gala Radial & poles, Salomon boots, size 7, plus bindings, see picture at JPL Store, $150/obo. 626/744-9064.

SOFA & LOVE SEAT, never used, $425. 957-3675.

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

TRIPOD PROJECTION SCREEN, Da-Lite Versatol, portable, white, 60 in. x 60 in., very good cond., hardly used, $60. 626/398-9702, Tom.

WEIGHT BENCH, adjustable, Marcy Brauny Plus, padded weight bench with leg lift, adjustable incline bench, adjustable barbell rack-both height and lateral extension, high density foam padded, very good cond., $50. 626/398-9702, Tom.

Vehicles/Accessories

'98 AUDI A4, 6 cyl., off-white, sunroof, concert sound syst., 22K mi., immac. cond., $18K. 793-2611.

'00 BMW Z3, 2.8, 5 spd., under 35K mi., custom lthr. inter'r, impeccably maint., silver/ black top, drives like "the ultimate driving machine," serious drivers only, low Blue Book, $30K. 323/550-1150.

'02 CHEVROLET Avalanche 1500, 2 w/d, V8, 4 spd. auto., 6,300 mi., loaded, + Star, Lo-Jack, running boards, $28,900. 779-8481, George.

'99 CHEVROLET Silverado LS15, auto V8 4.8L eng., 2 dr., black, stainless wheels, brand new tires, Rhino bed liner, Snug Top tonneau, cloth interior, AM/FM/CD, power accessories, exc. cond., 22,000 mi., $14,500. 626/792-7753, after 5 pm.

'94 CHEVY Astro cargo van, V6, auto. trans., a/c, ps, pb, airbags, ABS, am/fm stereo, cust. whls., exc. cond., new paint/tires/shocks/brakes, Cargo King bedliner, all records, 125K mi, see http://www.stonehillnews.com/astro, $5,155/obo. astro@stonehillnews.com, 626/399-6276, Jeremiah.

'94 CHEVROLET Camaro, V6, Bose stereo speakers, pwr. windows and driver's seat, teal, 116K mi., exc. cond., $6,000. 833-7107.

'99 DODGE Ram 1500 truck, 5.2L V8, 8' bed, locking shell, 41K mi., must sell, $12K. 909/593-6379, eves.

'97 DODGE Caravan, 7 pass., 4 cyl, a/c, pwr. steering, dual airbags, dk. green, 2nd owner, exc. cond., sold because moving out of U.S,. 76K mi., $6,000. 626/795-2409.

'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, code3media@crownvic.net for photos, $13,000/obo. 822-6465.

'98 FORD Windstar GL, 7 pass, a/c, pwr. steering, dual airbags, dark green, 2nd owner, exc. cond., sold because moving out of US, 93K mi., $9,800. 249-0909.

'96 FORD Escort LX, 2 dr. hatchback, stick shift, a/c, stereo, only 60K mi., great commuter car, exc. cond., $4,350. 909/985-6806.

'95 FORD Windstar XL minivan, rear air, quad seating, console, plus many more features, 87K mi., one owner with all records, runs great, $5,700. 626/447-6423.

'87 FORD F150, black, V8, 5.0, a/c, power doors/windows/brakes, auto, cruise control, 1/4 cab & bedliner, towball, wiring, HD springs, good cond., $3,100. 951-3653.

'67 FORD Mustang, candy apple red, exc. cond., good exterior, still needs work, newly painted, rebuilt 302 eng., power steering, put in front disk brakes, orig. 8-track stereo, 3rd owner, have all the work receipts, $9,000/obo. 954-0269, Dustin.

'00 HONDA Civic, silver, 38.1K miles, 5ps, a/c, PS, AM/FM radio, immaculate, always dealer serviced, service docs, great fuel mileage, $10K/obo. 243-1780 or armond@sprintmail.com.

'98 HONDA Civic LX sedan, white w/gray cloth interior, 47K mi., automatic, power brakes/door locks, AM/FM stereo, a/c, tilt steering, cruise control, tinted glass, driver and passenger side airbag, deluxe wheel covers, rear defroster, one owner, great cond., $10,700/obo. 956-8060.

'94 HONDA Nighthawk, 250cc, 2,500 miles, exc. cond., kept in garage, $2,000. 562/693-1136.

'93 HONDA Accord EX sedan, 4 dr., automatic, am/fm cass., sunroof, black, clean, 96,000 mi., $7,300/obo. 244-3343.

'81 HONDA Interstate SilverWing, shaft drive, water-cooled, Prolink suspension, just over 6K miles, garage kept, near mint, incl. 2nd seat for passenger, http://home.attbi.com/~macmaven/sw/index.htm for pictures, $2,250. 353-2103.

'99 JEEP Wrangler SE, exc., black, soft top, under 23K miles, 4 wheel drive, extras, like new, $11,000. 957-7742.

'93 KAWASAKI Ninja, 600cc, great cond., black with turquoise/purple stripe down the side, leather tank cover, 16K mi., see picture at JPL Store, $3,200/obo. 501-8161.

'94 MAZDA MX-3, silver, auto, a/c, Pioneer CD, 2 dr., 4 seater, Blue Book value $3,000, sell for $2,000. 213/280-5425, cell.

'93 MAZDA MX6, red w/tan interior, 5-spd., sunroof, alarm, new CD player, pwr. windows/ locks, a/c, 115K miles, vg cond., $3,900. 323/221-9691.

'93 NISSAN Altima GXE, dk. blue, 67K mi., new tires, 4 door., a/c, pwr. windows/locks/steering, airbag, 1 owner, vg cond., $3,800. 952-6214.

'86 SUZUKI GSX-R 750 motorcycle, very low mileage with some engine work, in great shape and lots of extras, $2,500. 640-7479, Greg.

'94 TOYOTA Tercel DX sedan, 4 dr., auto., a/c, pwr. steering, AM/FM stereo, 118K mi., gd. cond., $3,400. 661/259-5971, euihyeok@netzero.net.

'98 TOYOTA Camry LE, exc. cond., automatic, a/c, power locks/windows, sage, 13 mo. of warranty remaining, 63,000 mi., Blue Book value, $12,960. 626/797-6388.

Wanted

DONATED ITEMS, for Amnesty International Pasadena/Caltech Group 22 summer sale, household goods, clothes, toys, electronics, furn., all proceeds for human rights activities. aigp22@caltech.edu.

HOUSING, webmaster seeks extr. priv., quiet think tank, willing to pay rent, barter goods/ services or housesit for free. 248-6062, Elizabeth.

MINI-BIKE, Rupp, in running cond. 626/357-7347.

MOTOR HOME, to rent July 24-26. 661/290-2892 or 818/249-2235.

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

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

WOOD LATHE, med. to heavy duty. 323/662-4089.

Lost & Found

LOST, gold magnet bracelet, approx .25" wide, says "Nikken" on catch. 3-6897, Wendy Morey.

Free

COMPUTER CASES, old, with (non-ATX) power supplies and miscellaneous other 386/486 hardware for hobbyist. 626/794-9579, eves.

KITTENS, four, 2 tabby, 2 black, very friendly, litter trained, healthy, 16 wks old. 626/287-9433.

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

For Rent

ALTADENA, charming studio above garage with spacious closet area, bathroom, kitchen facilties; quaint foothill neighborhood, 4 miles from JPL; beautiful grounds, with friendly dog; $695, incl. utilities; avail. July 1. 626/797-2999.

ALTADENA house, 3 bd., 1 ba., hardwood floors, remodeled kitchen, new tile, fireplace, swimming pool, $1,600. 626/437-3691.

ALTADENA, charming, freshly painted 2 bd., 1 ba., house, nr Christmas Tree Lane, hardwd flrs., fireplace, appliances, whole-house fan, fenced backyard, fruit trees, roses; see www.alumni.caltech.edu/~chrisc, rent $1,650/negotiable, includes water, gardener, trash. 626/794-9579, eves.

ALTADENA, 3 bd., 2 ba., private family home, fireplace, remodeled kitchen and bath, 2-car garage, laundry, spacious back yard, great view, gardener included, $1,500. 909/392-7554.

ALTADENA, studio apt. with kitchenette, 3 mi. from JPL, $550. 626/797-6287.

ALTADENA, room, kitchen privileges, washer/dryer, swimming pool, $400. 626/345-0692 or 626/437-3691.

LA CANADA/FLINTRIDGE, private room, private ba., kitchen privileges, BBQ, pool, parking, 2 mi. from 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, $1,550. 805/659-1742.

LA CRESENTA, apt. to share, 2 bd., 1 ba, washer/dryer, 15 mins./JPL, no smoking or pets, female preferred, avail. 7/1, $425 + 1/2 util. 249-9739.

MONROVIA studio, off-st. parking, incl. water/trash, no smoking/pets, carpet, blinds, stove, gardener takes care of lawn, avail. 7/7, month-month, $600 + $500 sec. dep. 714/839-5705.

MONTROSE guesthouse, studio w/full ba., full kitchen. quiet, private, walk to Montrose Village, $625 includes utilities. 957-4812.

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

PASADENA condo, walk to S. Lake & Old Town, 2 bd., 2 ba., cent. air, secured bldg., underground parking, lg. balcony, $1,350. 626/826-9868.

Real Estate

COLORADO, 10+ level acres near Rio Grande, NM border, 2 adjacent 5-acre lots on St. Hwy 248, sell one or both for $1K/acre/obo. 626/254-1550.

GLENDALE, 4 bd., 2.75 ba., 2,410 sq. ft. home, pristine move-in cond., convenient 10 min./JPL, wooded Glenoaks Cyn., wonderful neighb'h'd, bay-windowed living rm w/fpl, formal dining rm, lg. fam rm w/wet bar, & remod. oak-cab kit, spacious front porch w/cyn view, incl. kitchen & laundry appl., new carpet/paint/lighting/furnace/dbl-pane windows, Cu plumbing, $529K. 323/937-9349.

MONROVIA, character California bungalow, walk to Old Town, 3 bd., 1.75 ba., on a large lot with lots of fruit trees, dining room with built-in wood cabinets, updated kitchen, $295,000. 952-6007.

SHOW LOW, Ariz., 3 bd. house, .43 acres w/ ponderosa pines, nat'l gas, sewer, in town subdivision, close to skiing and fishing, great investment property, house nds. help, $25K/obo. Randall.Mielke@fijivillage.com.

WILLIAMS, Ariz. area, (10 mi. away), 43 acres w/ 2-rm house, seasonal pond, wildlife everywhere, house on top of cliff w/ great views, $34K, adjacent 41 acres available w/ great building site on cliff edge, $22K. Randall.Mielke@fiji.com.

Vacation Rentals

BIG BEAR LAKEFRONT, luxury town home, 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.

CANCUN, timeshare condo (A Royal Resort), July 6-13, sleeps 6, 2 bd., 2 ba., on the North Shore, full kitch., resort offers restaurants, bars, mini-market, 2 pools, tennis, bicycles, sailboats, 18-hole golf course nearby, $500/wk. 805/577-0990.

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, Courchevel, fully equipped unit, 2 bd., 2 ba., sleeps 6, a short walk to Canyon Lodge and ski lifts. 661/255-7958.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, slps. 6-8, fully equip'd kitch. incl. microwave, D/W, VCR, cable TV, phone, balcony w/mtn. vw., Jacz., 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 kitchen, quiet, relaxing, beautiful beachside setting, BBQ, pool, spa, game room, great ocean view, easy walk to pier and restaurants, sleeps 8, avail. 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.

PACIFIC GROVE hse, 3 bd., 2 ba., f/p, cable tv/vcr, stereo/CD, well eqpd. kit w/microwv, beaut. furn, close to golf, bches, 17 Mile Dr., Aquarium, Cannery Row, JPL discnt. 626/441-3265.

PUERTO VALLARTA, Villa del Mar, lg. studio, sleeps 4 max, rooms have microwave, kitchen, phones, cable TV, priv. patio, 3 pools, 3 res-taurants, 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.

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