Universe

Jet Propulsion Laboratory

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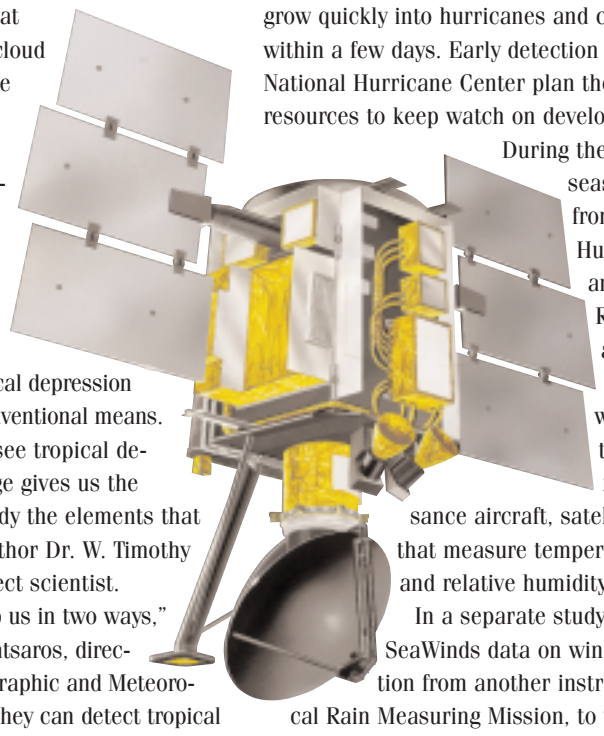
SeaWinds enables quicker storm detection

By Rosemary Sullivant



The SeaWinds instrument onboard QuikScat, above, will help detect tropical depressions at their earliest stages.

Tropical storms churning into potentially dangerous hurricanes often hide behind a cloak of clouds. But new research has given forecasters a new way to peek under the covers and identify storms much faster.

Scientists traditionally rely on satellite pictures to study the telltale swirl of clouds of a forming storm. However, the SeaWinds instrument aboard the JPL-built-and-operated QuikScat satellite can look through the cloud cover and measure winds at the ocean's surface.

According to a new study by National Oceanic and Atmospheric Administration (NOAA) and JPL researchers expected to be published in a major scientific journal, SeaWinds can detect the closed circle of winds that characterize a tropical depression up to 46 hours sooner than conventional means.

"The ability of SeaWinds to see tropical depressions at their earliest stage gives us the opportunity to identify and study the elements that create hurricanes," said co-author Dr. W. Timothy Liu of JPL, the SeaWinds project scientist.

"The SeaWinds data can help us in two ways," added paper author Kristina Katsaros, director of NOAA's Atlantic Oceanographic and Meteorological Laboratory in Miami. "They can detect tropical depressions early and help us improve our models. With more accurate information on the surface wind speed and direction in hurricanes at all stages, our models can do a better job of predicting a hurricane's evolution and course."

QuikScat, launched in June 1999, travels over 90 percent of the ice-free oceans every day with a high-frequency microwave scatterometer that provides detailed information on sea surfaces that can be translated into wind speed and direction.

In their NASA-supported study, Katsaros and her colleagues looked at SeaWinds data from the regions where 12 of the named storms in the 1999 hurricane season formed. Eight of the storms eventually developed into hurricanes. The researchers then examined the data collected 12 to 48 hours in advance of the storms being declared tropical depressions.

While the SeaWinds instrument wasn't always upstream of all 12 storms, it was in position to provide wind data on eight. In those cases, it was able to detect the closed wind circulation well before it could be seen as cloud swirls on the GOES satellite image. The lead times ranged from three hours for Hurricane Irene to 46 hours for Hurricane Lenny.

Being able to detect tropical depressions early is especially important in increasing warning times in regions like the Gulf of Mexico, where storms can grow quickly into hurricanes and can make landfall within a few days. Early detection also may help the National Hurricane Center plan the best use of its resources to keep watch on developing storms.

During the current hurricane season, scientists from the National Hurricane Center and the Hurricane Research Division are comparing SeaWinds data with wind information from computer models, reconnaissance aircraft, satellites, and devices that measure temperature, moisture and relative humidity.

In a separate study, Liu combined SeaWinds data on winds with information from another instrument, the Tropical Rain Measuring Mission, to which JPL also contributes. TRMM can also can see through clouds and measure rainfall in hurricanes. "Hurricanes are especially devastating when they are accompanied by strong winds and heavy rain," Liu said.

"QuikScat and TRMM provide the only opportunity for us to view the interplay between wind and rain before landfall and help us to understand and predict hurricanes," he said. The results of this study appeared in the June 6 issue of EOS, Transactions of the American Geophysical Union.

"This year the QuikScat data will be incorporated into a surface-wind analysis system of NOAA's Hurricane Research Division to produce the surface windfields in tropical storms in near real time," said Katsaros. "This will help the National Hurricane Center in making decisions about warning the public when a storm threatens landfall."

QuikScat data are available on the Internet at *http://manati.wwb.noaa.gov/quikscat.*

Ulysses begins study of Sun's south pole

By Martha Heil

The JPL-managed Ulysses spacecraft, on a mission to explore the Sun at extreme latitudes, began its investigation of the Sun's south polar region on Sept. 6. This is the second time Ulysses has passed under the Sun, but this time the glowing orb will look and act very differently because the Sun has reached solar maximum, a time of heightened activity.

Ulysses was able to assess the Sun during the relatively quiet solar minimum between 1994 and 1996. Now it will fill in the gaps with observations during the solar maximum, thus completing observations during a full sunspot cycle of 11 years.

"Ulysses has been making continuous observations of the Sun and heliosphere for the last 10 years," said Dr. Edward Smith of JPL, the U.S. project scientist for Ulysses. "The scientists involved are still as enthusiastic as ever and are looking forward to discovering lots of new things as the Sun acts up."

Scientists are interested in learning about sunspots, solar flares and coronal mass ejections, chunks of the Sun's outer atmosphere that blow off into space and can strike the Earth, causing aurorae and interrupting satellite communications.

The scientific investigations on Ulysses are studying the Sun's corona, its gaseous outer atmosphere, which extends far beyond the orbit of Earth. This gas moves outward through the solar system at high speed, and therefore is called the solar wind. In addition to affecting Earth and other planets, this wind pushes the gas and dust that occupies the space between the stars out of the solar system and forms a "bubble" in the interstellar medium called the heliosphere. In spite of the Sun's effort to keep out interstellar matter, some of the gas and dust penetrates the bubble and is found throughout the heliosphere. A major goal of Ulysses is to

study incoming cosmic rays—nuclei of atoms traveling at nearly the speed of light—and how they interact with the solar wind.

Ulysses has found that although the Sun's magnetic field is strongest near the poles, as the solar wind pushes it outward, the magnetic field eventually has the same strength over the equator as over the poles.

Ulysses, launched in 1990, is a joint venture of NASA and the European Space Agency.

Galileo probe data may explain Jupiter hot spots

By Guy Webster

Waves of up-and-down winds that span great ranges in air pressure may explain the surprisingly clear, dry areas near Jupiter's equator, new research based on data from JPL's Galileo entry probe indicates.

Scientists have been trying to understand the stability of these clear "hot spots" ever since the probe plunged into one of them nearly five years ago.

"If you could ride in a balloon coming into one of the hot spots, you would experience a vertical drop of 100 kilometers (about 60 miles)—more than 10 times the height of Mount Everest," said Caltech's Dr. Andrew Ingersoll, a Galileo science team member.

An explanation of how these deep holes in Jupiter's clouds could persist is reported in the Sept. 8 edition of the journal Science by Dr. Adam Showman of NASA's Ames Research Center, Moffett Field, Calif., and Dr. Timothy Dowling, director of the University of Louisville's Comparative Planetology Laboratory.

"This helps answer one of the big puzzles we ended up with after the probe entry," said Dr. Torrence Johnson of JPL, Galileo's project scientist.

Showman and Dowling propose that air moving west to east just north of Jupiter's equator is also moving dramatically up and down every few days. Water and ammonia vapors condense into clouds in Jupiter's white equatorial plumes as the vapors rise. Then the wrung-out air drops, forming the clear patches. After crossing those hot spots, the air rises again and returns to its normal cloudy state.

The researchers developed a computer simulation that recreates known traits of the hot spots and plumes when the simulation starts with a large-scale pressure difference. Dowling said smaller pressure differences do not produce stable patterns.

"There are no wimpy hot spots, only strong ones," he quipped.

During the Galileo probe's hour-long descent on Dec. 7, 1995, it returned the only direct measurements ever made from within Jupiter's atmosphere. Scientists quickly realized the entry point was a special place. On a planet mostly wrapped in high clouds, the probe hit the southern rim of a clear spot where infrared radiant energy from the planet's interior shines through.

The computer simulation reveals that the probe's entry site is probably even more unusual than previously thought. Both the probe and the computer model show that the head winds on the southern rim of a hot spot get stronger and stronger with depth into the planet. But in the model, this trend is reversed on the northern rim. "These results underscore the importance of future multi-probe missions to Jupiter," Dowling said.

News Briefs

Deep Space 1 sets ion engine record

Having run its unique propulsion system for more than 200 days (4,800 hours), the ion propulsion engine on JPL's Deep Space 1 has now accumulated more operating time in space than any other propulsion system in the history of the space program.

The almost imperceptible thrust from the system is equivalent to the pressure exerted by a sheet of paper held in the palm of your hand. The ion engine is very slow to pick up speed, but over the long haul it can deliver 10 times as much thrust per pound of fuel as more traditional rockets.

Previous ion propulsion systems, like those found on some communications satellites, were not used as the main engines, but only to keep the satellites on track. Deep Space 1 is the first spacecraft to use the technology as its primary means of propulsion. The NASA Space Electric Rocket Test 2, launched into Earth orbit in 1970, had the previous record for ion propulsion, thrusting for about 161 days.

"The importance of ion propulsion is its great efficiency," said DR. MARC RAYMAN, Deep Space 1 project manager. "It uses very little propellant, and that means it weighs less so it can use a less expensive launch vehicle and ultimately go much faster than other spacecraft."

The Deep Space 1 ion engine could have a total operating time of more than 583 days (14,000 hours) by the end of its mission in the fall of 2001.

Senior research scientists named

Five JPL employees have been appointed senior research scientists.

DR. JOHN ARMSTRONG (Section 333) was honored in recognition of his

Dr. John Armstrong

Dr. Sarath Gunapala

Dr. Ronald Kwok

Dr. Lute Maleki

Dr. Robert Nelson

significant and fundamental contributions to the field of gravitational wave and radio astronomy.

DR. SARATH GUNAPALA (Section 346) was appointed in recognition of his research specialty in semiconductor devices.

DR. RONALD KWOK (Section 334), was recognized for his research specialty in remote sensing of the ice-covered oceans using active and passive microwave observations.

DR. LUTE MALEKI (Section 335) was honored for specialty in atomic and electro-optics frequency standards and clocks also precision tests of fundamental physics with clocks and oscillators.

DR. ROBERT NELSON (Research Element 3238), was appointed in recognition of his research in remote sensing reflectance spectrophotometry.

The senior research scientist title was established to give special recognition and promotion of outstanding individual research achievers. Eligibility is established by the demonstrated ability to meet the research requirements typical for appointment as full professor at a leading university, as evidenced by outside peer review, and also depends upon the individual's active participation in programs related to JPL's research and institutional goals.

Earth science proposal goes forward

A proposal for an atmospheric water and climate change study led by DR. CHRISTOPHER WEBSTER of Research Element 3232 is one of 11 of 45 submitted proposals selected by NASA for further implementation plan development.

All of the proposals involve a new generation of Earth Science research studies aboard unmanned aerial vehicles, or UAVs. The pilotless planes will carry the first in a series of Earth science payloads to high altitudes.

Webster's team proposes to investigate the processes responsible for controlling water vapor concentrations in the upper troposphere and lower stratosphere through a series of flight measurements, using a suite of already developed and built aircraft instruments including a laser hygrometer, a microwave temperature profiler, solar radiometers, and a laser spectrometer specifically developed and built for UAV application.

Webster's study is scheduled be demonstrated aboard two UAVs—the Pathfinder, an eight-propeller vehicle, and the Helios, a 14-propeller plane with a wingspan of 247 feet. The main science demonstration is scheduled for spring 2002 in Hawaii.

The proposals, submitted in response to a NASA research announcement issued last fall, come from three NASA centers, four universities, a federally funded lab and one other federal agency. Seven of the 45 proposed studies were submitted by JPL.

The selected proposals will be asked to further develop mission implementation plans over the next three months. NASA will then choose two or three of the proposals for full development in 2001. NASA has budgeted approximately $12 million in fiscal years 2001-03 for this effort. The aircraft that have been identified in the proposals include government-sponsored as well as private-sector planes.

A complete listing of the research announcement and selected proposals can be found online at *http://www.earth.nasa.gov/nra/archive/selection_results.html* .

JPL team wins NASA software honor

DR. YOAZ BAR-SEVER and his team in Section 335 have won NASA's Software of the Year Award for 2000 with their Internet-based Global Differential Global Positioning System.

The system is a uniquely powerful and flexible C-language software package that provides a complete end-to-end system capability for GPS-based real-time positioning and orbit determination with unprecedented accuracy, coverage and economy.

Components of the system have been used as the foundation in several critical real-time systems for NASA, other agencies and the commercial sector.

More information about the awards is available online at *http://www.hq.nasa.gov/office/codei/nasaswy.html.*

JPLer honored for Y2K efforts

ANDREW DOWEN of the Telecommunications and Mission Operations Directorate was recently awarded the president's Y2K Council commemorative medal honored by NASA Headquarters for his efforts in assuring JPL's Y2K compliance.

Dowen, operations service manager of the Space Operations Management Office, leads the teams responsible for operating NASA's ground station assets. In leading TMOD's Y2K efforts, he was cited for accelerating completion of Y2K repairs and helping to achieve agency goals for compliance.

Special Events Calendar

Ongoing Support Groups

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

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

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

Senior Caregivers Support Group—Meets the meet the first Tuesday of each month in Building 167-111. For information, call the Employee Assistance Program at ext. 4-3680.

Parent Support Group—Meets the third Thursday of the month at noon in Building 167-111. Call Greg Hickey at ext. 4-0776.

Sunday, September 17

Skeptics Society Lecture—"A Symposium on Race and Sports" will be held at 1 p.m. in Caltech's Baxter Lecture Hall. Free admission for JPL staff. Call (626) 395-4652.

Monday, September 18

"On Our Own Terms"—The JPL Employee Assistance Program will hold a discussion group in Building 111-117 from noon to 1 p.m. to explore topics presented in the four-part PBS television series "Moyers on Dying"—shown Sept. 10–13—and how death and dying affect the workplace. The series will be shown again on KCET Sept. 17 starting at 12:30 p.m. For more information on the series, go online to *www.pbs.org/onourownterms* or call the Employee Assistance Program at ext. 4-3680.

Tuesday, September 19

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

Wednesday, September 20

AFS Quick Start Session for Windows NT—Jeff Sachs of Section 366 will provide an overview of the benefits of using the AFS distributed file system to manage your computer files, including setting up group space, accessing data, publishing web pages, and more. At noon in the Building 167 conference room.

JPL 2000 Lecture—Dr. Paul Swanson, manager of the twin 10-meter Keck telescopes at Mauna Kea, Hawaii, will speak at 11 a.m. in von Kármán Auditorium.

Thursday, September 21

Von Kármán Lecture Series—Space and Earth Science Programs Director Dr. Charles Elachi will present "Seeing the Unseen: Using Spaceborne Radars in Earth and Planetary Exploration" at 7 p.m. in von Kármán Auditorium. Open to the public.

Working Parents Support Group—Debi Vasques, a representative of the Edward Jones Investment Co., will speak on college planning and saving, focusing on the best investment choices that will increase return and reduce tax consequences. To be held at noon in the northeast corner of the Building 167 cafeteria.

Friday, September 22

Von Kármán Lecture Series—Space and Earth Science Programs Director Dr. Charles Elachi will present "Seeing the Unseen: Using Spaceborne Radars in Earth and Planetary Exploration" at 7 p.m. in The Forum at Pasadena City College, 1570 E. Colorado Blvd. Open to the public.

Saturday, September 23

Engineering Job Fair—JPL seeks to hire systems, electrical, mechanical and aerospace engineers. Hiring managers from various Lab organizations will be on hand from 9 a.m. to 2 p.m. in the Building 167 cafeteria, where they will interview candidates and possibly extend job offers. Qualified candidates must be U.S. citizens or permanent residents, and are requested to bring 10 copies of their resume. For more information, call ext. 4-5150 or go online to *http://eis.jpl.nasa.gov/hrext/engfair.*

Wednesday, September 27

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

Thursday, September 28

Caltech Architectural Tour—The Caltech Women's Club presents this free service, which is open to the public, 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.

JPL Stories—Don Bickler, inventor of the "rocker bogie" suspension that transported Sojourner around Mars in 1997, will present "Romancing the Rover" at 4 p.m.

in the customer services area of the Library, Building 111-104. For questions about the story series or to participate, call Barbara Amago at ext. 4-3183.

NOVA awards

The following employees received JPL's Notable Value Added (NOVA) awards in August:

Section 100: Laura Dunn, Jo Jean Kos, Annette Ling. *Section 101:* Patricia Ortiz. *Section 107:* Tracy Carrillo.

Section 180: Viola Miller. *Section 183:* Thomas Nolan, Anita Sohus, Marguerite Syvertson, Peter Xaypraseuth. *Section 184:* Kimberly Johansen, Margaret Porter. *Section 185:* Paula Padilla.

Section 197: Lynn Baroff.

Section 210: Jane Goforth. *Section 212:* Grace Fan, Rosemary Montoya, Lientje Zheng. *Section 214:* Linda Bakhoum, Pam Leavitt, Yaun-Chyong Lee, Gabrielle Magee, Leah Miller, Josephine Soliz, Desiree Trevizo, Kathleen Ulrich. *Section 215:* Mariza Arnot, David Estrella, Laura Lee, Cathy Marte, Billie Ottenfeld, Kelly Pittman, Mina Rad, Joan Taylor. *Section 216:* Enrico Pineda.

Section 220: Carl Liu, Vuong Phan, Haiyan Wang. *Section 222:* Ida Young.

Section 231: Sheryl Jackson.

Section 252: Linsee Ramsay, Charles Simon. *Section 253:* Jan Smith.

Section 261: Martha Molodowitch.

Section 311: Theresa Anderson, Robert Aster, John Baldwin, Gary Carver, Janine Daughters, Wendy Ellery, Jairus Hihn, George Jaivin, Jancis Martin, Joel Signorelli, Nien-Tung Sun, Donna Wolff. *Section 312:* Julia Bell, Mark Garcia, Martin Johnston. *Section 313:* Maurice Argoud, Eleanor Basilio, Ronald Boain, Karen

Continued on page 4

SOLAR SYSTEM CHRONICLE

By Mark Whalen

When space buffs want the best images, they come to the Photojournal

Dutch Slagter/JPL Photo

The Science Data Processing Systems Section 388 maintains a unique resource for NASA, the Planetary Photojournal. This web site (http://photojournal.jpl.nasa.gov), which currently contains more than 2,400 images and adds more every day, serves as an archive for spacecraft-based, full-resolution images of all nine planets in our solar system as well as a number of asteroids and comets.

Originally developed as a tool to aid textbook authors and others in easily acquiring good-quality images of the planets, the Photojournal has also proved to be an invaluable resource to scientists as well thousands of educators, students, news media organizations and members of the general public. Section 388 Manager Sue LaVoie (above) discusses the site with Universe.

QUESTION *How long has the Photojournal been online? How did it begin?*

A Historically, through the Voyager days in the '70s and '80s, JPL had provided textbook publishers and news media organizations with hard-copy prints from all the planetary encounters. But in later years, budgets were tighter and that capability was no longer funded. A NASA-formed committee looked for a solution. The committee included JPL's chief scientist, Dr. Moustafa Chahine, and others from the science community, as well as JPL's Public Information Office. I was involved because of my work with the Planetary Data System Imaging Node, which is responsible for archiving imaging data returned to Earth from spacecraft instruments.

The Imaging Node recommended an online system that people could access for the data and then download and print for their needs. The committee agreed, and within about nine months of the proposal, we had created a prototype. The Photojournal was officially released in February 1996.

QUESTION *So this type of online capability didn't exist before?*

A There were individual project web sites, each with their own pictures—some of which were full-resolution, others were not—but there was none that was a collection of all of the data in one location with the ease of access that the Photojournal provided.

One of our challenges is allowing enough flexibility and capability so that the broad spectrum of users can make the most efficient use of the system; whether that's high-resolution images for a textbook, magazine, or to post on a wall in an observatory, or a compressed version of an image to use as a figure for an elementary school project.

QUESTION *What are the main advantages of using the Photojournal?*

A The Photojournal provides timely access to image releases from JPL and NASA planetary missions and maintains a digital archive of image releases at the full resolution acquired by the spacecraft, beyond the life of the missions, and supports users at both ends of the spectra, from casual browser through publisher.

QUESTION *How many people visit your web site?*

A We're getting an average of about 150,000 hits per day, which translates to between 4 and 5 gigabytes downloaded—approximately 4,000 to 5,000 images per day. The popularity of our site surged with the Mars Pathfinder mission in 1997, and to help accommodate the demand, we set up a "mirror" site at the U.S. Geological Survey in Arizona (*http://photojournal.wr.usgs.gov)*.

QUESTION *Are there other mirror sites?*

A We recently established a mirror site in Germany (*http://photojournal.dlr.de*), which is administered by the German space agency, DLR. The site in Germany has proved to be very popular.

We're also looking into setting up mirror sites in other parts of Europe, as well as in Asia. There is a lot of demand around the world for JPL and NASA images, and the mirror sites allow those in other parts of the world to download images much more efficiently.

QUESTION *How do you decide which images are posted on your site?*

A Each flight project science team decides which images are to be posted. We post the images at the same time they are released at news conferences or in scientific papers.

QUESTION *How many of the nearly 2,500 images in the system are from active missions and how many are from past missions?*

A About 1,200 are from active Earth and planetary missions; the 1,300 images from past missions date back to Mariner 10, which flew by Venus and Mercury in the mid-'70s.

We're averaging five or six images per week from the active missions (Cassini, Mars Global Surveyor, Galileo, Multi-Angle Imaging Spectro-Radiometer, Advanced Spaceborne Thermal Emission and Reflection Radiometer, Near Earth Asteroid Rendezvous, and Shuttle Radar Topography Mission).

We continue to work to locate and add images from the older missions, but it's a difficult job. Our goal is to put everything online in full resolution and not scan anything, unless absolutely necessary. Finding this older data requires searching through hundreds of old tapes, disks and negatives.

But we're doing pretty well. We've posted about 60 percent of the images from Voyager, with somewhat less than that for the Viking missions. We also plan to include the older Mariner missions.

QUESTION *So, how is the Photojournal funded? Since it's an online system, is it a money saver for the Laboratory?*

A Our main source of funds is the Planetary Data System Imaging Node. This covers maintenance of the JPL site and mirrors, upgrades, hardware, and interfacing with NASA Image Exchange, which links databases of images throughout the agency. This funding also allows us to do a little bit of archeology of past mission data. We continue to seek additional funds to enable us to make significant improvements in hardware and the system's capabilities, and to locate, archive and post all data from past missions.

In addition, we negotiate with the active missions for funding to support the release of their data on the Photojournal. This cost is approximately $125 per release to cover labor and hardware and software maintenance. We also receive collaborative support from the Solar System Visualization (SSV) project.

We can measure cost savings this way: The cost to distribute hardcopies of an image to 100 people would cost $2,000, while the cost to distribute the digital version of that image via the Photojournal to the world is $125. System and infrastructure costs are about $10 per image in the system.

QUESTION *What are your goals for Photojournal five or 10 years into the future?*

A In the near term, we plan to add a relational database and more flexibility in searching for specific images, or images with certain characteristics. For example, searching by acquisition date within a mission, images with volcanoes, full disk images of Jupiter, and keyword searches. We also plan to increase the number of "mirror" sites.

Our five- to 10-year-goal is to be the system of choice for accessing the complete set of the best-of-the best in NASA planetary imagery.

To attain this goal, we must utilize the state-of-the-art in hardware and information technology to provide lightning response and intuitive searches so that the user can find and download the image desired immediately. Evolving the system to this state will take time, expertise, and funding. During this evolution, we will continue to solicit feedback from our user community to ensure that the system we build is the system they need.

AWARDS *continued from page 2*

Boyle, George Cancro, Christopher Carr, Nagin Cox, Michael Davis, Scott Doudrick, David Durham, Hershall Fitzhugh, Robert Gaston, Tom Huynh, Alex Jimenez, Patrick Ko, Minh Lang, Daniel Limonadi, Jose Mancera, Jitendra Mehta, Joseph Okonek, Thomas Pagano, Scott Pick, Joel Rademacher, Cassandra Sellers, Gerald Snyder, Donald Starkey, Nancy Vandermey, Stacy Weinstein, John Wirth, Lu Yang. *Section 314:* Patricia Lock, Mark Rokey.

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Section 385: John Bulharowski, Gindi French, Jose Garcia, Kenneth Klaasen, Militiadis Papalexandris, Daniel Peters, Steven Pravdo, Orin Serviss, John Shields, Paul Springer, Frank Villegas, Tatiana Vinogradova, Chris Wrigley. *Section 386:* Steven Dinardo, Joseph Hernandez, Barron Latham, Tracy Lee, Karen Lee, Robert Lin, Catherine Magnano, Barbara Nakamura, Raymond Tsang, James Velebir Jr. Section 387: Randy Pollock, Orlesa Williams.

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Section 511: Courtney Lambert. *Section 515:* Kirk Barrow, David Guarino, Elizabeth Ingram.

Section 644: Judith Dedmon, Susan Foster, Michele Kelly.

Section 700: Clara Sneed. *Section 708:* Christina Alvarado.

Section 730: Deborah Vane. *Section 738:* Amy Walton.

Section 764: G. Joy Hodges.

Section 770: Terrence Adamski, Lori Ludwig.

Section 781: Gregory Goodson.

Section 795: Enrico Bruno, Consuelo Gennaro.

The following contractors were also awarded NOVAs as part of JPL teams:

Peter Barrett, Louis Belombre, Harmodio Gray, Denise Island, Thomas Larter, Peter Rentz, Gene Vitkus.

View this and previous issues of Universe online

http://universe.jpl.nasa.gov

Universe

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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.

Letters

Michele and I would like to thank our friends at JPL for their thoughts and sympathy over my mother's passing. Their kind words, cards, and the plants from the ERC were greatly appreciated during a very difficult time.

Bryan Bell

My family and I would like to thank the employees of JPL for their expressions of sympathy at the passing of our father, Carlo Fea Jr. We would like to thank Benefits and the ERC for the beautiful plants. Both were very appreciated.

Donna Williams and family

My wife and I thank all our JPL friends for their kind words of comfort after the death of my mother. We also want to thank the ERC for the beautiful plant delivered to our home.

Marc and Florinda Walch

Passings

DAVID PERALTA, 84, retired from Section 662, died of diabetes Aug. 26.

Peralta joined JPL in 1957 and retired in 1982. He is survived by sons Kenneth, David and Bernard and daughter Marie.

Services were private.

GARY WANCZUK, 62, a retired engineer in Section 314, died Aug. 26.

Wanczuk worked at the Lab from 1962 to April 2000. He is survived by his mother, Anna-Laurie, brother Glen and sister Gail Barton.

Services were held Sept. 6 at Hemet Cemetery.

JOEL ROGERS, 53, a a senior electromechanical specialist in Section 357, died of pancreatic cancer Aug. 15.

Rogers joined JPL in 1998 after working as a contractor since 1985. He is survived by his wife, Sharon.

Services were private.

Classifieds

For Sale

BARBECUE, elec., 1,500W, grill in & outdoors, $75; PRINTER, Lexmark 3200, color, like new, orig. ink cartridge over half full, $50; TREADMILL, Jane Fonda model, simple, rugged design, fits under bed, $100. 626/254-1550.

BED, queen w/queen futon, black enameled steel frame w/lattice headboard, exc. cond., $250/obo. 626/564-1384.

BED, twin set, exc. cond., $200; FOOD PROCESSOR, QuisineArt, gd. cond., w/blades, $60.626/798-8071.

BEDROOM SUITE, antique, 5 pc., matching, honey maple: bed, queen/full headbd., blended wood shades, footboard/bedrails, 2 matching end tables w/drawers, $350; vanity, unique, V2 drawer/dressing table w/full-length adj. ctr. mirror, exc. cond., $295, or all 5 pcs., $595. 368-9520.

BIKE, Bianchi, touring, gd. cond., $100. 626/359-7608.

CAR, radio contr., one of a kind, ready-to-run; CEN electric ($200), top-of-the-line LRP V7.1 electronic spd controller ($130) w/Trinity PK2 Pro motor ($30); comes with Futuba AM radio ($100), electronic spd controller, motor, 1 batt. pack & extra parts; everything you need except battery charger ($30); best for beginners; can be modified; $460 value, sell $250. 500-9163.

CASSETTE SYSTEMS, 2, portable, am/fm, Craig/RCA, dual, still in boxes, great for dorm or RV, $25 ea./obo. 362-3358.

CLARINET with case, VG cond., needs about 3 new pads, $200/obo. 790-2825, Terri Formico.

CLARINET, wooden, B-flat, #7823, A. Fontaine, Couesnon, Paris, $285. 310/318-9574.

CLAY POTS, round, lg. (2' & 3' dia.), $50 ea. 2'/obo, $60 ea. 3'/obo. 626/398-3480.

CRIB, dk. wood, Vict. Looking, Simmons, + newer 15 yr. matt., exc. cond., $600 new, sell both $150/obo; SIT-IN BARN, like new, Little Tikes, perf. gift for older infant/toddler, $25; TOY ENGINE, Thomas Tank, new, still in-pkg.; DUVET cover & pillow case, $35; EXERCISE MACHINE, NordicTrack, $100. 626/798-5143, jfhook@pacbell.net.

CRIB, lg., white wood w/matt., pad, sheet, bumper guards, coverlet, adj. exc. cond., $150. 626/285-9103.

DESK, executive, all wood, gd. cond., 6'x33", $75; FILE CABINETS, 2 drawer, $10 ea. 626/793-3228.

DISHWASHER, Maytag, 6 mo. old, pd. $450, sell $200. 541-0131.

EXERCISE MACHINE, Healthwalker, gd. cond., $65/obo. 447-4734.

EXERCISE MACHINE, NordicTrack 505, ski, $300/obo; BIKE TRAILER, Burley, non-collapsable, $100/obo. 661/248-6554.

EXERCISE MACHINE, Vitamaster Pro, 1.5 hp, variable spd. (0-10), exc. cond., little used, $250/obo. 626/335-6864.

FILE CABINET, 5-drwr, lock, fine cond., incl 150 hang-file folders, $65/obo. 909/593-4046, vivdavies@starquest.net.

FISHING ROD, 7', spinning, $8; REELS, 2, $5 & $7; STOVE, Coleman, $15; LANTERN, Coleman, $20; TENT, camping, heavy duty, $75. 626/793-1895.

GARAGE DOOR OPENER, Genie, all hardware & remote, moved and new location had opener, $50/obo. 362-3358.

FURNITURE: computer center, $20; entertainment center, $5; bookshelf, $10; student desk, $5. 790-9355, eves.

FURNITURE, oak: desk, computer, 2-pc., L-shape w/butcher block top, keyboard drawer, 5 drawers (2 for files, 1 w/lock); cabinet, file, vertical, 4 drawers (1 w/lock); shelf unit, 8 shelves 50wx 60hx12d, all in VG cond., $500/obo. 626/791-6101.

FURNITURE: chair, rattan, & ottoman, $100; table, rattan, w/leaf, 48", 4 swivel-chairs; coffee table, 42", black, $50; TV, 26", in walnut cabinet, $100; sofa, yellow, vinyl, $75; love seat, floral, $50; sewing machine, Pfaff, in cabinet w/chair. 790-3543.

GUITAR, Hohner, steel string acoustic, exc. sound, VG cond., great for beginners, w/case, $120. 626/573-2564, Mary, nites.

HAM RADIO, Kenwood TH-31BT 220 HT w/ PL encoder, $110; TV, color, RCA XL-100, 19" no remote/cable-ready, works well, $30; LABEL MAKER, Brother PT-530, laminated labels up to 1-1/2" wide, good for file folders, etc, perfect cond., $85; CELL PHONE, Audiovox CDM-4000 dual mode, progr. for Verizon network, desktop charger, gd. cond. 352-0075.

HARDWARE, older Apple floppys, monitors, h/d, more. 323/262-7469.

HONEY, fresh, home grown, pure comb, chunk or liquid gold in honey bears, bottles, or jars. 626/584-9632.

MISC: telescope, 4.5" reflecting, $75; floor speakers, JBL, $75; cross walk, pro-form, like new, $200; lawn sweeper, Craftsman, $50; dining table, 43" round, rattan, & 4 chairs, $50. 661/253-1183.

MODEM, fax, for Macintosh, 1 yr. old, exc. cond., $75. 626/793-3561.

LATHE, Craftsman, metal, 12"x36" w/cabinet, 3 & 4 jaw chucks, numerous access., VG cond., $1,000/obo. 790-3208, 790-0297.

MOVING SALE: sofa & love seat, Italian, white lthr., pd. $2,000, sell $600; table & 6 chairs, blk. marble, pd. $1,500, sell $350; china cabinet, black lacquer, $250. 909/393-7732.

PRINTER, Canon 5500, color, fax/scan/copy, exc. cond., in box w/manuals, $200; SOFA/sleeper, beige/Santa Fe style, gd. cond., $100. 626/359-7608.

PRINTER, HP Laserjet Series II, exc. cond., printed only 6,100 pgs., new toner cartridge, would make good 2nd printer in addition to color printer, $150. 790-0665.

SCOOTER, fashionable girl's model painted rare light pink, pink wheels & handle grips, new, in box w/instructions, Just Go brand (just like Razor), $100/obo. 626/379-8222, Diana.

STANDS, 2, marble-top, dk. wood, $50 ea.; TABLE, sm., round, marble-top, dk. wood, $40; CHANDELIER, bronze, w/candles & ctr. spotlight, $40; CHAIR, beanbag, black, $10. 790-0335.

TABLE, dinette, square, glass top, 5'x5' w/metal feet & 4 matching chairs, $800/obo; BAR STOOLS, 4 matching, metal frame, all exc. cond., $400/obo. 626/398-3480.

TV, Panasonic 25' diag., wood cab-inet, remote, 8 yrs old., $150/obo. 626/398-3480.

TV, Quasar 7" color & 11" VCR/remote, special quality, $175/obo. 909-593-4046. vivdavies@starquest.net.

TOOL BOX, Jenson, new, $250/obo; DESK, teak, 5-drawer, mint cond., $450; LAMP, brass/wood, 3-way, $250; BIKES, 2, men's Free Spirit, $75 ea.; PRINTER, HP, color, $75. 626/355-1109.

WATER SKIS, VG cond., 1 pr., $100/obo. 994-6588.

WHEELS, bicycle, Spinergy Spox 2000, black w/black spokes, R1 model, brand new, still in box, $550. 548-5082.

Vehicles / Accessories

'93 ACURA Integra RS, black, 5 spd., manual, a/c, full pwr., stereo CD/cass., alarm, remote entry, rear spoiler, orig. owner, 103K mi., exc. cond., $8,000/obo. 790-1419.

'93 ACURA Vigor GS sedan, white w/black leather int., auto, sunroof, heated seats, exc. cond., $9,500/obo. 626/793-3561.

'00 BMW 328i, loaded, CD player, 9K mi., silver/black, like new, auto, $34,000. 909/599-3230.

'87 BMW 635csi, red, 126K mi., 5-spd manual, 2nd owner, orig. paint, pwr. leather seats, pw, pb, sunroof, a/c, am/fm/stereo cass., new tires, immac. cond., always garaged, $13,500. 626/446-0291, Mike.

'95 CHEVROLET Camaro V6, auto, 70K mi.,dk. green, tan int., pwr./win./locks/ mirrors/steer., keyless entry, cc, ac, dual airbags, alloy wheels, ABS, Alpine CD player, gd. cond., well maintained, $8,500/obo. 626/792-1878.

'94 FORD Probe, 3 dr., hatchback, blue-green, grey int., 5-spd. manual, 72K orig. owner mi., serviced at intervals sugg. by manuf., runs well, but has sm. amt. of flaking paint on front bumper, $3,500/obo. 626/356-0834, Mike.

'92 FORD Thunderbird, clean, exc. cond., new tires, $3,250. 626/798-6886.

'91 FORD Tempo, 75K mi., blue, runs & looks great, $3,500. 790-3854.

'89 FORD Tempo GL, new paint/tires/brakes, runs well. 626/966-2904, Eva.

'67 FORD Mustang coupe, auto, engine in good cond., orig. owner, lt. green, $4,900/obo. 626/797-5768.

'94 MAZDA 626 ES sedan, 4D, V6, silver w/gray leather int, auto, a/c, pwr./s/w/d/l, cc, am/fm stereo/cass., 10 CD changer, ABS, moonroof, alloy wheels, exc. cond., $7,750. 389-8979, eve & wkend.

'96 MITSUBISHI Eclipse GSX, black, VG cond., modified to 280 hp, $14,000 w/all modifications, $12,000 w/no mods. 909/263-2571.

'93 PONTIAC Sunbird convertible, vg cond., 3.1L V6, blue. 135K mi., orig. owner, maint. records, $4,100. 248-0236.

'89 RANGE ROVER, 135K mi., silver, exc. body & engine, sunroof, CD, grill guard, LoJack alarm, leather int. 310/858-1874, eves.

SOFT-TOP, tan, '88-'95 for Jeep Wrangler, gd. cond., rear wins. incl,. $30. 626/335-7179.

'95 SUBARU Legacy, 4 dr. sedan, 56K mi., single owner, exc. cond., 4WD, ABS, auto, pwr./win./sunroof/locks, a/c, am/fm/cass., cc, alloy wheels, $9,500/obo. 626/355-5662.

'92 TOYOTA Corolla DX station wagon, auto, air, new tires/struts/cv boots/water pump-radiator, well maintained, $3,950 firm. 362-7187.

'88 TOYOTA Celica GT, 100.6K mi., orig. owner, pearl red, air, alarm w/pager, looks & runs good, $2,650/obo ($1,000 below Blue Book). 790-9355 eves.

'93 VOLVO 940 turbo wagon, mint cond., loaded, heated leather seats, sunroof, ABS, pwr. everything, side impact protection sys., all service records, super clean, 76K mi., $11,995. 790-2799, Larry.

Wanted

AIDE, for disabled elderly lady (82), weekends, prefer Saturdays, Sunland, 6-8 hrs., paid, 951-3653.

HANDYPERSON to replace wood gate and similar work on home. 626/351-0348.

PC, old, in working shape, for 3-yr.-old to learn basics. 323/935-3432. Allan.

PC for student, cheap, w/monitor, early Pentium OK. 626/577-6773.

PEOPLE interested in starting JPL investment club. troopers4@earthlink.net, 626/797-6824.

SATELITE DISH, Direct TV, receiver & card. 352-0075.

Free

ANTENNA for TV, VHF/UHF w/both 300 ohm (flat) and 75 ohm (coax) hookups, works fine. 352-0075.

FIREWOOD, u-haul, La Tuna Canyon, 24" logs & stumps of 50' alder tree cut spring of '99. 768-1538.

TV, VCR, stereo receiver, CD player, cass. tape deck in various states of disrepair, all need work, good for those who enjoy repairs or want spare parts. 626/449-8013, Marc Sarrel.

For Rent

ALTADENA, 11 min./JPL, lg. furn. rm., cable, priv. ba., priv. off-st. pkg., share 3-bd. 3-ba. quiet hilltop house, view (incl. JPL), pool, patios, c/a/h, all amen., kitch., d/w, laundry, smoke OK, owner smokes; $480, incl. all util. + dep. 626/794-1050 after 5 p.m., Harry.

ALTADENA, share charming 2 bd. house in quiet neighbrhd., Altadena Estate area, near NY Dr. & Allen, yard, patio, off-st. pkg., gar., storage, all privileges, $600, all util. pd. 626/797-3354.

LA CANADA/FLINTRIDGE, room, private bath, kitch. privileges, pool, BBQ, off-street parking. 790-1280.

MT. WASHINGTON house/rms., lg. custom 3 bd., 2 1/2 ba., 2-car gar., exc. elem. schools, 12 min./JPL, hilltop view, quiet neighbrhd., 2,000 sq. ft., avail. end of Sept. 323/255-1474.

PASADENA apt. to share w/Caltech post-doc., 3 bd., 3 ba., furn., laundry, parking, 2 mi./Caltech, $495+util. 626/351-9641.

Real Estate

LA CANADA-FLINTRIDGE, view home, 4 bd, 2.5 ba, c/a, 2,778 sq. ft., 2-car gar., lg. driveway, 15' swim spa, LC schools, very quiet street & neighbrhd., 53,954 sq. ft. on 2 lots, oak forest, creek, 2.5 mi./JPL, see www. realtor.com, "La Canada", "Ca", MLS ID=G202353, $849,500. 952-9654.

TEHACHAPI, weekend retreat, 1 3/4 acres + mobile home, 2 bd., 2 ba., l/r, d/r, fam. rm., cent. a/h, wood stove, panoramic views, $55,000/OWC. 626/794-5858.

Vacation Rentals

BIG BEAR cabin, quiet area near town, good walking, hiking, 2 bd., sleeps 8, completely furn., $75/nt. 249-8515.

BIG BEAR LAKE cabin, near lake, shops, village, forest trails, 2 bd., sleeps up to 6, f/p, TV, VCR, phone, mcrwv., BBQ & more, JPL disc. from $65/nt. 909/210-9182.

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

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

HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing & beaut., swim/snorkel/fish, spectacular views, near restaurants/golf/other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, on beach w/ocean view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn., phone, color TV, VCR, mcrowv., d/w, pool, priv. lanai, slps. 4, 4/15-12/14, $100/nt./2, 12/15-4/14, $115/nt./2, $10/nt. add'l. person. 949/348-8047.

LAKE ARROWHEAD house, 4 bd., 2 1/2 ba., sleeps 10, quiet, secluded, relaxing, woodsy area of Cedar Glen, close to the best burgers/malts on mtn., JPLers receive free days, weekend or week rates. 323/255-1474.

LAKE TAHOE, North shore, 2 bd., 2.5 ba., sleeps 6, private beach, pool, great location, all amenities, hiking, golfing, fishing, 2 miles to casinos, Sept. 10 thru Nov. 8 - $85/day or $500/week + cleaning fee, 3-day min. 626/355-3886, Rosemary or Ed.

MAMMOTH, Chamonix condo at lifts 7/8/16/17, walk to warming hut, 2 bd., 2 full ba., sleeps 6, fully equip. elec. kitch., micrwv & extras, f/p & wood, color TV, VCR, cable, FM stereo, pool & sun area, o/d Jacuzzis, sauna, game/rec./ laundry rms., convenient to shops, lifts, hiking, special events, daily/weekly rates, summer rates thru Oct. 249-8524.

MAMMOTH, St. Moritz studio condo, queen sz. bed, full kitch., balcony overlooking swim pool, across from beautiful golf course, JPL disc. 626/791-5376.

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

ROSARITO BEACH condo, 2 bd., 2 ba., ocean view, pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure pkg. 626/794-3906.

SAN FRANCISCO, Nob Hill honeymoon suite (sleeps 2 max), full kitch., maid service, concierge, $125/nt.; $750/wk., reserve early. 626/254-1550.

SOUTH LAKE TAHOE KEYS waterfront, 4 bd., 3 ba., 1 bd. & liv. rm. upstairs, hcp. access fair, slps. 12+, f/p's, decks, gourmet kitch., boats, TV's, VCR, stereo, assn. pools, beach, tennis/ski/casinos/golf, 3-day min., $1,195/wk. [1 June-15 Sept; 22 Nov- 1 April], $595/wk. low seas., + $90 clean fee. 949/515-5812.