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# Phoenix landing

Carol Lachata / JPL Photo Lab

"I know that everybody who is involved in this mission has done everything that could possibly be done to make it a success."

## Spacecraft due for May 25 Mars touchdown

By Mark Whalen

Mars' frigid northern hemisphere will receive a first-time visitor on Sunday, May 25, when JPL's Phoenix spacecraft is scheduled to touch down to begin a three-month mission. Carrying seven science instruments, Phoenix will dig into the icy soil to study the history of water in the region, study Martian weather from a polar perspective and determine if the Martian arctic soil could support life. Project Manager Barry Goldstein provides an update.

**HOW DOES IT FEEL BEING SO CLOSE TO THE BIG DAY?**

Remarkably calm. Not because I'm not concerned about the success or failure of the mission, but because I know that everybody who is involved in this mission has done everything that could possibly be done to make it a success.

In terms of testing, training, simulations, risk reductions—each is so important due to all of the contingencies we have to work through.

**PHOENIX IS A UNIQUE MISSION IN MANY WAYS, COMPARED TO ANY OTHER MARS MISSION. WHAT ARE YOUR MAIN CHALLENGES? ALSO, YOU HAVE USED MUCH OF THE HARDWARE FROM TWO PREVIOUS MISSIONS, THE 1999 MARS POLAR LANDER AND THE 2001 MARS SURVEYOR LANDER. HOW HAS THAT WORKED OUT?**

First of all, architecturally, Phoenix is almost identical to the 1999 mission. It's not exactly the same hardware but it has the same entry, descent and landing flow, and the spacecraft configuration changes we go through are the same. Over the course of the last five years the real challenge has been to not only close out the issues that were identified for us by the Mars Polar Lander review board and the return to flight review for Mars '01, but in my opinion, more importantly, to ferret out other issues—things that may have been a problem.

There are two priorities above and beyond what was found by the two review boards. One is to make sure we have a robust entry, descent and landing communication strategy, so that in the unfortunate event that there was something we didn't consider, at least we would have a record of it and understand why. The second was to find all of the other hardware or systematic issues which had yet to be identified.

I think on both counts we have been extremely successful. We have a very robust entry, descent and landing communication strategy, both in terms of recorded data and real time, but also we have a list of more than a dozen items we found over the course of our development and testing—which weren't found before—that would clearly result in an unsuccessful end.

At the first meeting I had with the entry, descent and landing team in October 2003 I commented that if we launch this vehicle having only closed out the recommendations of the failure review boards, I don't think I would recommend to launch—because I can guarantee that there were other issues out there. The fact that we found so many makes me feel better—not great, but better.

**DID JPL'S ORBITERS AT MARS—ODYSSEY, RECONNAISSANCE ORBITER AND THE NOW-DORMANT GLOBAL SURVEYOR—PROVIDE A LOT OF SUPPORT WITH SELECTION OF A SAFE LANDING SITE?**

Yes, they all did.

We had originally planned on landing in an area we called "region B"—which, as it turned out when we received the first high-resolution images from Mars Reconnaissance Orbiter's Hirise camera, was littered with meter- to 2-meter-sized boulders. So we then used the entire collected global imaging database to establish a correlation between regions of high rock counts and, for example, infrared maps. Between October and November of 2006 we conducted this work, and identified a new region, which, as it turned out, was rather rock free. Our current landing site has been completely mapped with high-resolution images from Hirise, and we have latterly counted all of the rocks that could be a hazard to the mission.

**WHAT ARE THE CONCERNS THAT PHOENIX AND ITS INSTRUMENTS MIGHT FREEZE IN MARS' EXTREME COLD?**

Almost all of the previous Mars landers, with the exception of Viking 2, have touched down in the equatorial regions—even Viking 2 was not above the Arctic Circle—and we're much farther north. If you were to compare the geography to Earth, we're landing in an area equivalent to where northwest Canada would be, next to Alaska.

One of the nice things about being equatorial is that you're going to get a rather regular pattern of diurnal, or daylight, cycles. But since we're going to be above the Arctic Circle, there is going to be an end to this mission.

When we land, it will be early spring in the northern hemisphere of Mars. So we're trying to take advantage of the warm time in that region. However, if we have an extended mission, once we get to about November we could lose all sunlight for quite some time. Without sunlight, our batteries won't be able to be recharged.

We land May 25, and our primary mission is for 90 sols, or Martian days. After that, the sunlight rapidly falls off, to the point that when we get to April 2009, there's no sunlight whatsoever. Eventually, the vehicle will lose all heater capability.

In November we have conjunction, when we lose communications for a little over a month. By the time we come out of conjunction, the sun is not up very long and is very low on the horizon, so it's very unlikely we'll be able to keep the vehicle alive and thermally stable.

*Continued on page 2*

## Phoenix *Continued from page 1*

At some point, in the January–February timeframe, the carbon dioxide frost that condenses out of the Martian atmosphere will envelop the entire lander structure in carbon dioxide ice.

**WOULD THE PHOENIX MISSION HAVE WORKED WITH A ROVER?**

From a science objective point of view, something even the size of a Mars Exploration Rover would probably not suffice to meet the objectives of Phoenix's mission, given the need to access depth in the regolith and the amount of in-situ investigation we're doing.

If we had a clean sheet of paper to start with, would we end up with the mission we have now? In all likelihood, no. But when the Scout announcement of opportunity came out, there were limited funds, and the additional resource brought forward for proposers to use was the residual hardware from the '01 mission.

So can you design a mission with a large rover to achieve Phoenix science? Absolutely! Mars Science Laboratory is an example of this. Would it have more flexibility? Sure. It could rove and dig; Mars Science Laboratory is much more capable than Phoenix. But that wasn't in the cards in the context of a Scout mission.

All the Scout missions are very different. One of the fundamental tenets of the Scouts is that they're intended to be quick-turnaround reactions to recent discoveries, and the program has the ability to select something that was outside of the original thrust of the directed mission.

But as far as development philosophy, planetary missions—whether they have "Scout" in front of them or are directed missions or flagship missions—will have the same level of scrutiny, the same level of reliability requirements. So we've taken that approach and have been able to do it within a reasonable budget.

We're quite proud of that. We were actually able to do a flagship mission, in terms of reliability and testing, on a tight budget, certainly within the context of the same review scope.

**THE UNIVERSITY OF ARIZONA IS JPL'S ACADEMIC PARTNER. HOW MANY FROM JPL WILL WORK THE MISSION FROM THE TUCSON CAMPUS?**

About 1½ to 2 weeks before we land, we'll have 31 JPLers relocating to Tucson for surface operations. Once we land, the JPL mission managers have the responsibility of running the mission. There's a huge JPL presence in the operation of this vehicle even though the facilities are in Tucson.

We have very experienced people—there is a Lockheed Martin presence for the spacecraft team in Tucson in addition to their main team in Denver.

We moved ground data system hardware and JPL-developed software, and established a communications line between JPL, Tucson and Lockheed Martin in Denver, so that we can utilize our contact with the Deep Space Network and the data we get from Odyssey and Mars Reconnaissance Orbiter in a nominal way. In effect, what we've done is taken the JPL mission support area and its people, picked them up and moved them about 400 miles to the east.

Post-landing operations at Tucson will be conducted for 90 sols. The surface team includes mission management, strategic management and tactical management, as well as payload team members—several people on the robotic arm and the microscopy, electrochemistry and conductivity analyzer are JPLers, as are those who run the ground data system and system engineering. It's not any different than if it were to be done here at JPL.

Dave Spencer, Phoenix's deputy project manager, and I will be rotating back and forth between JPL and Tucson to make sure everything is moving smoothly.

Also, we are augmented by a considerable staff of University of Arizona team members, who will operate the payload interoperability testbed, a full-scale lander structure that has all of the engineering model instruments.

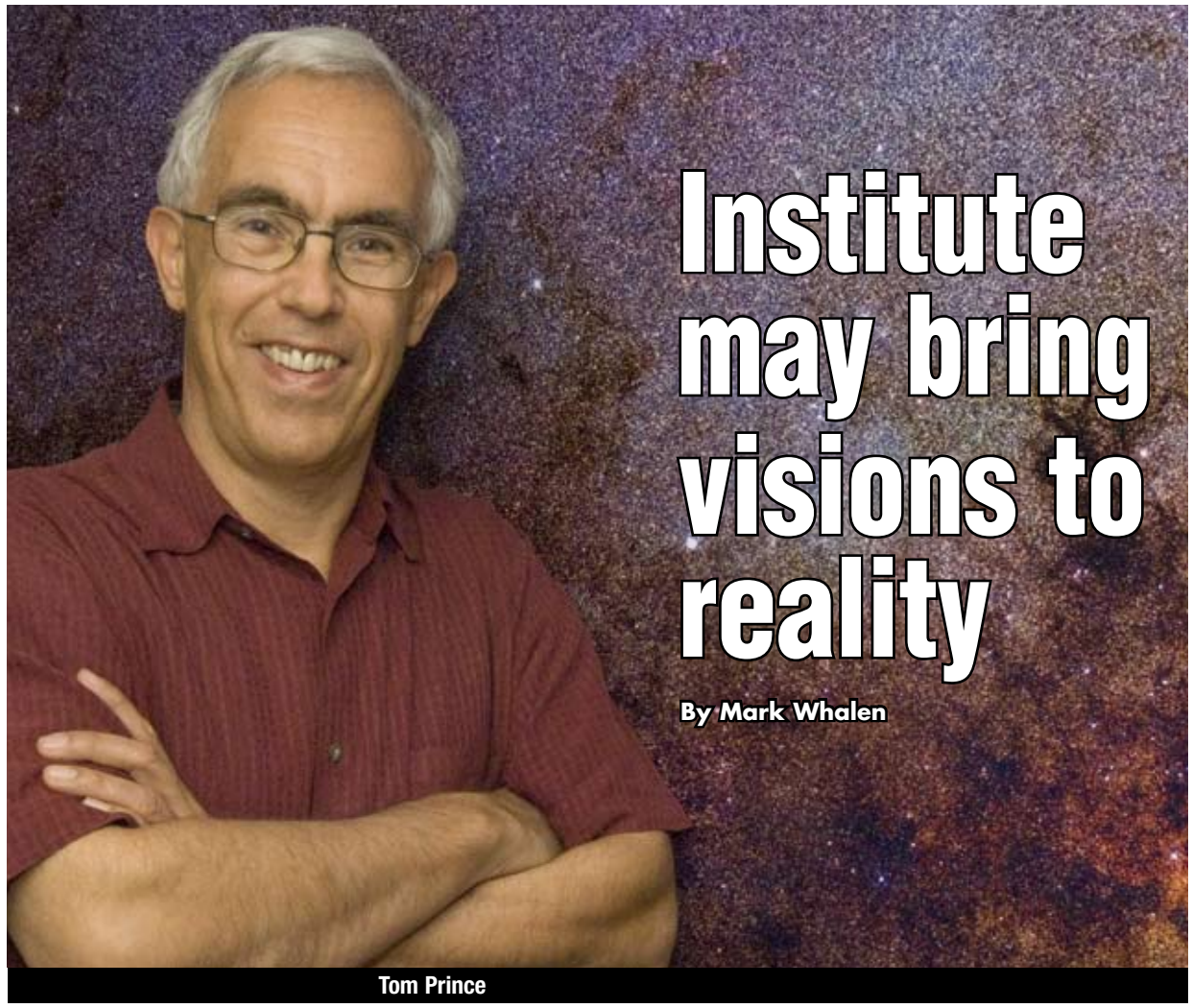
This is our "Mars Yard"—we can simulate Mars material and adjust the tilt and the attitude of the vehicle, then we move terrain in front of the arm to allow it to try to dig. The University of Arizona team has done an exceptional job during development, because we don't use the testbed just for operations; we also use it for our verification and validation programs during development as well.

## TAKE OUR Children to Work

*More than 500 children of JPL staff attended the annual Take Our Children to Work Day April 24, as imaged by the Photo Lab's Dutch Slager.*


# Institute may bring visions to reality

By Mark Whalen



Tom Prince

Tom Wynne / JPL Photo Lab

**Where will the bold new ideas in the study of space science come from? Where can scientists, engineers and leaders best leverage their experience and enthusiasm to envision the revolutionary missions of the future? And what future technologies need to be developed to achieve the challenges?**

The answers may, in large part, be at hand with the establishment of the new Keck Institute for Space Studies, a joint effort of JPL and Caltech that is preparing to debut this summer.

Created with a $24 million gift from the Keck Foundation, the institute will bring together the best expertise from JPL, the Caltech campus and the wider scientific community to conduct in-depth technical studies in science and technology that will lead to new mission and instrument concepts. The funding will cover the institute's first eight years.

The effort was initiated several years ago by former Caltech President David Baltimore, who wanted to see more close collaborations between JPL and the campus.

"Baltimore was impressed by all of JPL's successes but felt that there was even more potential there, much more that could be done," said Tom Prince, the institute's initial director.

The institute will combine the campus' proven basic and applied scientific and technological excellence with JPL's proven excellence in engineering and space science, its continued central role in robotic exploration of the solar system and its major role in astronomy and Earth science.

The focus will be on ideas for revolutionary advances in capabilities, as opposed to incremental advances. The major goal is to have "significant impact" on future space missions. "The institute should identify areas where there are breakthroughs, and develop the energies and resources to encourage brainstorming," noted Prince, a Caltech physics professor and a former JPL chief scientist. "We want to create the atmosphere where great ideas are developed."

Each year, the institute will adopt two or more new large study programs based on specific themes, beginning with symposia and in-depth studies, leading (in best-suited cases) to actual development of prototypes of emerging technologies. The programs will have a JPL lead and a Caltech co-lead, or vice versa.

In addition, the institute will occasionally conduct smaller, two-week "mini-programs."

The institute will also play a key role in the education and cross training of the next new generation of scientists and engineers through the involvement of graduate students, post-doctoral fellows and visitors in the various studies and design programs.

Each large program will include a study phase, lasting for a year or less, which comprises a kickoff workshop, a short course covering the current state of knowledge in relevant areas and a period of a few weeks to several months of informal daily discussions and seminars. A written report will conclude the study.

A unique aspect of the institute promises to be its ability to quickly follow good ideas with technical follow-on investigations for design and prototype development. In this way, the institute looks to be thought of as a "think and do tank."

Three programs of study have been selected for the institute's first year: new directions in the robotic exploration of Mars; large space apertures; and coherent instrumentation for cosmic microwave background polarization observations.

Although program concepts will be solicited from JPL, the campus and the space science and technology communities at large, only JPL investigators and campus faculty can submit and lead a program proposal.

Selection of the study programs will be the responsibility of the institute's steering committee, which includes, from JPL, Chief Scientist Dan McCleese; Chief Technologist Paul Dimotakis; Mike Werner, chief scientist for the Astronomy and Physics Directorate; and Samad Hayati, chief technologist for the Mars Exploration Directorate. Committee members from Caltech are professors David Stevenson, Ares Rosakis, Sergio Pellegrino and Tony Readhead.

An external advisory committee of scientists and technologists from outside of Caltech and JPL will review programs and provide recommendations.

The organization's success will be measured "when one can say 'this mission is different' in part due to the institute," Prince said. "We are looking to the future of new, innovative ideas in instruments, propulsion mechanisms or batteries, or basic ideas for missions or a new way of doing analysis." Other examples could be new approaches to enhance the detection and characterization of Earthlike planets around other stars or new ways for in-situ measurements on future Mars landers and rovers to measure the age of surface materials and detect and characterize pre-biotic chemistry.

Besides the initial funding from the Keck Foundation, research through the institute will be augmented by support from JPL's Research and Technology Development Program.

Prince noted that, to his knowledge, there has never been an investment of this scale in the future of the U.S. space program from a private foundation. NASA, he says, sees the institute as a very positive development.

JPL has a great track record for writing proposals for missions and instrument studies, and Prince sees the kickoff of the Keck Institute for Space Studies as "a shot in the arm to take mission concept ideas to the next level."

The institute will conduct its initial activities at a variety of locations on the Caltech campus, but a permanent facility is being prepared at the Milliken Library for an initial staff of about a dozen people.

"We certainly want to make sure that the institute benefits the U.S. space program," Prince said, "and hopefully, it will become a national asset as well."

For more information on the institute, visit *http://www.kiss.caltech.edu.*

# News Briefs

National Air and Space Museum

*Tom Duxbury accepts the National Air and Space Museum Trophy.*

### Stardust gets Smithsonian honor

JPL's Stardust comet sample return mission team has received the Smithsonian Institution's National Air and Space Museum Trophy, the museum's highest honor.

The award was bestowed at the National Air and Space Museum in Washington, D.C. in April. The Stardust team won in the current achievement category. Stardust Project Manager Tom Duxbury accepted the honor.

Stardust launched in February 1999 on a 2-billion-mile round trip to rendezvous with Comet Wild 2 and return a capsule bearing these primordial solar system "treasures" for analysis here on Earth. The journey ended with the capsule landing in Utah in January 2006. Since then, the dust samples have gone to laboratories around the world for scientists to study the chemical composition of the comet and its signature of the early solar system. The Stardust team accomplished the first U.S. robotic sample return mission beyond the moon and the first collection of comet material for study on Earth.

The Stardust team shared the award with world record–setting parachutist and balloonist Col. Joseph Kittinger Jr., who was honored in the lifetime achievement category. Established in 1985, the award recognizes outstanding achievements in the fields and history of aerospace science and technology.

### Energy honors from NASA

JPL facilities energy team and the Lab's energy management program have received NASA's Excellence in Energy and Water Management Group Award.

Awarded by NASA's Environmental Management Division, the honor is part of the agency's 2008 Blue Marble Awards, bestowed in April for environmental and energy excellence demonstrated during fiscal year 2007.

The two other categories in the awards program are the Environmental Quality Award and the Environmental Management Division Director's Environment and Energy Award.

For more information about the honors, visit *http://oim.hq.nasa.gov/oia/emd/blue_marble.html.*

### Small business program praised

JPL has won the U.S. Small Business Administration's 2008 Dwight D. Eisenhower Award for Excellence in the research and development category. The award recognizes large prime contractors who excel in using small businesses as suppliers and subcontractors.

This is the third time JPL has received this prestigious award, which is an unprecedented honor: Only 2 percent of Eisenhower Award winners have earned it at least twice. The Lab also received the award in 1996 and 2003.

The Small Business Administration evaluated JPL on the effectiveness of its supplier-diversity program and management's commitment to small-business utilization. JPL has led an aggressive supplier-diversity program to give small businesses the maximum opportunity to compete for contracts. Managed by JPL's Business Opportunities Office, the program helps small businesses owned by veterans, women and minorities, and aims to increase the number of procurements and dollars awarded to such small businesses each year.

Acquisition Division Manager Karl Bird accepted the award at the Small Business Administration's National Small Business Week celebration in Washington, D.C. in April.

For more information on the JPL Business Opportunities Office and its Supplier-Diversity Program, visit *http://acquisition.jpl.nasa.gov/boo .*

For more information on the Eisenhower Award and National Small Business Week, visit *http://www.sba.gov/sbw.*

### Satellite celebrates 25 years

JPL staff and retirees are invited to attend a conference commemorating the 25th anniversary of the Infrared Astronomical Satellite, a JPL-managed mission that carried the first-ever space-based, cryogenically cooled telescope to record a survey of the entire sky at infrared wavelengths.

"Far-Infrared Astronomy from Space: A Community Workshop About the Future" will be held at the Pasadena Hilton May 28–30. A session on the Infrared Astronomical Satellite will be offered free of charge May 28 from 3 to 5 p.m. A 25th anniversary dinner will be held that day at Caltech's Dabney Lounge and Gardens at 6 p.m. The $40 dinner includes a buffet, beverage and dessert.

See *http://www.ipac.caltech.edu/irspace.*

The deadline to sign up for the Infrared Astronomical Satellite portion of the conference and the dinner is May 15. E-mail Pat Patterson at *patp@ipac.caltech.edu* or call her at 626-395-1801. Checks for the dinner should be made out to Caltech and sent to her at Caltech mail stop 100-22 before May 15.

# Passings

**Eleanor Griggs,** 91, a retired secretary, died March 5.

Griggs worked at JPL from 1958 to 1983. She is survived by her son, Stephen.

**James Van Dyck,** 83, retired from the former Flight Computer System Section, died March 7.

Van Dyck joined JPL in 1958 and retired in 1987. He is survived by his wife, Genevieve, daughters Paula and Joan and son James.

Services were held at St. Bede Church in La Cañada. In lieu of flowers, the family requests donations to the Alzheimer's Association, 225 N. Michigan Ave., Chicago, IL 60601.

**Edward Batka,** 68, a retired Deep Space Network contractor, died March 20.

Employed at the Lab for 36 years until retiring in 1999, Batka served as a Deep Space Network project engineer for the Voyager mission.

Batka is survived by his wife, Margaret, daughter Michele and grandsons Sean and Cody.

**George Inskeep,** 93, a retired senior quality assurance engineer in Section 511, died March 22.

Inskeep worked at JPL from 1964 to 1981. He is survived by his wife, Lois, seven children, 15 grandchildren and seven great grandchildren.

**Judith Novelly,** 47, a senior environmental engineer, died April 7.

Novelly had worked at JPL since 1991. During her tenure she served as deputy project manager for the JPL Superfund Program, as well as the lead for the National Environmental Policy Act efforts for non–flight-related projects.

She is survived by her husband, Phil, and daughter Grace. Services were held at Holy Redeemer Church in Montrose.

**Angel Carretino,** 78, a retired carpenter, died April 15. Carretino joined JPL in 1971 and retired in 1995. He is survived by his wife, Rosa; children Vincent, Rosa, Angel Jr., Marcos, Maria, Rafael, Martha, Patricia, Judith, Joseph and David; 28 grandchildren and seven great grandchildren.

# Letters

My family and I would like to express our sincere thanks and appreciation to all my friends and co-workers on MER, Mars Odyssey, Mars Program Office and my JPL colleagues for their cards, expressions of sympathy and support upon the recent passing of my older brother. My appreciation is also extended to JPL for the beautiful plant sent to our home.

Emma Ramos

Thank you to my colleagues in Section 345 and the Laboratory for your kind condolences on the passing of my mother, Wilna Treichler, at age 96. My appreciation also to JPL/Caltech for the beautiful plant I received shortly thereafter.

John Treichler

I would like to express my deepest thanks and appreciation to all my friends and co-workers over the passing of my grandfather. The flowers, cards, thoughts, prayers, support, kind words, expressions of sympathy and plant were greatly appreciated.

Audrey Joya

After slightly less than 40 years at JPL, I am retiring. I would like to thank all my friends and co-workers for the great times I have had here. JPL is a wonderful place to work, and I appreciate the opportunities I have had to contribute to its success. Thank you also for the terrific retirement luncheon. It was a great send-off.

Dave Hermsen

On behalf of my family, I would like to thank all my colleagues and friends for their kind thoughts and words of support and comfort on the sudden death of my father. The outpouring of love and support that my wife Carmen and I have received has been amazing. A special thank you to our co-workers and friends in Section 322 and JPL Facilities. Thank you to the hospitality group for the beautiful plant. Sincerely,

Michael and Carmen Ascencio

I would like to thank my friends, Division 35 and the JPL community for your cards, prayer, support and encouragement during the time my father was sick and following his passing. Thank you also for the lovely orchid plant you sent in memory of my dad. My father was not able to visit JPL; however, he was always interested to know what was happening at the Lab and about the wonderful people with whom I work. Your many expressions of sympathy and care have meant more than I can communicate—thank you.

Lyn Cross

Thank you to the JPL community for the beautiful plant; also to my co-workers in Division 37 and the rest of the Lab for their kind words and condolences over the passing of my father-in-law.

Maria Flores-Quiroz and family

To all my friends and colleagues at JPL, I would like to express my sincere thanks for your support, prayers and expressions of sympathy following the passing of my brother, William Phillips. My thanks also to JPL for sending the lovely plant; it was greatly appreciated. Sincerely,

Barbara Hesselgesser

My deepest thanks to my colleagues and friends at JPL for their many kind expressions of sympathy and support during the weeks surrounding the unexpected passing of my dear father. His sharp mind was always interested in others and never stopped wondering how things work. He was proud to tell people that his daughter works at JPL, and frequently asked me "What's new at 'Jipple'?" He was wearing his Topex t-shirt on our last visit just a few weeks ago. Thanks also to JPL for the beautiful hydrangea plant, which I will enjoy in his memory.

Jennifer Kesterson

I would like to thank all of my friends and colleagues for their support and prayers during the passing of my mom, Bea Gelle. She loved what you stand for at JPL and always watched the specials on TV in regards to space and science. Thanks also to JPL for the lovely plant that my family received. Sincerely,

Pam Rothman

Thank you to my friends and colleagues in Section 312, the Project Support Office and the Polaris Project for their sympathies and condolences on the passing of my brother, Wayne Webster. Your support is deeply felt and appreciated. Wayne had a life-long interest in science and engineering and he was very proud of our family's connection to JPL. I also thank JPL for the card and plant sent to my home; it is a very thoughtful gesture that my family and I appreciate.

Jeffery Webster

# Retirees

The following JPL employees retired in May:

Arthur Lane, 41 years, Section 3220; David Hermsen, 40 years, Section 313A; Gregory Bearman, 27 years, Section 389E; Lorraine Suwa, 10 years, Section 9200.

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**Editor**
*Mark Whalen*

**Design**
*Audrey Steffan*

**Production**
*David Hinkle*

**Photography**
*JPL Photo Lab*

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