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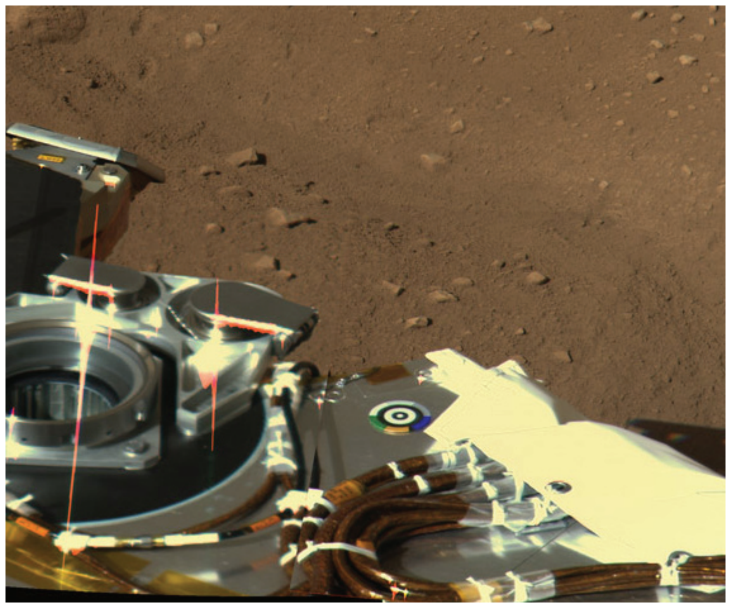
Phoenix stands tall

Spacecraft makes 'flawless' landing on Mars arctic plain

By Guy Webster and Mark Whalen

Tom Wynne / JPL Photo Lab

Reacting to Phoenix's successful landing are, from left, Project Manager Barry Goldstein; Ed Sedivy, Phoenix program manager for Lockheed Martin Space Systems, and Peter Smith, Phoenix principal investigator.



This approximate-color view was obtained on sol 2 by the Surface Stereo Imager on the Phoenix lander. The view is toward the northwest, showing polygonal terrain near the lander and out to the horizon.

It was hugs, cheers and high-fives all around for members of the Phoenix team and their supporters in the late afternoon of May 25, as the spacecraft touched down to a safe landing on the Martian polar north.

"In my dreams it couldn't have gone as perfectly as it went," exclaimed Phoenix Project Manager Barry Goldstein. "I can't be more proud of the team than I am right now."

Launched last August, Phoenix completed its 422-million-mile journey (about 680 million kilometers) at 4:53:44 p.m. Pacific Time, landing in a valley about 30 miles wide. Initial images from the spacecraft's camera showed a hilly area about 250 meters away from the lander.

Among those in the JPL control room was NASA Administrator Mike Griffin, who noted this was the first successful Mars landing without airbags since Viking 2 in 1976.

"For the first time in 32 years, and only the third time in history, a JPL team has carried out a soft landing on Mars," Griffin said. "This team took something that is incredibly hard to do and made it look easy. Very few things humans do require such accuracy. I couldn't be happier to be here to witness this incredible achievement."

"I was right to be optimistic," added Peter Smith of the University of Arizona, the mission's principal investigator. "This team performed perfectly."

Added Mars Exploration Program Director Doug McCuistion: "Once entry, descent and landing started, the anxiety level went up … but everything went absolutely flawlessly. The spacecraft has been a flawless performer since launch. Absolutely unbelievable."

The time period within the entry, descent and landing phase known as "the seven minutes of terror" took Phoenix from more than 12,500 mph at the top of Mars' atmosphere to just 5 mph shortly before touchdown.

"I told the team that the seven minutes of terror would now be replaced by three months of joy," Goldstein said, referring to Phoenix's nominal three-month mission.

In addition to using JPL's Mars Reconnaissance and Odyssey orbiters to monitor the landing, the European Space Agency's Mars Express orbiter also supported the entry, descent and landing phase by confirming Phoenix's descent characteristics, including speed and acceleration through the Martian atmosphere.

About two hours after touchdown, Phoenix's first pictures confirmed that the solar arrays needed for the mission's energy supply had unfolded properly, and masts for the stereo camera and weather station had swung into vertical position.

Smith was thrilled with the landing site, noting that it reminded him of active regions seen in the Arctic on Earth. "We've really nailed it," he said. "This is exactly the place we want to be. It's a scientist's dream.

"The workspace is ideal for us because it looks very diggable," Smith added. "We're very happy to see just a few rocks scattered in the digging area. We can see cracks in the troughs that make us think the ice is still modifying the surface. We see fresh cracks. Cracks can't be old. They would fill in.

"The surface interacts with the atmosphere in significant ways," he said. "Nobody's ever studied how this has happened, and we'd like the chance."

Mars Reconnaissance Orbiter relayed spectacular first images of the lander from orbit, views from Phoenix of where it will work for the next three months and a preliminary weather report. The orbiter's Hirise camera returned a full-resolution view of Phoenix's parachute and lander during its descent, with Heimdall crater in the background. Phoenix appears to be descending into the 10-kilometer (6-mile) crater, but is actually 20 kilometers, or about 12 miles, in front of it.

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Phoenix *Continued from page 1*

Hirise's image of Phoenix on the ground, taken about 22 hours after it landed, shows the parachute attached to the back shell, the heat shield and the lander itself against red Mars. The parachute and lander are about 300 meters, roughly 1,000 feet, apart.

"Phoenix is in perfect health," Goldstein said Wednesday morning, May 28, the same day Phoenix scientists sent commands to unstow the spacecraft's robotic arm and take more images of its landing site.

The robotic arm's first movement was delayed by one day when Tuesday's commands from Earth did not get all the way to the lander. The commands went to Mars Reconnaissance Orbiter as planned, but the orbiter's Electra UHF radio system for relaying commands to Phoenix temporarily shut off. Without new commands, the lander instead carried out a set of activity commands sent Monday, May 26 as a backup. Images and other information from those activities were successfully relayed back to Earth by Mars Reconnaissance Orbiter Tuesday evening.

Wednesday morning's uplink to Phoenix and evening downlink from Phoenix were planned with JPL's Mars Odyssey orbiter as the relay. "We are using Odyssey as our primary link until we have a better understanding of what happened with Electra," Goldstein said. He added that the first digging activity by the robotic arm would take place the week of June 1.

On May 29, the team revealed that the larger rocks in the digging area measure approximately five to eight inches in length. Images also showed a polygonal area dedicated as the first "national park system" on Mars, a protected spot scientists want to keep out of "until we figure out how best to use this natural Martian resource," said Surface Stereo Imager co-investigator Mark Lemmon of Texas A&M University. Other nearby areas were named after fairy-tale characters and folk legends, including Ichabod (The Legend of Sleepy Hollow) and Alice (Alice in Wonderland).

On May 30 scientists announced that ice may have been exposed when soil was blown away as Phoenix landed. The possible ice appears in an image the robotic arm camera took underneath the lander. "We could very well be seeing rock, or we could be seeing exposed ice in the retrorocket blast zone," said Ray Arvidson of Washington University, co-investigator for the robotic arm. Full confirmation will come when layers in the nearby workspace are excavated and analyzed, he said.

Testing on May 29 of Phoenix's Thermal and Evolved Gas Analyzer instrument that bakes and sniffs samples identified a possible short circuit. The instrument includes a calorimeter that tracks how much heat is needed to melt or vaporize substances in a sample, plus a mass spectrometer to examine vapors driven off by the heat. The tests recorded electrical behavior consistent with an intermittent short circuit in the spectrometer portion.

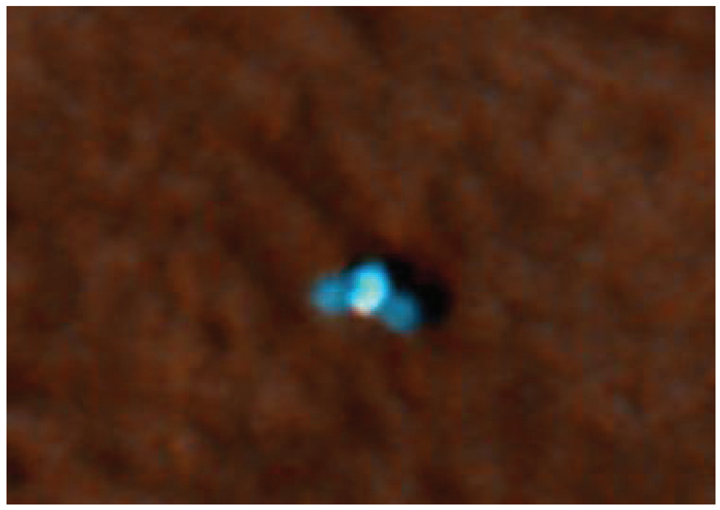
William Boynton of the University of Arizona, lead scientist for the instrument, said a strategy had been developed to gain a better understanding of the behavior and that workarounds for some of the possibilities have been identified.

For the latest images from Mars and more about the mission, visit *http://www.jpl.nasa.gov/phoenix*.

Left: An approximate-color image taken shortly after landing by Phoenix's Surface Stereo Imager that shows a polygonal pattern in the ground near the lander, similar in appearance to icy ground in the Arctic regions of Earth. Below: Fuk Li (left), head of JPL's Mars Exploration Directorate, celebrates the successful landing, as JPL Director Charles Elachi enjoys the moment with NASA Administrator Mike Griffin.

Tom Wynne / JPL Photo Lab

Mars Reconnaissance Orbiter's high-resolution camera acquired this image of Phoenix hanging from its parachute as it descended to the Martian surface. Shown here is a 10-kilometer (6-mile) diameter crater informally called "Heimdall," and an improved full-resolution image of the parachute and lander. Although it appears that Phoenix is descending into the crater, it is actually about 20 kilometers (about 12 miles) in front of the crater.



This color image from Mars Reconnaissance Orbiter's High Resolution Imaging Science Experiment camera shows the Phoenix lander with its solar panels deployed on the Martian surface.

Riding the waves

The Ocean Surface Topography Mission, set to launch in June, will continue the tradition of Topex/Poseidon, Jason 1

By Mark Whalen

Photos by Carol Lachata / JPL Photo Lab

ONE OF JPL'S MOST ACCOMPLISHED AND CRITICAL OCEANOGRAPHY STUDIES CONTINUES WITH THE LAUNCH OF THE JASON 2 SATELLITE ON THE OCEAN SURFACE TOPOGRAPHY MISSION, SCHEDULED FOR JUNE 15 FROM VANDENBERG AIR FORCE BASE. THE MISSION IS A FOLLOW-ON TO TOPEX/POSEIDON AND JASON 1, WHICH HAVE CONTRIBUTED TO A CLIMATE DATA RECORD OF MORE THAN 15 YEARS THAT HAS SHOWN KEY INDICATORS OF HOW OCEAN CIRCULATION AND GLOBAL SEA LEVEL ARE LINKED TO CLIMATE CHANGE. PROJECT MANAGER PARAG VAZE AND PROJECT SCIENTIST LEE-LEUNG FU PROVIDE AN UPDATE.

WHAT ARE THE MISSION'S MAIN OBJECTIVES?

Vaze: We will build on everything we've done before in space-based oceanography. From an organizational perspective, one of our objectives has been to transition our altimetry ocean data from pure research to a truly operational type of measurement, discovered and enabled on Topex and then refined on Jason 1. Now that people in the user community have recognized the utility of this, they would like to move it into an operational type of measurement.

What we've been able to do with our space-based ocean data is to achieve the goal of many missions, which is to take a discovery or a measurement and actually bring it into daily use.

And the way we're planning on doing that from an operational perspective is to have two new partners in this mission. As in the past we are working with Centre National d'Etudes Spatiales, the French space agency. Our new partners are the National Oceanic and Atmospheric Administration, from the United States, along with the European Organisation for the Exploitation of Meteorological Satellites, which provides meteorological products to the European community.

HOW IS YOUR MISSION AN IMPROVEMENT ON WHAT TOPEX AND JASON 1 HAVE PROVIDED?

Vaze: It's clearly different from Jason 1; we're trying to enhance all aspects of it. From a JPL perspective it's particularly reflective in the main instrument we're providing, the advanced microwave radiometer, which was designed and developed here in Division 38, completely in-house. It's a significant generational improvement from the past radiometers we've been flying. Even on Jason 1, most of the basic design was on the order of 20 to 30 years old.

Now we have the advanced microwave radiometer, which is on the cutting edge in terms of electronics technology, the overall design, performance and reliability, which has been a significant achievement.

Fu: Topex and Jason 1 performed excellently over the open ocean, and the advanced microwave radiometer will improve those measurements. In particular, the radiometer antenna is larger than that on Jason, leading to better resolution. For example, the radiometer will take accurate measurements up to 25 kilometers from the coast instead of Jason 1's 50-kilometer capability. Another key enhancement will be the data from the altimeter, which will provide much more accurate measurements near the coastlines—within a couple of kilometers from the coast instead of 10 kilometers. We will therefore have much better coverage of the world's coastal zones. Most of the population lives close to the coast, so there's a lot of interest there, and getting more data is going to help with that.

ARE THERE ANY SIGNIFICANT LESSONS LEARNED FROM JASON 1?

Vaze: Not so much from a problematic perspective but from a performance improvement perspective. For example, the advanced microwave radiometer's antenna has a whole new design that not only improves just the radiometer's performance, but we've done it synergistically with the altimeter, provided by the French space agency, that has also improved its performance such that the overall mission products can be significantly improved.

With these instruments on Topex and Jason 1 the main thing was to make sure they worked in the open ocean. Now that we know how to do that, we want to get measurements closer to the coast—that's where the mission's impact on society makes a big improvement.

But we still need lots of coverage to understand currents, sea-level rise, tides and their interactions, and one of the most interesting phenomena, eddies, which are localized phenomena that happen in the open ocean. One of the things we're looking forward to is a dual operation with Jason 1, where we can increase our resolution by two.

HOW WILL THAT WORK? WHAT ARE THE ADVANTAGES?

Vaze: A tandem operation with Jason 1 helps us in two ways: we can quickly calibrate our instruments to continue our data records between the two missions, and it also increases our resolution because we have two altimeters on slightly separate ground tracks and similar overflight.

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Ocean *Continued from page 3*

We will actually launch to a slightly lower orbit than Jason 1, then over a period of a month or so, there will be some small corrections to get into the exact orbit as Jason 1. We will follow roughly between one and 10 minutes behind Jason 1 on the exact same ground track and orbit.

That's our calibration validation phase—not only our individual instruments but between the two satellites. One of the challenges is to how to bridge the data records between the two missions; there are always some differences in the measurements. We expect this phase to take roughly six months.

IS THIS IS A CLASSIC EXAMPLE OF A GREAT INTERNATIONAL MISSION?

Vaze: I believe so. The policy among all our partners is that all of the data is free and publicly available and was intended to be used by the global community. One of the most interesting things in my history with this program is when we have science team meetings, there's a map of the global community and we can see it blossoming and growing across all areas of the world, including places like Africa and Asia—where there hasn't been a big space emphasis—but the utilization of this data, and the science research behind it, has been significant.

Fu: There's one particularly interesting example from Australia. A team of Australian rowers recently set a record of rowing from New Zealand to Australia. Their adventurous journey had benefited from using the information on ocean currents from Jason 1 data. That type of information was very useful to them by optimizing their route of rowing.

Also, our information on currents is used by the offshore drilling industry in the Gulf of Mexico. The routes of towing drilling rigs have been optimized from using the information. The cost savings from minimized rig down-time and transportation expenses amount to more than half a million dollars from one single operation. And this information is not exclusive to our country. Similar applications are taking place in northern Europe. There are a lot of activities in the North Sea, where they use altimeter data for currents, wind and waves all the time.

Another great use of our data is for hurricanes because the altimeter measures the heat stored in the upper ocean and thus provides information on how much fuel lies below the surface for driving the hurricane, which is important in predicting how strong the hurricane will become. That is a unique piece of information because just knowing the sea-surface temperature, whose information content is only skin deep, is not enough for making such predictions.

All of the partnership efforts so far have been tremendous. The planning and collaboration between NASA and the French space agency goes back to 1983, about 10 years before the launch of Topex, and is now used as model for the way to conduct international missions.

TOPEX IS BEST KNOWN FOR THE EL NIÑO AND LA NIÑA PHENOMENA; WHAT OTHER TYPES OF SIGNIFICANT CLIMATE/WEATHER REVELATIONS CAN WE EXPECT FROM YOUR MISSION?

Vaze: What I look forward to is the major application of our data in day-to-day forecasting models for weather and other events such as hurricanes. I expect that someday we will have made a big improvement in the understanding of these critical events, especially along the coastlines—to me, that's going to be the biggest improvement and most beneficial short-term impact in terms of mission return. The long-term study will also lead to a greater understanding of the ocean's role in the global climate system.

Fu: The discovery of El Niño and La Niña certainly made Topex famous, not only for the public but also for the scientific community. We documented for the first time the evolution of a big El Niño and a big La Niña—from 1997 to early 2000—after that, the El Niño and La Niña both became smaller. This kind of a variation of a well-known, short-term climate phenomenon is very important because now we've found the connection between El Niño and much larger-scale change in the Pacific Ocean, the Pacific Decadal Oscillation. We've just begun understanding the interactions between the Pacific Decadal Oscillation and ocean circulation.

Topex planners, including myself, had a lot of doubt when we first began seeing these tiny, minute changes of global sea level; we wondered, was it a true signal or just an error? Over 10 years, through extensive analysis and validation, we knew this was probably the first truly global measurement of sea-level change. And sea-level change reflects a potentially serious consequence of global warning, which has timescales of over decades, so it's critical to continue this important data record of global sea-level change.

HOW FAR INTO THE FUTURE?

Fu: Indefinitely. What we have done so far is just the minimum to understand the ocean, which influences climate in a tremendous way. Every day we have to deal with weather; climate is long-term changes in weather with much bigger magnitude. Now we have the technology; we have no choice but to continue. It is the responsibility of our generation.

WHAT IS NEXT AFTER OSTM, OR DO YOU LOOK THAT FAR AHEAD?

Fu: We do look ahead. There is currently a plan for Jason 3. Both the French space agency and the European Organisation for the Exploitation of Meteorological Satellites want to continue and have secured half the funding for Jason 3; the other half will come from the United States with the National Oceanic and Atmospheric Administration as the lead agency. And the international scientific community is behind us.

For the future, beyond Jason, I'm working on a very exciting project called the Surface Water Ocean Topography mission, which will bring the current capabilities to measure the ocean surface to the next level, on a scale of 1 to 100 kilometers. These are the scales of ocean turbulence, which influence the oceans' intake of heat and carbon dioxide, in a profound way.

This is a significant technology challenge, so it falls under NASA's priority. This is exactly what NASA was established for—to drive the edge of technology to benefit the science.

ABOUT HOW MANY PEOPLE ARE ON THE SCIENCE AND OPERATIONS TEAMS? HOW MANY FROM JPL?

Fu: We have six JPL principal investigators on the team. Overall, there are 74 principal investigators from 16 countries around the world.

Vaze: Right now we're a small team, since we've delivered our instruments and are preparing for launch, but the developmental team was 40 to 50 people spread across divisions 33, 38 and 31.

HOW ARE LAUNCH PREPARATIONS AT VANDENBERG? WHAT IS YOUR LAUNCH WINDOW?

Vaze: We are on schedule for a June 15 launch. All preparations are in place and we're continuing through our standard process of final checkouts and reviews but so far it's going extremely well.

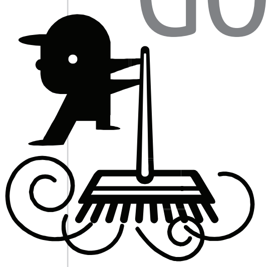
We will be ready to launch daily, with a nine-minute window in which we could launch and fully achieve our mission objectives.

We're launching very early in the morning, at 1:47 a.m., so we hope to see a spectacular launch. I can't be sure, but I think there's a very good chance folks in the Los Angeles area can see our launch as our flight path moves south along the coastline.

We're excited and are expecting a successful launch, and we look forward to seeing all our hard work over the years pay off, getting our data back and having scientists use it to see the impacts it makes on daily life.

Spring 2008
JPL Safety Awareness news
A PUBLICATION OF THE OCCUPATIONAL SAFETY PROGRAM OFFICE

GOOD HOUSEKEEPING MAKES A DIFFERENCE



Good housekeeping is one of the surest ways to identify a safe workplace. You can tell how workers feel about safety just by looking at their housekeeping practices. Good housekeeping isn't the result of cleaning up once a year just prior to Annual Inspections, once a week before Spot Inspections or even once at the end of the day. It's the result of keeping cleaned up all the time. It's an essential factor in a good safety program that promotes safety, health, production and morale.

Whose responsibility is housekeeping?

It's everyone's. Clean work areas and aisles help eliminate tripping hazards. Respecting "wet floor" signs and immediately cleaning up spills prevents slipping injuries. Keeping storage areas uncluttered reduces the chances of fire as well as slips, trips and falls.

What is housekeeping?

When we think of "housekeeping," we tend to think of the common phrase "A place for everything and everything in its place." But housekeeping means more than this. Good housekeeping means having no unnecessary items lying about and keeping all necessary items in their proper places.

Housekeeping practices include keeping tools and equipment clean and in good shape or keeping hoses and cables or wires bundled properly when not in use. Broken glass should be picked up immediately with a broom and dustpan, never with bare hands. Be aware of open cabinet drawers, electric wires, sharp corners or protruding nails.

What's so important about housekeeping?

Besides preventing accidents and injuries, good housekeeping saves space, time and materials. When a workplace is clean, orderly and free of obstruction, work can get done safely and properly. Workers feel better, think better, do better work and increase the quantity and quality of their work.

What are the benefits of good housekeeping at work?

Good housekeeping at work benefits both employers and employees alike. Good housekeeping can:

- Eliminate clutter, which is a common cause of accidents, such as slips/trips/falls, and fires and explosions
- Reduce the chances of harmful materials entering the body (e.g., dusts, vapors)
- Improve productivity (the right tools and materials for the job will be easy to find)
- Improve JPL's image (good housekeeping reflects a well-run business. An orderly workplace will impress all who enter it—employees, visitors, customers, etc.)
- Help JPL to keep its inventory to a minimum (good housekeeping makes it easier to keep an accurate count of inventories)
- Help JPL to make the best use of its space, since space is such a premium
- Make the workplace neat, comfortable and pleasant—not a dangerous eyesore.

Think about what could happen if a bunch of oily rags suddenly caught fire one night, or if, in an emergency, employees couldn't get out of the work area safely because aisles were cluttered. Imagine those same employees unable to get out altogether because of a blocked exit.

Not only is it imperative that JPL employees use good housekeeping habits, it is also important for everyone to correct unsafe conditions, if possible. If you need assistance in correcting unsafe conditions, you can notify any of the following:

Occupational Safety Program office:
Call On-Lab 4-4711 • Off-Lab 818-354-4711

Hazardous Materials and Chemicals:
Call On-Lab 4-0180 • Off-Lab 818-354-0180

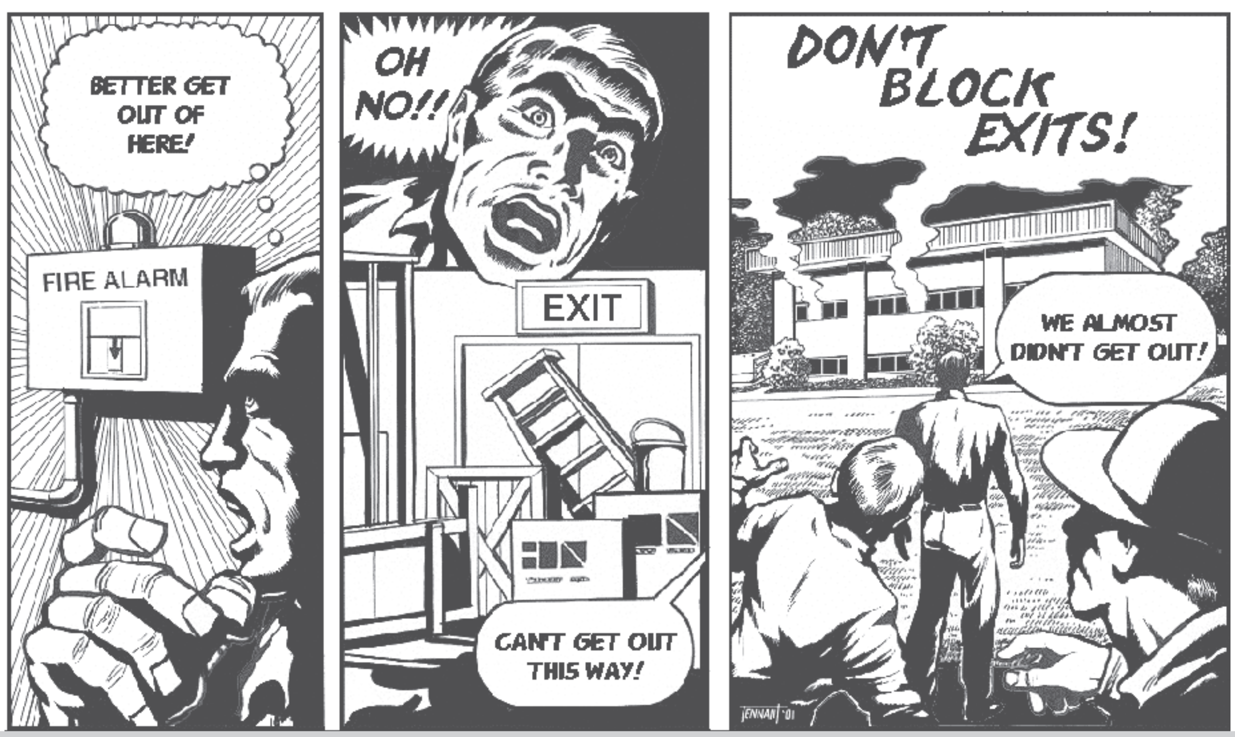
Facilities Maintenance:
Call On-Lab 4-7827 (4-STAR)

Material Movement:
Call On-Lab 4-3172 • Off-Lab 818-354-3172

JPL Safety Hotline:
Call On-Lab 3-6483 • Off-Lab 818-393-6483

OSPO List of Contacts:
http://safety.jpl.nasa.gov/programs/

Safe housekeeping is important in all types of employment. It is also very predictable. Without it, a safety program won't be successful. Experience has shown that good housekeeping is an essential part of JPL's Health and Safety Program.



NEW CELL PHONE LAW

Want to use your cell phone while driving? Well, you better not while driving in California. In fact, a new California cell phone law is serving as a model for other states concerned about the unsafe practices of drivers who are distracted by their phones.

Under the new California cell phone law that takes affect July 1, 2008, drivers will be prohibited from using cell phones while driving unless they use hands-free devices. Violations will cost the driver $20 for the first offense and $50 for each subsequent transgression. There are exceptions built into the law for use of cell phones during emergencies, use of push to talk features and use of cell phones by emergency personnel. More information about the new California cell phone law can be found at *http://www.dmv.ca.gov/cellularphonelaws/index.htm*.

Remember, cell phone use on the Laboratory is prohibited in NASA-owned vehicles and will also become prohibited for use in privately owned vehicles once the new law goes into effect July 1, 2008.

At JPL, compliance with the cell phone law will be enforced by Protective Services and treated as a moving violation under JPL's Parking and Traffic Regulations.

HEAT STRESS

Summer is almost here. We need to think about our safety when working in the heat. Symptoms of heat-related illnesses can run from mild to severe.

Heat stroke is the most serious heat-related health problem. It occurs when the body's temperature regulatory system fails and perspiring becomes inadequate. A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105 degrees F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur. Call 911 immediately. Any person with heat stroke requires immediate hospitalization.

Heat stroke is caused by the loss of large amounts of body fluid by perspiring, sometimes with excessive loss of salt. A person suffering from heat exhaustion still perspires but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, victims may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

Heat cramps are painful spasms of the muscles that occur among those who perspire profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt.

Fainting may occur to a person not accustomed to hot environments and who stands erect and immobile in the heat. With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Moving around prevents blood from pooling and prevents fainting.

Transient heat fatigue is a temporary state of discomfort and mental or psychological strain caused by prolonged heat exposure. Symptoms include a decline in task performance, coordination, alertness and vigilance.

Training and Education is a key component of prevention. Educate yourself about preventive measures and understand the symptoms of heat illnesses. OSPO is offering Heat Stress Training in May, June, July and August, 2008. Sign up on *hr/et*.

Smart Safety Rules

- **Don't wear dark, tight-fitting clothes**
- **Don't eat heavy meals before working in the heat**
- **Loosely cover as much of your body as possible**
- **Keep drinking water close by**
- **Don't drink alcohol or drinks with caffeine**
- **Know and react to symptoms of heat-related health problems**
- **Drink water!!**

Drink Water! During a day's work in the heat, a person may produce as much as 2 to 3 gallons of perspiration. It is important that water intake during the workday be equivalent to the amount of perspiration produced. Don't depend on thirst to signal when and how much to drink. Instead, drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body.

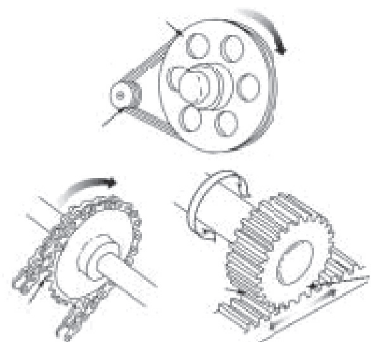
THE IMPORTANCE OF MACHINE GUARDING

According to the California Occupational Safety and Health Administration (Cal/OSHA), workers operating and maintaining machinery suffer approximately 11,000 non-fatal amputations, lacerations, crushing injuries, abrasions, and over 21 deaths per year. You can help to prevent injuries of this nature.

An effective machine guarding safety program is the fundamental component in a workplace safety and health program to prevent serious injuries. Machine guarding helps to prevent arms, fingers, hair and clothing from coming into contact with moving or dangerous parts of machinery. Without such guarding, the result can be a severe injury or even a fatality.

Guards are protective barriers that surround areas on machines or equipment that have nip points, rotating shafts, mechanical shears or belts and pulleys. Operators must determine the points of operation. This is the area of the machine where the machine performs work such as cutting, shaping, boring and forming.

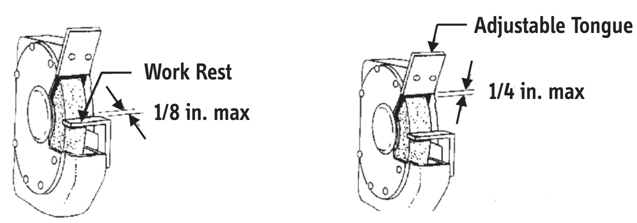
Identifying both the moving and non-moving hazards of the machinery and the points of operation will help the operator understand what types of guarding may be necessary and what potential injuries may arise if left unguarded.



In addition, there are regulatory-specific machine safeguarding requirements identified for various machinery such as: mechanical power presses, press brakes, conveyors, printing presses, roll-forming and roll-bending machines, shears, food slicers, meat grinders, meat cutting band saws, drill presses, milling machines and grinding machines.

Prior to use of the machine or equipment, operators must evaluate the guards present on each machine or equipment and verify that they are functioning correctly and are not damaged. In the event a machine or equipment has a defective guard, do not operate it. Lock and tag out the machine until it can be repaired. Upon completing the repair of the machine and ensuring all guards have been replaced, then you could proceed to operate it.

Ensure the preventive maintenance program includes a periodic review of the guards on all machines or equipment. Equipment such as abrasive wheel grinders requires that the distance between the wheel periphery and the adjustable tongue never exceeds 1/4 inch and the work rest must be within 1/8 inch of the wheel.



Remember, wherever there is a machine part, function or process that can cause injury to the operator, provide proper guards. Learn more about machine guarding by enrolling *(hr/et)* in the JPL Machine Guard Class that is offered monthly or contact the Occupational Safety Program Office at extension 4-4710.

Top performers receive Explorer Bonus Awards

Twenty of JPL's top performers were honored at the Explorer Award and Edward Stone Award ceremony May 6 at Caltech.

The JPL awards program consists of various monetary and non-monetary awards for individuals and teams. The Explorer Award, the highest monetary award in the program, is designed to honor individuals based on four categories of excellence, the "focus areas" of the JPL Implementation Plan. Award categories are Strategic Leadership, Scientific and Technical Excellence, Effective Business Management, and Effective Partnerships and Relationships.

In addition, two individuals were honored with the Edward Stone Award for Outstanding Research Publication, presented for reporting a major scientific advance or technological innovation having a significant impact on advancing a field of knowledge.

The Explorer Award honorees:

Strategic Leadership

Genji Arakaki, for outstanding leadership of Phoenix mission assurance, including close-out for launch approval and a key role at Kennedy Space Center during the launch campaign.

Eri Cohen, for leadership of the Kepler Primary Mirror coating activity to develop a sound process involving several contractors on a tight schedule.

Allen Farrington, for outstanding leadership in establishing the Urey astrobiology in-situ instrument at JPL.

Isik Kanik, for outstanding strategic leadership of personnel recruiting and hiring, to significantly enhance JPL core competency in planetary science.

Chi Lin, for outstanding leadership resulting in certification of JPL mission software at Capability Maturity Model Integration Level 3.

Scientific and Technical Excellence

John Brophy, for outstanding technical excellence in successfully infusing cutting-edge solar electric, xenon ion propulsion technology into the Dawn mission.

Mark Brown, for exceptional systems engineering and technical problem-resolution leadership for the Dawn project, leading to a successful launch.

Joseph Green, for outstanding technical performance in development, analysis, processing and visualization of new data products for a reimbursable customer.

Shantanu Malhotra, for exceptional leadership in establishing and successfully implementing the architectural vision for the Deep Space Network's service preparation subsystem.

Tien Nguyen, for outstanding reliability and trouble-shooting technical leadership and contributions to solving system anomalies for JPL flight projects.

Michael Roche, for technical excellence in the design, development and implementation of the Antenna Maintenance Terminal software program.

Robert Shotwell, for exceptional engineering of Phoenix verification and validation, including an innovative certification for flight readiness process and tool that was crucial for achieving launch approval.

Deborah Vane, for outstanding scientific leadership that resulted in the first-of-a-kind science returns and operations success for the CloudSat mission.

Gregory Whiffen, for outstanding innovation and technical excellence as the software architect and cognizant engineer of the Mystic software set.

Effective Business Management

Kelly Moran, for outstanding leadership and effort in preparing JPL for the NASA Institutional Programmatic Support Audit, resulting in excellent performance.

Deborah Padilla, for outstanding performance in delivering the highest level of business management expertise for the Kepler Project.

Effective Partnerships and Relationships

Paul MacNeal, for an outstanding 10-year effort in leading the annual Invention Challenge, raising student interest in engineering and creativity among JPLers.

James Newell, for outstanding performance as Kepler mission assurance manager, improving team dynamics and effectiveness.

Edward Stone Award for Outstanding Research Publication

Jon Giorgini, "Predicting the Earth encounters of (99942) Apophis," 2007: For developing and extending the dynamical model of

Continued on page 6

Systems engineers move up

Recent ceremonies honored the first graduating class of JPL's Systems Engineering On-the-Job Training program, which is operated by the Systems Engineering Advancement Project.

The graduates were Jessica Collisson [Section 314], Jessica Faust [382], Louise Hamlin [382], Ken Hurst [382], Loren Jones [346], Daniel Limonadi [313], Jennifer Rocca [313], Matt Wette [343] and Paul Woodmansee [353].

The objective of the training program is to increase the participants' ability to be highly competent systems engineers on JPL flight projects. The participants endured a vigorous selection process to enter the program, noted Ross Jones of the Systems and Software Division, who oversees the effort.

The program is focused on training those who best meet the selection criteria regardless of their organization within the Engineering and Science Directorate and regardless of the type of systems engineering they intend to practice, Jones said.

Training, conducted in classroom and online sessions, included events in all project lifecycle phases, as well as 360 evaluations focusing on the highly valued behaviors of JPL systems engineers. Graduates participated in more than 2,500 hours of training, including proposal preparation, Team X design sessions, attendance at formal project reviews and observation of projects during operations.

Richard Hasegawa / JPL Photo Lab

Front row: Loren Jones, left, and Daniel Limonadi. Back row, from left: Jessica Collisson, Paul Woodmansee, Jennifer Rocca, Matt Wette, Ken Hurst, Jessica Faust.

Each participant was paired with one of JPL's best systems engineers for personal mentoring, Jones said. The mentors were Mark Brown, Riley Duren, Nagin Cox, Cece Guiar, Gentry Lee, Rob Manning and Charles Whetsel.

The program is designed to operate for five years. The second class will graduate in June. Participants are Rob Abelson [313], Mohamed Abid [313], Jennifer Dooley [382], Tracy Drain [314], Marc Foote [382], Paula Pingree [389], Steven Schroeder [345], Calina Seybold [313], Rob Sherwood [838] and Chris Voorhees [352]. The third training class is being selected now.

For more information on the program, visit *http://sea.jpl.nasa.gov/SE_Training/OJT_Program.*

News Briefs

Elachi earns Goddard honor

JPL Director Charles Elachi has been named a recipient of the American Institute of Aeronautics and Astronautics' Goddard Astronautics Award for 2008.

The award, named in honor of rocket pioneer Robert Goddard, is the oldest institute tribute for notable achievement in the field of astronautics.

The institute also named JPL to receive its 2008 Foundation Award for Excellence, established in 1998 to recognize unique contributions and extraordinary accomplishments by organizations or individuals.

The awards were presented during the Aerospace Spotlight Awards May 14 in Washington, D.C.

The American Institute of Aeronautics and Astronautics advances the state of aerospace science, engineering and technological leadership. Headquartered in suburban Washington, D.C., the institute serves more than 35,000 members in 65 regional sections and 79 countries. Membership is drawn from all levels of industry, academia, private research organizations and government.

Kudos to Ulysses operations

The Ulysses Mission Operations Team has received the 2008 International SpaceOps Award for Outstanding Achievement, which is presented for outstanding efforts in overcoming space operations and/or support challenges, and recognizes those teams or individuals whose exceptional contributions were critical to the success of a space mission.

A trophy and certificate of citation was presented in May to recognize the team for its outstanding contributions to the success, scientific productivity, and longevity of the joint mission of NASA and the European Space Agency mission to the poles of the sun.

Also, one of three International Space Ops Distinguished Service Medals was presented to Robert K. Wilson, Spitzer Space Telescope project manager at JPL, for "outstanding dedication, leadership, operational excellence, innovation and sustained technical performance, significantly contributing to the success of NASA astronomy, physics, planetary and Earth-observing missions and Spitzer."

Houston club honors CloudSat

The CloudSat team recently received an exceptional achievement award from the Houston Rotary Club.

The Rotary's Stellar Award was bestowed for "exceptional achievement by an international joint government, university and industry team in conceiving, designing, developing and launching the CloudSat spacecraft that provides unprecedented three-dimensional perspective of Earth's clouds to answer questions about how they form, evolve and effect the weather, climate and fresh water supply."

The annual award recognizes outstanding individuals and teams from industry and government who have made significant contributions to the future of the nation's space program.

Army award to JPL teams

Members of JPL's Joint Non-kinetic Effects Model and Corps Battle Simulation development teams recently received the 2007 Army Modeling & Simulation Award.

Team members Troy Barry, Ted Brunzie, Robert Chamberlain, Will Duquette, Joe Fearey, Dave Hanks, Nelia Miller, Joe Provenzano, Jon Stinzel, Richard Thielen and Marcus Traylor were honored for software modeling design and implementation through the rapid development of the Joint Non-kinetic Effects Model from February 2005 to February 2008. "For this time period, the team produced the Army's only viable, relevant tool for modeling the effects of the interactions of combatants and non-combatants of all types, and added a whole new layer of realism and complexity to the Army's collective battle command training capability," said the award citation. "This accomplishment brings great credit to the team and provides an invaluable improvement to Army training and readiness."

Awards

Continued from page 5

potentially hazardous near-Earth asteroids, thus allowing far more accurate predictions of their future motions, including Earth-threatening encounters.

Tony Song, "Detecting Tsunami Genesis and Scales Directly from Coastal GPS Stations," 2007: For advancing a novel approach in tsunami prediction by utilizing coastal GPS measurements and numerical ocean circulation modeling that reveals new insight into the generation and propagation of tsunamis.

For more information about the JPL awards program, visit *http://eis.jpl.nasa.gov/hr/esr/BONUS*.

Passings

Patty Line

Robert Nofer, a retired senior facilities engineer, died Dec. 19, 2007.

Nofer worked at JPL from 1988 to 2006. He is survived by his wife, Ann.

Retiree **Robert Ivanoff,** 77, died March 2.

Ivanoff worked at JPL from 1964 to 1993. He is survived by children Deborah, Brian and Keith. Burial was at Forest Lawn in Glendale.

David Quarles, 72, a retired engineer, died March 7.

Quarles joined the Lab in 1967 and retired in 1997. After his retirement, he returned to JPL as a Swales Aerospace employee and served as a senior propulsion engineer for the Pathfinder, Cassini, Deep Space 1 and Mars Exploration Rovers missions.

He is survived by his wife, Elaine, sons Dan and Mike, daughters Kathleen and Heather, nine grandchildren, two great grandchildren and sister Ramona. Services were private.

Floyd Stoller, 83, a retired Deep Space Network engineer, died April 1.

Stoller joined the Lab in 1956 and retired in 1988. Among his career highlights was the supervision of the construction of a 26-meter, polar-mounted antenna in Australia in 1960, similar to the one at the Goldstone Pioneer station.

He is survived by his wife, Bette, four children, six grandchildren and three great grandchildren. Services were private.

Cecil Wiggins, 89, retired supervisor of the former Transmitter Group, died April 1.

Wiggins joined JPL in 1960 and retired in 1988. His career highlights include initiating computerized operation of the Deep Space Network ground tracking stations as well as fostering the use of fiber-optic technology for DSN transmitters, both in 1965.

Wiggins is survived by daughters Amy, Mary, Kathleen and Megan.

Patty Line, 90, a retired secretary, died April 6.

Line worked at the Lab for 25 years, including a three-year period between 1959 and 1962 in a future studies program office in Washington, D.C. within the newly-formed NASA. She then returned to work at JPL until her retirement in 1975.

No services were held.

Clarence Gates, 81, retired former assistant laboratory director and former associate director, died April 25.

Gates, who joined JPL in 1950, led the team that designed the Laboratory's first three-axis-stabilized spacecraft, a concept that led to the Ranger and Mariner series. Later he managed several JPL divisions, including the Mission Analysis Division and Systems Division. In 1980 he was named deputy assistant laboratory director for the Office of Technical Divisions, followed by his appointment the following year as assistant laboratory director. He retired in 1991.

He received NASA's Exceptional Service Medal and the Institute of Navigation's Thurlow Award for his work in space navigation.

Gates is survived by his wife, Betty, sons William and Robert, daughter Cynthia and husband Fred Gortner and grandchildren Devyn, Davis and Danica.

Gates' family requested that contributions in his memory be considered to the Moorpark Symphony Orchestra, 7075 Campus Rd., Moorpark, CA 93021.

Letters

I wish to thank all my friends and colleagues at JPL for the outpouring of sympathy and support following the passing of my wife, Dale Ann Metcalf. Your cards, phone calls and e-mails meant a lot to me, and to Dale's family. Thanks also to JPL for the beautiful plant we received.

Leigh Torgerson

I would like to thank my friends, colleagues and all the Security Operations personnel for their prayers, cards and expression of sympathy during the passing of my mom, Shirley Kennedy. It helped ease the pain a bit during this difficult time for me. A special thank you to JPL/Caltech for the beautiful azalea they sent shortly thereafter. It was planted with great love in memory of her.

Robert Kennedy and family

My family and I want to thank my friends and colleagues in Section 203 during the time of our bereavement upon the sudden death of my father; the cards of condolences, support and prayers are heart-felt during our difficult time. A special thanks also to JPL for the beautiful plant. A sincere thanks from me and my family.

Greg Pruitt

Thanks to JPL for the beautiful plant that I received at the passing of my brother. I would like to express my sincere thanks to my co-workers and friends at JPL for the cards and kind words during this difficult time. It was much appreciated.

Manju Kapoor

My family and I would like to thank my colleagues in Section 316 and friends around the Lab for the flowers, gifts and condolences after the passing of my mother. Your kind words and thoughtfulness are very much appreciated.

Ken Vines and family

On behalf of Johnny Lopez and his family, we wanted to thank Division 180 and other JPL employees for the kindness and loving ways you have shown our family by giving us hugs, cards and flowers during the sorrow of losing Johnny's father to cancer. My mother-in-law will cherish the beautiful plant from the Hospitality Group. Without faith and wonderful people like you the world would be nothing. His memories will endure. Love,

Johnny and Sherri Lopez

I would love to thank everyone who has supported me and my daughter Rae through our amazingly tough time. To all the people who asked and cared and donated to help us get through it, my words cannot express how much your generosity meant to us. Thanks to your support, we were able to move forward with the surgery and Rae is healing and recovering at an astounding rate. I would especially like to thank Cassini, Arlene in the Benefits Office and my line management. I am truly blessed to work with you.

Marissa Rubio

Retirees

The following JPL employees retired in June: Michael Salsman, 43 years, Section 2662; Ramon Garcia, 34 years, Section 3548; James Frautnick, 32 years, Section 313C; Sheila Chatterjee, 24 years, Section 172F; Diana Lanagan, 21 years, Section 111; Sung-Yung Lee, 18 years, Section 3243, Ronald Carlson, 10 years, Section 3533; Burton Sigal, 10 years, Section 5100.

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