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Carol Lachata / JPL Photo Lab

Are we alone? Let's find out

PLANET-HUNTER KEPLER SET TO TRACK LIFE-SUSTAINING WORLDS

By Mark Whalen

For generations, astronomers and amateur skygazers alike have wondered whether we on Earth are alone among the stars. On March 5, the quest moves forward in earnest as Kepler, NASA's first mission capable of finding Earth-size and smaller planets around other stars, is scheduled for launch from Kennedy Space Center. Kepler will explore the structure and diversity of planetary systems by continuously measuring the brightness of 100,000 stars, searching for planets that cross in front of them. JPL Project Manager Jim Fanson discusses the mission with Universe.

KEPLER'S MISSION IS TO OBSERVE "EARTH-LIKE" PLANETS IN OUR GALAXY. IN THIS RESPECT, WHAT DOES EARTH-LIKE MEAN? ROCKY AND TERRESTRIAL? THE SIZE OF EARTH? WHAT OTHER FACTORS ARE CONSIDERED IN TARGETING KEPLER'S OBSERVATIONS?

By Earth-like, we mean rocky planets that orbit their star in a region called the "habitable zone," where the temperature of the planet would permit liquid water on its surface. We believe liquid water is essential for the existence of life as we understand it. Planets ranging in size from about half an Earth mass to 10 Earth masses are the most interesting targets. Below half an Earth mass (such as Mars), the planet's gravity is too small to retain much of an atmosphere; beyond 10 Earth masses the gravity is strong enough to hold onto the gasses from the original protoplanetary disc from which it formed, and tends to grow to become a gas giant planet like Jupiter or Saturn.

WHAT'S THE HISTORY OF PLANET-HUNTING SPACECRAFT? DOES KEPLER REPRESENT A QUANTUM LEAP IN THIS AREA?

Kepler is the first spacecraft specifically designed to find Earth-size planets orbiting in the habitable zone. The European Corot mission, which launched about two years ago, uses a similar method as Kepler to hunt for planets, but is not designed to find planets in the habitable zone. Kepler is orders of magnitude more powerful; it's a giant leap forward.

HOW DID THE CONCEPT FOR THE MISSION COME TO BE? IS IT CONSIDERED A FOLLOW-ON TO PREVIOUS MISSIONS?

The idea for Kepler originated with our science principal investigator, William Borucki, about 25 years ago. The concept is simple: continuously monitor the brightness of many thousands of stars, waiting for orbiting planets to pass in front of them, blocking a portion of the star's light and causing the star to dim slightly for a few hours. By measuring several of these "transits," the size of the planet and the size of the planet's orbit can be determined. It's a

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Carol Lachata / JPL Photo Lab

Opportunities ahead

By Mark Whalen

Even in today's tough economy and uncertainty, opportunities and challenges abound for JPL in the coming years, Laboratory Director Charles Elachi told staff in his semiannual state of the Laboratory address Feb. 24.

Elachi first cited the disappointing loss of the Orbiting Carbon Observatory that morning. The satellite that was to track carbon dioxide in Earth's atmosphere failed to reach orbit shortly after launch from Vandenberg Air Force Base due to launch vehicle anomaly.

The director was confident that JPL would overcome the setback and noted that discussions are already underway to see if the mission's capability can be recaptured. "Our colleagues at NASA's Kennedy Space Center will find out what happened, and we will all learn from it," Elachi said, adding to those who have worked on the mission: "We are very proud for what you have done, and despite this loss, you should be too."

"The key challenge for an institution is not when things are going well, but how it does in the face of adversity, internal or external," he said. "There should be no doubt in anyone's mind that we are going to pursue very aggressively our Earth-science activities."

Coincidentally, Elachi told the crowd that among JPL's activities, Earth science appears to be the biggest beneficiary of recent developments combining the recently enacted federal economic stimulus package, increases in NASA's fiscal year 2009 budget and positive signs from the Obama administration.

"There is no question that for the new administration Earth science is very important, as are global climate change issues," he said. "In order to address this in an intelligent way, we have to understand what is happening on our planet. With the stimulus package and the increase in the 2009 budget — with more increases expected in 2010 and 2011

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Kepler

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very difficult measurement, though. The brightness of an Earth-like planet transiting a star like our sun causes the star's brightness to dim only by about 80 parts per million, a very faint signal. In addition, the star's brightness varies naturally, so identifying the transit signature against this noisy background is quite challenging. Many years of laboratory testing and analysis were required to convince skeptics that the measurement could be made.

HOW DOES THE PHOTOMETER INSTRUMENT WORK? WHAT MAKES IT DIFFERENT THAN CAMERAS ONBOARD OTHER SPACECRAFT?

The photometer measures the brightness of more than 100,000 stars by counting up the photoelectrons produced by light falling on the silicon charge-coupled device detectors every six seconds. Only the pixels surrounding each target star are measured and downlinked to the Earth; we don't send down pictures the way a conventional camera does. It's crucial that no photoelectrons be missed because we're trying to measure the brightness of stars to the part per million level. If the star image is too sharply focused the charge-coupled device will quickly saturate, spilling photoelectrons across the charge-coupled device in an effect called "blooming." For this reason the Kepler telescope is designed to form images that are very slightly blurred. In order to capture 100,000 sun-like stars at one time Kepler's field of view must be very large. The telescope images 100 square degrees of sky (more than 30,000 times larger than the Hubble Space Telescope) onto a focal plane that is one square foot of silicon—the largest ever flown in space.

WHERE WILL KEPLER BE TRAVELING?

Kepler will be placed into an Earth-trailing solar orbit similar to that of the Spitzer Space Telescope. It will drift away from Earth at the rate of about 0.1 astronomical units [about 9 million miles] per year. Leaving Earth behind gives Kepler an uninterrupted view of the target region between the constellations Cygnus and Lyra. It also provides a very stable thermal environment, which helps to minimize systematic errors that might be introduced into the measurement.

OVERALL, WHAT ARE JPL'S ROLES IN THE MISSION, INCLUDING THE SCIENCE TEAM? WHERE AND HOW WILL DATA BE COLLECTED AND ANALYZED?

JPL leads the development phases of the mission, and will provide navigation and deep-space telecommunication services during operations. The JPL project scientist, Nick Gautier, is also a co-investigator on the science team. Data will be collected using the Deep Space Network and routed to the science operations center at NASA Ames Research Center in Northern California, where they will be analyzed. Some of the analysis tools are being built at the NASA Exoplanet Science Institute on the Caltech campus.

WHO ARE JPL'S PARTNERS?

Ames is the home institution of the science principal investigator and is responsible both for delivering the ground segment and managing the mission during operations. The science operations center at Ames built the analysis pipeline and will process the data. Ball Corporation of Boulder, Colorado, built the flight vehicle and will support mission operations. The Laboratory for Atmospheric and Space Physics, part of the University of Colorado, also in Boulder, provides the mission operations center, and the Space Telescope Science Institute in Baltimore will archive the data.

Kennedy Space Center photo

At a processing facility near Kennedy Space Center Feb. 16, the Kepler spacecraft is lifted from a work stand to be joined to a Delta II third stage, in the background.

WHEN WILL THE FIRST DATA BE RETURNED AND AVAILABLE?

The first data will be returned about a month after the two-month commissioning period is completed. The first public release of data will follow about a year later. The early data will contain giant planet detections and planets with short period orbits. The data necessary to find Earth-size planets will take about three and a half years to collect and will be made public about four and a half years after launch.

IS THERE A LOT OF INTERNATIONAL INTEREST IN THE MISSION?

There is great interest from scientists in other nations, who are particularly interested in the treasure trove of data Kepler will collect on stars. We have a formal collaboration with the Asteroseismic Science Consortium at Aarhus University in Denmark, which will be using the data to probe the interior structure of stars.

IT'S BEEN A WHILE NOW SINCE THE MISSION HAD TO DEAL WITH FUNDING ISSUES THAT THREATENED CANCELLATION. HOW WAS THAT HANDLED, IN TERMS OF RESCOPING THE MISSION OR CHANGING ITS GOALS?

The goals of the mission were not changed. But we took a hard look at what was essential to do and what could be eliminated, in terms of capability, in terms of testing, in terms of oversight and independent review. We dug deep to find a solution forward that required no additional funding, but which carried technical risk acceptable to all the stakeholders. And then we reorganized to form a more streamlined team with clearer lines of authority. One consequence of this process is that we shortened the mission duration from four years to three and a half, knowing that if the mission were performing well, extended mission funding would be found.

WHAT ELSE IS TO BE DONE PRIOR TO LAUNCH? DO YOU AND THE TEAM FEEL READY TO GO?

The team feels ready. We're in the process now of checking the final details, looking back over our records to ensure we've not overlooked something that could bite us. Experienced engineers and managers at JPL and elsewhere are scrutinizing our final risk posture and asking probing questions. This is the moment of truth, when everything we've worked for these many years, the decisions we agonized over, will be put to the test. Every once in a while we look up from the detailed engineering and remind ourselves that we're about to take a great leap into the unknown and attempt to answer a question that has come down to us from the ancient Greeks across 100 generations of human history: Are there other worlds out there like Earth? Is it exciting? You bet it is.

With help from JPLers, kids discover fun in learning

By Brian Frank

Far Left: Anita Sengupta of the Entry, Descent and Landing Systems and Advanced Technologies Group visits with students at Sylvan Park Elementary School in Van Nuys as part of an LA's Best event.

Left: Sara Hatch of the Inner Planet Mission Analysis Group simulates an impact crater, created by dropping a golf ball in flour and cocoa powder. She and Ravi Prakash of JPL visited Annandale Elementary School in Los Angeles.

In his first four months at JPL, systems sequence engineer Victor Luo had already worked with two flight projects, first with Mars Science Laboratory and later with Mars Reconnaissance Orbiter. Now he was hiding Easter eggs for 50 second- through fifth-graders at Monte Vista Elementary in Highland Park —but all in the name of science, of course.

The object of the game was to find the eggs holding not candy but ping pong balls, each one representing a planet in our solar system. The lucky finders then played the planets, and Luo had them line up in the correct order and try to figure out how far apart they should stand to accurately mimic the real thing.

"I just remember when I was in fourth grade and fifth grade—that's when I started getting excited about space," said Luo, describing similar hands-on activities he got to do as a child. "That's how I got started with this space thing, so I figured if I can influence the kids at a young age like I was influenced, then that would be full circle."

Each year the Laboratory's Education Office connects JPL volunteers with schools participating in LA's Best, or Better Educated Students for Tomorrow, an afterschool program for students aged 5 to 12 in Los Angeles schools that aims to keep kids out of gangs, off the streets and out of trouble without charging parents for it. Luo's visit to Monte Vista was just one of many happening throughout the city over two weeks in January.

JPL's involvement with LA's Best has been much expanded since it began more than 10 years ago with a single-day event. In fact, this year marked the strongest turnout in recent memory with more than 50 volunteers visiting 48 schools across the city, according to Trisha Wheeler, coordinator for LA's Best in JPL's Education Office. The average participation rate from previous years had been only 25 to 30.

With support and teaching tools from the Education Office, JPL volunteers lead activities to get students excited about science and engineering. Some of the more popular activities have included building paper-finned straw rockets, simulating an impact crater by dropping a golf ball in a bucket full of flour and cocoa powder, and visualizing the distances between Earth, the moon and Mars with colored balloons.

Quality assurance engineer Curtis Wilkerson, who has worked at JPL for about a year and a half, tried out that last exercise on students at Toland Way Elementary in Eagle Rock. He started by showing them three balloons: blue for Earth, black for the Moon and orange for Mars. With the blue one already filled up as a reference, Wilkerson had students volunteer to inflate first the black one and then the orange one, and that they should stop him when each "planet" was about the right size in proportion to "Earth." Many students were surprised to discover that the moon is actually a quarter the size of Earth, while Mars is about half the size.

Next, Wilkerson asked the students to guess how far apart they should place the blue and black balloons to approximate the distance between Earth and the moon. Once more the students were surprised, this time to discover they had to place the balloons about 20 feet apart, almost clear across the classroom from each other. At that scale, the only way for Wilkerson to demonstrate the distance to Mars was to point out the window at the 134 freeway about three-quarters of a mile away.

Wilkerson's presentation included animations from the Mars Exploration Rover and Mars Science Laboratory missions, but he also fielded questions from curious students and talked about what it's like to work at JPL.

"I remember sharing with the class that I really enjoy the work I do at JPL. I have a lot of fun, and they pay me to do it!" Wilkerson said. "One girl raises her hand and says, 'So you going to work is like us going to recess?' I said 'Yes, it's kind of like that, and then they pay you for going to recess.'"

Wilkerson's visit was a smashing success but also a bittersweet reminder of how sorely many of L.A.'s underprivileged students want for mentoring.

"When my kids walked out of the classroom—kids that have a hard time paying attention or don't like sitting down, more sports-type kids—they had the biggest smiles," said Lupita Cardenas, an LA's Best coordinator who was at Toland Way that day.

"People from other companies have come out, read to the kids, but never about outer space and never to teach kids about—I want to say—a rover? I've never seen that type of presentation done here," said Cardenas, who has worked at LA's Best for about three years.

A coordinator at Monte Vista said the afterschool staff there wanted to have presentations like Luo's every month but were lucky if they got one every other month. But the need for mentoring is not lost on the Education Office and is as much a focus as the teaching activities.

"Pull it back to the basics. What made you interested? What were your challenges? Talk a little about how you got to where you are, and then you have an audience. We really tried to push that message," Wheeler said of trying to help rocket scientists connect with students who may never have dreamed they were capable of pursuing such a career.

JPLers who have volunteered to work with LA's Best or who have taught in a classroom know how silly, how unpredictable, how obnoxious, how downright intelligent such students can be. For many of them, the experience is all about making that connection.

Before he left Monte Vista that day, Luo was handed a sheaf of letters handwritten by the students and tied neatly into a package with a piece of green yarn. The students had prepared them in advance, but they were no less touching, no less entertaining.

"I hope you take us to outer space. We all hope you will take us with you," wrote a student named Jesus. To accompany the text, he had drawn a rocket blasting up the left side of the paper, a full yellow Swiss cheese moon, and an astronaut in a funky, clunky red and green spacesuit.

And, in an unwitting but marvelously succinct summary of the entire program, a student named Isaac wrote, "I hope you will inspire us all so one day we can be smart like you."

State of the Lab

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— there will be a lot of attention to Earth science, and we are in the right place, at the right time, with the right ideas."

Elachi noted that the fiscal year 2009 budget, which just became public Feb. 23, has a positive impact for NASA. Specifically the budget includes an increase of about $43 million for Earth science, relative to the request submitted by the Bush administration. Elachi said he is "pretty confident" there will be a positive impact on JPL's Soil Moisture Active and Passive mission and expressed similar hope for some of the Lab's airborne instruments and technology work.

Besides Earth science, he noted, the fiscal year 2009 budget also includes $20 million additional for the Space Interferometry Mission/Exoplanet Program.

The federal stimulus package includes $1 billion for NASA, which must be spent between now and September 2010. The breakdown is $400 million for Earth science, $400 million for Constellation, $150 million for aeronautics and $50 million for construction projects, the last dealing mostly with the aftereffects of Hurricane Katrina. Elachi said the agency would in a few weeks submit an operating plan for specifics on how the money will be spent.

Other areas that might result in a positive impact for JPL will be the potential for work with the National Oceanic and Atmospheric Administration, the Department of Energy and the National Science Foundation.

Elachi praised the efforts by the team supporting the currently orbiting Ocean Surface Topography Mission on the Jason 2 satellite, one of 18 spacecraft and eight instruments operated by JPL across the solar system right now.

"What Jason 2 did was almost as critical as what Phoenix did, even though it was not as dramatic," he said. "The measurement capability of the second satellite matched almost exactly the capability of Jason 1, so it allows us continuity in the measurements of ocean topography. When you have long-term records over many decades, it's very important that you have the right calibration. That's what makes it tough in many of the Earth science missions. After launching Jason 2, literally within weeks we are singing the same tune as the first satellite — this gives us confidence that for the next five years we are building on the database that is calibrated relative to the first one. That is in my mind almost like landing on another planet."

Regarding other planets, Mars Science Laboratory continues preparations for launch in a little more than two years. Referring to the current status of the rover in the high bay and the hardware being disassembled after undergoing environmental testing, "It's kind of sobering," Elachi said, "how challenging it was and how much the team has been able to accomplish. In my mind it's absolutely amazing what they have done."

At a cost of about $2.28 billion, roughly the same price as Voyager, Galileo or Cassini, "There is no question that what the team has accomplished is worth the cost of the mission," Elachi added. "Where I feel bad is that we underestimated the complexity, and therefore cost, at the beginning.

"We need to support the team; they have my full confidence. Instead of worrying about what happened in the past, we will apply lessons learned to future activities. I encourage everyone to support the team in being successful in launching that mission."

For missions and opportunities in Earth science in 2012 and beyond, following the Soil Moisture Active and Passive mission will be the Deformation, Ecosystem Structure and Dynamics of Ice; Jason 3; Extended Ocean Vector Winds Mission; Wide Swath Altimeter; and additional decadal survey missions and instruments.

"We are doing very well in the decadal plan, the missions recommended by the National Science Academy for the next decade," Elachi noted. He acknowledged Randy Friedl and Stacey Boland for their efforts in working with the academy.

NASA recently announced a major opportunity for JPL starting in the next decade. In collaboration with the European Space Agency, NASA will embark on two outer-planet missions. First will be a Europa Jupiter orbiter, followed by a Saturn Titan orbiter. "Both missions are very exciting scientifically," Elachi noted. "Europa will go first because it is technically more ready." Teams

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are now forming, and Elachi expects an announcement of opportunity for the mission's instruments by late next year with a launch in the 2018-2020 timeframe.

Elachi said an announcement of opportunity is expected in the next few months under the New Frontiers Program, representing missions in the $750 million range. JPL is expected to submit four to six proposals; by end of this year an announcement of opportunity is anticipated for Discovery Program missions, those with a price tag of about $500 million.

The Mars program is being re-examined, Elachi noted. Following Mars Science Laboratory is Maven (2013), a Goddard-led mission for which JPL has program responsibility. For 2016 and beyond, discussions are underway with the European Space Agency on potential collaborative efforts—discussions include orbiters, landers and rovers, leading to a sample-return mission beyond 2020. Elachi hopes for an outline within the next few months. "The intent," he said, "particularly with the orbiters and the rover, are that these will be missions that will be assigned to the Laboratory."

Elachi expects steady funding for the Mars and planetary programs. "Not a sharp increase, but increases at the level of inflation—a core of very good funding in all our planetary activity."

In institutional issues at the Laboratory:

- **In NASA's evaluation of JPL for fiscal year 2008** – in which the Lab received a ranking of "very good" and an overall score of 81 – Elachi recognized the Office of the Chief Engineer and the Office of Communications and Education for achieving a perfect score of 100. "In almost all of our activities we were rated excellent, but clearly we created a big challenge for NASA with Mars Science Laboratory – not on the technical side, but on the budget side," he noted.

- **JPL's Job Classification Redesign Project will be implemented Oct. 1.** The key aspects of the plan, Elachi said, are the expansion from four individual contributor levels to six plus Fellows and four managerial levels instead of three. In addition, three clear career paths will be available to employees. Details are being discussed with JPL managers, with a briefing planned for employees in September.

- **Elachi emphasized that every member of the staff is "critical to the operation of this Lab.** It's very important that we all work as a team. If there's any business that requires team effort, it's our business. It is critical that the business side and technical side work together with mutual respect."

- **Efforts are underway to see how JPL can become a "green" Lab**.A committee chaired by Mike Gunson of the Global Change and Energy Group and Steve Rigdon of the Facilities Division will consider ways JPL can minimize its carbon footprint. Ideas include small efforts such as watering more efficiently or turning off lights to major projects like having the whole Lab be solar powered.

- **Regarding ways JPL can economize and remain budget-conscience,** Elachi cited keeping the current hiring freeze in effect until there is clarity on JPL's 2009 and 2010 budgets; urging everyone to reduce travel significantly and rely more on videoconferencing; and challenging managers to reduce burden budget expenditures wherever possible, including deferring or eliminating certain activities.

Also under consideration is closing JPL the last week of the calendar year, between Christmas and New Year's, and asking employees to take vacation. "The decision has not been made, but early indications are that this could save JPL $5 million to $6 million," Elachi noted. "That corresponds to 30 to 40 jobs." He expects a decision within a month.

Annual merit increases will also be assessed. "We are going to look at the state of the economy and the business base, then make a decision," Elachi said. "Another way to think about it is that every 1 percent increase in salary corresponds to 50 jobs at JPL. We're not going to be stingy; we're going to be realistic. We will hopefully work together to work out the right thing to do in this difficult economic situation," he said.

"Your management is going to do everything possible to protect employment at JPL," Elachi added. "I'm pretty confident, but I cannot guarantee anybody's job. My expectation is that most likely we will have an impact of less than 1 or 2 percent. It depends on the skill mix and on the nature of the missions that will get funded.

"I know that many of you are concerned, but this is the place I would want to be, more than anywhere else, particularly in this environment." He ended by quoting from Teddy Roosevelt: "Far and away the best prize that life has to offer is the chance to work hard at work worth doing." ■

Winter 08/09
JPL Safety Awareness news
A PUBLICATION OF THE OCCUPATIONAL SAFETY PROGRAM OFFICE

TRITIUM EXIT SIGNS

What is tritium and how will it affect me? Tritium is the naturally occurring radioactive isotope of hydrogen (3H). It is normally in gaseous form. In the presence of moisture, it becomes an oxide. It is often used to illuminate items that require non-electrical power sources. Among those items are building EXIT signs. The biological impact of tritium exposure is very low, because it emits extremely weak radiation and is eliminated from the body relatively quickly by way of perspiration and urination. In addition, because of tritium's short elemental half-life and consequently short biological half-life, very large amounts (large curie quantities) must be ingested to pose any significant health risk.

What are tritium EXIT signs and how can you identify them? Tritium EXIT signs display the word "EXIT" to identify emergency exits. Most often they are used in buildings for illumination of egress routes. Tritium EXIT signs are self-luminous (i.e., require no electrical power source). In the absence of light or in a smoke-filled environment, tritium-illuminated signs display a greenish glow emanating from several sealed glass tubes arranged into the word "EXIT." A tritium-illuminated EXIT sign may be easily distinguished from other types of EXIT signs. Tritium EXIT signs lack evidence of an electrical power source and circuit test buttons, as seen on most electrically powered EXIT signs, and should be visibly labeled with a "SELF-LUMINOUS EXIT SIGN (MARKERS)," bearing the standard radiation trefoil (3-bladed propeller) and labeling that includes the words "CAUTION – RADIOACTIVE MATERIAL."

Regulation of tritium EXIT signs Tritium EXIT signs are regulated by the U. S. Nuclear Regulatory Commission (NRC) Federal regulations and Agreement States. California is an Agreement State. Under the applicable regulations, a user has a general license to own the device. The user must adhere to the requirements of the general license as for any other lawful regulation.

What's the problem? Because a damaged EXIT sign can leak tritium, it should not be handled by a layperson. While damage to tritium EXIT signs is rare, it will most likely occur if a sign is dropped during installation or smashed during the demolition of a building. If a sign escapes damage during demolition, it may ultimately release tritium to the environment if improperly disposed of in landfills. Nationally, tritium EXIT signs are being improperly disposed in landfills (often from construction debris), thereby creating contamination hazards. In addition to violating several regulations, contamination of a landfill may pose a significant liability resulting in penalties and contamination clean-up.

What do I do if I am involved in a tritium-illuminated EXIT sign breakage?

Utilize the **SWIM'N** acronym:

- **S**top the spill – minimize the spread of contamination
- **W**arn others – ensure other people in the area know what has happened
- **I**solate the area – for tritium, ventilate the area, open doors and windows
- **M**inimize your exposure – move away from the area toward an upwind location
- **N**otify emergency response personnel – call 911 from a JPL landline and notify JPL Radiation Safety Office personnel at (818)-354-5811

What must be done?

Management shall ensure:

- Personnel (especially maintenance personnel) are aware of the need to use caution when working with tritium-illuminated EXIT signs
- Removal of tritium-illuminated EXIT signs is coordinated with the JPL Radiation Safety Office in Building 200, Room 122, phone 818-354-5811
- Personnel are aware that tritium signs are not to be disposed of in ordinary trash
- Personnel are aware that a broken tritium-illuminated EXIT sign may result in potential radiation exposure to personnel and contamination of property and the environment
- An inventory of all tritium EXIT signs is provided to the JPL Radiation Safety Officer
- Missing or damaged signs are reported to the JPL Radiation Safety Officer

Tritium EXIT *signs are self-luminous. In the absence of light or in a smoke-filled environment, tritium signs display a greenish glow emanating from several sealed glass tubes.*

Tritium EXIT *signs do not have an electrical power source or circuit test buttons. A damaged sign can leak tritium and it should not be handled by a layperson or disposed of in a landfill.*

Pursuant to NASA NPR 8570.1, replacement exit signs shall not contain tritium. Examples of non-radioactive technologies include EXIT signs using light-emitting diodes (LEDs) and those using photochemical luminescence.

JPL Safety Awareness news

NEW SAFETY & HEALTH INCIDENT NOTIFICATION HOTLINE

The Occupational Safety Program Office (OSPO) is proud to announce the creation of a new Safety and Health Incident Notification Hotline. This number is for all JPL employees, managers and contractors to report all types of Mishaps and Close Calls during regular working hours, after hours or on weekends and holidays.

The new number is: (818) 354-2141

Please note the requirement to input all JPL employee Mishaps and Close Calls into the Mishap Reporting System (MRS) is still effective. Please refer to JPL Rules! DocID 44598.

What is a Mishap?

A Mishap is an unplanned event that results in:

- Injury/illness to non-NASA personnel caused by NASA operations
- Damage to public or private property (including foreign property) caused by NASA operations
- Occupational injury or illness to NASA personnel
- NASA mission failure
- Destruction of or damage to NASA property

What is a Close Call?

A Close Call is an event in which there is no injury or only minor injury requiring first aid and/or no equipment/property damage or minor equipment/property damage (less than $1,000), but which possesses a potential to cause a Mishap.

All Mishaps are assigned a Classification Level. This Classification Level determines reporting requirements to Cal/OSHA as well as NASA Headquarters (HQ) and the JPL Executive Council (EC).

Classification Level	Injury	Property Damage	Reporting Time Requirements to OSPO
Type A Mishap	Occupational injury and/or illness that resulted in: A fatality, or, A permanent total disability, or, The hospitalization for inpatient care of 3 or more people.	Total direct cost of mission failure and property damage is $1,000,000 or more,	Immediately upon knowledge
Type B Mishap	Occupational injury and/or illness has resulted in permanent partial disability, or, The hospitalization for inpatient care of 1–2 people.	Total direct cost of mission failure and property damage of at least $250,000 but less than $1,000,000.	Immediately upon knowledge
Type C Mishap	Nonfatal occupational injury or illness that caused any workdays away from work, restricted duty or transfer to another job beyond the workday or shift on which it occurred.	Total direct cost of mission failure and property damage of at least $25,000 but less than $250,000.	8 hours from time of knowledge
Type D Mishap	Any nonfatal OSHA recordable occupational injury and/or illness that does not meet the definition of a Type C mishap.	Total direct cost of mission failure and property damage of at least $1,000 but less than $25,000.	8 hours from time of knowledge
Close Call	An event in which there is no injury or only minor injury requiring first aid, but which possesses a potential to cause a mishap.	An event in which there is no equipment/property damage or minor equipment/property damage (less than $1000), but which possesses a potential to cause a mishap.	8 hours from time of knowledge
High-Visibility Close Call	An event in which there is no injury or only minor injury requiring first aid, but which possesses a potential to cause a mishap AND is a high-visibility concern.	An event in which there is no injury or only minor injury requiring first aid, but which possesses a potential to cause a mishap AND is a high-visibility concern.	Immediately upon knowledge

Please contact the OSPO at 4-4710 or 4-9834 for more information and please visit HR/ET for Mishap Reporting Training availability.

Always ask for help if the load is too large or awkward

BACK HEALTH

Good posture is a reflection of the way we look and feel about ourselves, and much more. Good posture is one of the simplest things we can do to help our backs stay healthy and pain-free. Good posture can prevent muscle pain, stiffness and tension as well as backaches, pain and injury. Good posture is actually quite simple. It means keeping the three natural curves of your back (neck, chest and lower back) in balance while standing, sitting or lying down.

Standing Contrary to what most of us were taught, good posture does not mean standing with shoulders thrust back, chin forward, and spine straight as an arrow. Actually, you're using good standing posture when your ears, shoulders, hips, knees and ankles are "stacked" in a straight line. (Note: Your shoulders should be relaxed and your knees slightly bent.)

Sitting While sitting, you can keep your spine balanced by again "stacking" ears over shoulders and shoulders over hips. To prevent lower back strain, place a lumbar roll (or rolled-up towel or sweater) between your lower back and the back of your chair. Keep your buttocks resting against the chair back, and if your feet don't reach the floor, rest them on a footstool or box.

Lying Down When lying down or sleeping, try resting on your side in a modified "fetal" position (knees slightly bent toward chest) or on your back with a pillow placed beneath your knees. Sleeping with more than one pillow under your head can exaggerate your neck curve and can place undue stress on your back. Choose a firm mattress for adequate back support.

A Healthier Back By using good posture throughout your day, you can help keep your back balanced and reduce your risk of back problems and injury. You'll not only feel better, you'll look better, too.

HAZARD COMMUNICATION CHEMICAL SAFETY CLASS

As of October 2008, chemical users are required to take Hazard Communication Training as well as Hazard Communication Refresher Training every 2 years. If you have not taken Hazard Communication Training within the last 24 months, you may not be able to order or use chemicals in your processes. OSPO is offering additional Hazard Communication Training classes each month; however, they have been filling up quickly and have long waiting lists. Therefore, OSPO has decided to offer group training on March 16 at 1:00 PM to 3:00 PM in von Kármán Auditorium. Please register in HR/ET as soon as possible to preserve your seat.

Tom Gavin

Chris Jones

Rick Grammier

Executive management changes announced

JPL Director Charles Elachi has announced new personnel announcements on the Executive Council, effective in March.

Tom Gavin will step down as associate director for flight projects and mission success. Replacing him will be Chris Jones, who currently serves on the Executive Council as director for solar system exploration. Replacing Jones will be Rick Grammier, the current deputy director for solar system exploration.

Gavin, who joined the Executive Council as director for space science flight projects, was responsible for the Genesis, Mars 2001 Odyssey, Mars Exploration Rover, Spitzer Space Telescope and Galaxy Evolution Explorer projects. He also served as deputy director for space and Earth science programs, spacecraft system manager for the Cassini mission, and as a member of the Galileo and Voyager project offices responsible for mission assurance. Gavin will continue to work on a part-time basis as senior staff to the director and will provide oversight and guidance to the Mars Science Laboratory project.

Jones was previously deputy director for space science flight projects, spacecraft development manager for Cassini and manager of the Space Interferometry Mission. Since joining JPL in 1969, he has contributed to the design, test and flight operations of numerous spacecraft including Mariner 9, Voyager and Galileo, and has managed the Laboratory's Spacecraft Systems Engineering and Guidance and Control sections.

Grammier, project manager for Juno during its critical development through confirmation phase, was the project manager for the Deep Impact mission. He also served as manager of the Mission Assurance Division, deputy project manager for Stardust, and manager for the Cassini command and data subsystem development.

All will assume their new roles Monday, March 16.

Gore makes his case on climate change

Former Vice President Al Gore appeared before the Senate Foreign Relations Committee Jan. 28 to urge lawmakers to adopt a binding carbon cap and push for a new global climate pact by the end of the year. As part of a slide show presented to the committee, Gore displayed Atmospheric Infrared Sounder carbon dioxide images created with data from July 2003 and July 2008 to demonstrate the increase in carbon dioxide in Earth's atmosphere. For more information, visit http://airs/story_archive/AIRS_CO2_in_Gore_Testimony_Jan_2009.

Gore also used the images at a meeting of the Advancing Science Serving Society on Feb. 13 in Chicago, in which he called on scientists to communicate the urgent nature of climate change to government leaders and the public. For more information, see *http://news.aaas.org/2009/0214gore-a-call-to-action-on-climate.shtml.*

Al Gore testifies to the Senate Foreign Relations committee in January.

Carbon mission fails to reach orbit

JPL's Orbiting Carbon Observatory satellite failed to reach orbit after its from launch from Vandenberg Air Force Base at 1:55 a.m. Pacific time Feb. 24.

Preliminary indications showed that the fairing on the Taurus XL launch vehicle failed to separate. The fairing is a clamshell structure that encapsulates the satellite as it travels through the atmosphere.

Rick Obenschain, deputy director at NASA's Goddard Space Flight Center, will lead an investigation board convened to determine the cause of the launch failure.

The board will have four other members. NASA will announce the names of additional members as they become available. The board will gather information, analyze the facts, and identify the failure's cause or causes and contributing factors. The board will make recommendations for actions to prevent a similar incident.

For more information about the Orbiting Carbon Observatory failed launch and investigation, visit *www.nasa.gov/oco.*

Caltech reduces staff, reorganizes

Caltech has announced that it is implementing cost-cutting measures in an effort to stay focused on its core mission of research and education.

Caltech said it is moving to reduce expenses with a combination of systematic reorganizations on campus and a reduction in its workforce, including not filling currently vacant staff positions. Neither will interfere with educating students or any ongoing research projects.

Institute spokesman Jon Weiner said the cutbacks at the campus were not expected to affect any JPL functions, such as the cafeterias or JPL Store.

The withering economy, Caltech said, has resulted in a decrease in the portion of its revenue that comes from its endowment and private giving. In excess of 30 percent of the school's budget is funded from endowment and private sources.

"These reductions are an effort to counteract the affects the Institute is feeling from the current economic crisis," said Jean-Lou Chameau, Caltech's president. "We feel it's prudent to take these steps now to limit future effects we may see if this ongoing financial situation continues."

Some of the changes include structural reorganizations within several administrative units. Academic divisions are also seeing a reduction in revenue from the endowment; however, faculty hiring will continue, albeit at a smaller pace than in recent years.

Caltech employs approximately 3,600 people at the campus, with about 100—or 2.7 percent—faced with layoffs.

News Briefs

Moustafa Chahine

Chahine elected to academy

JPL scientist Moustafa Chahine has been elected a member of the National Academy of Engineering, one of the highest professional distinctions accorded to engineers and scientists.

The academy elected Chahine based on his leadership in determining the structure and composition of Earth's atmosphere from space. The organization awards those who have made outstanding contributions to "engineering research, practice or education" and for pioneering new fields of technology, advancing the engineering field and "implementing innovative approaches to engineering education."

Chahine is the founder of JPL's Earth and Space Sciences Division and served as the Lab's chief scientist from 1984 to 2001. He is the principal investigator for the Atmospheric Infrared Sounder, a JPL instrument on NASA's Aqua satellite that measures air temperature, humidity, clouds and surface temperatures.

Lifetime award for Casani

Longtime JPLer John Casani, special assistant in the Office of the Director, has been selected to receive the 2009 National Air and Space Museum Trophy for Lifetime Achievement.

During his career, Casani has managed several major flight projects, including Voyager, Galileo, and Cassini.

John Casani

In the 24 years since the trophy was first awarded in 1985, individuals and teams accomplishing NASA missions have been honored 15 times. Joining Casani in receiving the award will be C. Gordon Fullerton, an astronaut and longtime NASA chief test pilot.

Award ceremonies will be held April 29.

Twitter recognition

NASA's activities in social networking media were recognized Feb. 11 in New York, when the agency received an award for its presence on the popular Web site Twitter.

Known as the Shorty Award, it was created to honor the best producers of short content on Twitter during 2008. Updates on JPL's Mars Phoenix lander mission received the most votes in the science category from users of the site.

The Mars Phoenix Twitter delivered more than 600 updates during the 152 days the lander was operating in the north polar region of Mars. By the end of the lander's mission in early November, more than 38,000 people were following its reports, called "tweets." The account is still used to provide updates on the mission's science results and has more than 41,000 followers.

Veronica McGregor, manager of JPL's Media Relations Office and originator of the updates, accepted the award.

JPL thanked for generosity

Photo courtesy of United Way of Greater Los Angeles

JPL Deputy Director Gene Tattini is joined by Martha Corbett (left), 2008 United Way campaign chair, and Elise Buik, president of United Way of Greater Los Angeles, during the Feb. 3 Corporate Philanthropy Summit held at the California Science Center, where the Lab was presented with an "Employee Giving Award." JPL was honored as one of the top five local companies that had the largest percentage of employee donors (more than 80 percent) giving to the "Creating Pathways Out of Poverty Fund," the United Way general fund, during JPL's campaign in fall 2007, when JPLers donated about $454,000. In fall 2008, JPLers donated about $500,000 to United Way.

Passings

Patricia Westerlund, 70, retired supervisor of the Electronic Packaging and Fabrication Group, Section 349, died Nov. 17.

Westerlund joined JPL in 1979 and retired in 2001. She is survived by sons Rob and Rick and granddaughter Nikki. Services were held in Temecula, Calif.

Retiree **Charles Shaffer,** 88, died Dec. 3.

Shaffer joined JPL in 1959 and retired in 1986. He is survived by daughter Sharon and son William.

Retiree **Ivan Snyder,** 76, died Dec. 7.

Snyder worked at the Laboratory from 1964 to 1997. He is survived by his wife, Wilma and son Michael. Services were held at Forest Lawn in Glendale.

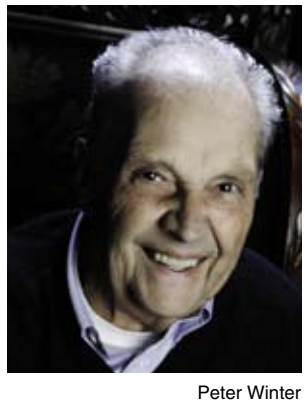
Mortimer Kron, 81, a retired Deep Space Network engineer, died Jan. 15.

Kron worked at JPL from 1965 to 1992. He is survived by children Richard, Stephen, Patricia and Penny, eight grandchildren and two great grandchildren. Services were held at Forest Lawn in Glendale.

Eugene Vosicky, 75, who co-developed and oversaw the JPL Educator Resource Center, died Jan. 19.

Vosicky worked at JPL from 1989 to 2002. He was site administrator of the Educator Resource Center and Applied Technology Classroom at Cal Poly Pomona, inaugurated in 1999 to provide materials and strategies for teachers to include the space program in their curricula. He was credited with helping to obtain a National Science Foundation grant to fund the university's "Comfortable Approach to Teaching Science" program to instruct and familiarize teachers with various basic math and science concepts, and was also involved in many workshops that helped teachers learn about NASA and JPL exploration.

No services were held.



Peter Winter

Peter Winter, 77, a retired engineer who worked on the Viking, Voyager and Galileo missions, died Jan. 12.

Winter joined JPL in 1976 and retired in 1993. He received group achievement awards for his work on Voyager and for the Mark IV-A Deep Space Network Implementation Project.

Winter is survived by his wife, Halina, daughter Kirsten, granddaughter Christel and grandson Dillon.

Anne Hastings, 71, a retired buyer in the Materiel Procurement Section, died Jan. 22.

Hastings worked at the Lab from 1976 to 1992. She is survived by daughter Lynda, sons James and Richard, grandchildren Jessica, Mitchell, Daniel, Alexander, Ashley, Michael, Sarah and Ethan, and sister Ruth.

Services were held in Citrus Heights, Calif.

Paul Winson, 84, retired from JPL's Procurement Office, died Jan. 23.

Winson worked at the Laboratory from 1965 to 1980. He is survived by his wife, Marlene, children Paul, Stephen, Kathy and Leigh, and grandchildren Elizabeth, Paul, Kelsey, Matthew, Cody and Jesse. Private services were held in Pennsylvania and California.

Letters

My family and I would like to thank my colleagues in the Cassini Mission Support and Services Office for the thoughtful sympathy card and their messages of condolence after the recent passing of my mother-in-law, LaWana. She was always amazed and appreciative of the things we do here.

Bill and Leslie Mogensen

I want to thank JPL for the kind expression of sympathy on the recent passing of my brother, William Pruden. We appreciate all of the calls and cards, and thanks to JPL for the lovely plant. Your kindness will always be remembered.

The William H. Pruden family
Ella Pruden Jackson
Martha Pruden Hamiter

I would like to thank JPL for the beautiful flowering plant and the wonderful support from all my friends and colleagues in Division 26 on the passing of my grandmother. My grandmother was 101 and was feisty to the end. I will miss her very much. Thank you again.

Susan Scrivner

I would like to thank my JPL family, especially my colleagues and vanpool, for their thoughtfulness, support and condolences at the recent passings of my mother-in-law, Carole Hope, and my father, Jay Kennicott, within a three-week period. My dad was proud to have designed and implemented some of the earliest clean rooms at JPL, and the cooling for the base of the 70-meter antenna at Goldstone Deep Space Communications Complex, during his career as a refrigeration and air-conditioning engineer. On behalf of my entire family, I would like to express our thanks for the beautiful plants, flowers and cards, and the comfort they have brought us. Thank you.

Sharon Hope

I would like to express appreciation to all who sent their condolences on the recent passing of my mother, Anne Hastings. Thank you to JPL ERC for the lovely anthirum plant and to my group (2231) for the gorgeous geranium tree and planter sent in honor of her memory. A special thank you to Bill and Cindy Stewart and Kathy O'Ryan for the spectacular arrangement sent to the church for her memorial service. Finally, thank you to all, including all the people in the IBS Section (2230) who have expressed their condolences via cards, notes and phone calls—your loving support during this time certainly means a lot to me.

Lynda Noell

Retirees

The following JPL employees retired in February:

Warren Martin, 47 years, Section 9120; **Mary Ann Gero,** 40 years, Section 2509; **Eugene Burke,** 38 years, Section 9120; **Peter Poon,** 35 years, Section 9120; **Herbert Pickett,** 30 years, Section 3828; **Bob Debusk,** 26 years, Section 383G; **Judith Dedmon,** 20 years, Section 2744.

JPL RETIREES:
Read and submit classified ads at JPL's online news source

http://dailyplanet

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Universe

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