

JPL's next journey to the outer planets, the Juno mission to Jupiter, is preparing for its scheduled Aug. 5 launch from Kennedy Space Center. The spacecraft's launch period continues through Aug. 26. Juno is the first solar-powered mission to the outer planets.

The primary goal of the \$1.1 billion Juno mission is to understand Jupiter's origins—how the planet was formed and evolved. Other objectives include studies of Jupiter's interior structure, deep atmosphere and evolution, as well as a close look at the planet's polar magnetosphere.

Lockheed Martin built the spacecraft, while JPL contributed the telecommunications subsystem and a critical microwave radiometer that will help determine the water content in the Jovian atmosphere. JPL also provided project management, science leadership, systems engineering, navigation and the mission operations system/ground data system, as well as mission assurance and business office functions.

According to Project Manager Jan Chodas, the Juno spacecraft has completed all of its tests and is ready to go. The Juno team is focused on completing the final reviews and preparing for operations. "It's been years of hard work, and now we're excited to be so close to launch!" she said.

Chodas added that the JPL Juno team, comprising a large cross-section of staff from the Lab's engineering and science divisions, mission assurance and business areas, has received inspiration through the memory of a former colleague and leader.

She noted that Rick Grammier, JPL's former director for solar system exploration who passed away in January, was instrumental in Juno's development and, along with principal investigator Scott Bolton of the Southwest Research Institute, assembled the original Juno team.

Chodas said that, since becoming the project manager in August 2008, she has worked to foster a spirit of cooperation. "We have a very open and communicative relationship across the board. Not just within the project management team at JPL or across the JPL extended team, but also throughout the team that stretches across institutions," she said. "This attitude was instrumental in enabling Juno's development to proceed as smoothly as it did."

Bolton noted that in some respects Juno is a follow-on to JPL's Galileo mission, which studied Jupiter from 1995 to 2003. When Galileo arrived at the planet, the spacecraft delivered a probe that descended into the planet's atmosphere to measure the composition of cosmological heavy elements. Bolton, a former JPLer who previously worked as Galileo's science coordinator and a co-investigator on a couple of the instruments, said a key measurement for the probe—water abundance in

Juno preps for Jupiter launch



Mission will follow Galileo's studies of the giant planet; liftoff set for Aug. 5

By Mark Whalen

Jupiter's atmosphere—couldn't be determined.

"So we're following the Galileo probe in the sense that we're picking up the last measurement that it missed," said Bolton. "When Juno measures the water abundance it's getting what is arguably the most important ingredient in the list of elements that enriched Jupiter. Somehow Jupiter's composition is different than the sun's, it is enriched in heavy elements, everything heavier than helium. We're really aiming to discover the recipe for planets and getting the ingredient list is a key step."

Another key advance will be the new perspective provided by Juno's polar orbit; very different than Galileo's orbit around the equator. Juno also will skim the cloud tops at its closest approach, only about 5,000 kilometers (about 3,100 miles) above the clouds, much closer than the Galileo orbiter.

"Because we're polar, we'll be measuring the full range of latitudes of the magnetic and gravity fields," said Bolton, "and our proximity enables us to get very high-order measurements.

And the microwave measurements we're making also are enabled by the fact that we're getting very close to the planet and going inside Jupiter's radiation belts."

Bolton noted that a better understanding of Jupiter will provide key

"It's been years of hard work, and now we're so excited to be so close to launch!"

Juno Project Manager Jan Chodas



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Executive Council changes, new assignments announced



Firouz Naderi



Jakob van Zyl



Dave Gallagher



Mike Sander

JPL Director Charles Elachi has announced a set of organizational changes and appointments on the Executive Council intended to position the Laboratory to seek new business as NASA pursues robotic and human exploration of the solar system.

Effective Aug. 15, the Exploration Systems and Technology Office (190) will be merged into the Solar System Exploration Directorate (400). Firouz Naderi will become director for the expanded Solar System Exploration Directorate. Mike Sander, who headed the Exploration Systems and Technology Office supporting NASA's human spaceflight program, was named an assistant to the JPL director and will serve on Naderi's staff.

Jakob van Zyl was named JPL's associate director for project formulation and strategy, a position previously held by Naderi. Succeeding van Zyl as director for astronomy, physics and space technology will be David Gallagher, who most recently was deputy for that directorate.

The new assignments "will use the unique abilities of our executive leadership team in the best possible way to

meet the opportunities and challenges of NASA's planned robotic and human exploration of the solar system," said Elachi.

Naderi joined the Laboratory in 1979. His career at JPL includes program and project management for satellite communications systems, Earth remote-sensing observatories, astrophysical observatories and planetary systems. His last three assignments have been as the Origins Program manager, Mars Program manager and as associate director for formulation and strategy.

Van Zyl came to JPL in 1986. Initially a research scientist in Division 32, he led the Airborne Synthetic Aperture Radar Group and the Radar Science and Engineering Section, and also served as project manager of the GeoSAR airborne radar. After managing the Earth Science Flight Missions and Experiments Office and the Focused Physical Oceanography and Solid Earth Program, he was appointed deputy astronomy and physics director in 2002 and the director for astronomy and physics in 2005. Van

Zyl remains involved in synthetic aperture radar research, and is currently a member of the Soil Moisture Active Passive science definition team.

Gallagher most recently has been serving as the deputy director for astronomy, physics and space technology. Previously, he was the manager of the Advanced Optical Systems Program. He has also served as project manager for the Space Interferometry Mission, the Spitzer Space Telescope, the Starlight Project, the Pressure Modulated Infrared Radiometer instrument and the Drop Physics Module reflight. He also served as the integration and test manager for the Wide Field and Planetary Camera 2 instrument for the Hubble Space Telescope repair mission.

In making the announcement, Elachi thanked retired JPL executive Tom Gavin, who led the Solar System Exploration Directorate on an interim basis following the death of former directorate head Rick Grammier in January.

JUNO *Continued from page 1*

information on the formation of the solar system. "Juno will give us a gateway to view our early history," he said. "I'm hoping these new measurements and new perspectives will answer a lot of questions and set up new questions for future missions."



Scott Bolton,
Juno principal investigator

Chodas said JPL's Instruments and Science Data Systems Division designed, built and tested the microwave radiometer, while the telecommunications subsystem was developed by the Communications, Tracking and Radar Division. The Autonomous Systems and Mechanical Systems divisions assisted with both. Fabrication and environmental testing for the JPL hardware components were provided by the Enterprise Engineering Division. Systems engineering for the project—including project system, flight system and payload system—as well as mission planning, mission operations, the ground data system and assembly, test and launch operations support, are contributed by the Systems and

Software Division. Mission design and navigation are performed by the Autonomous Systems Division.

In addition, several JPL co-investigators will contribute to Juno science.

Michael Janssen of the Astronomical Instrumentation Group (3265) is lead co-investigator for the microwave radiometer, with Sam Gulkis of the Astrophysics and Space Sciences Section (3260) as co-investigator. Steve Levin, Juno's project scientist, is also a member of the microwave radiometer science team. Eric DeJong of the Geophysics and Planetary Geosciences Group (3223) will lead data visualization and imaging, and Ed Smith of the Space and Astrophysical Plasmas Group (3263) will support magnetic field mapping.

The spacecraft will also carry the "JunoCam," a color camera that will provide unprecedented close-up images of Jupiter, including the first detailed look at the planet's poles.

Juno will fly by Earth for a gravity assist in October 2013. Due to arrive at Jupiter in July 2016, the spacecraft will orbit the planet's poles 33 times during its mission, slated to end in October 2017.

For more information, visit <http://www.nasa.gov/juno> or <http://missionjuno.swri.edu>.



Shrinking JPL's carbon footprint

By
Franklin O'Donnell

Think about what steps JPL might take to reduce the Lab's energy usage and carbon footprint. Turn off lights in unoccupied rooms? Install high-efficiency LED lights? Unplug computer printers when not in use? Deploy solar panels on the rooftops of buildings?

All of those moves are necessary, but not sufficient. If the Lab wants to make serious strides in energy and carbon, it needs to deal with the three biggest smoking guns behind JPL's energy usage: computing centers, air conditioning and travel.

That was the message at a town hall meeting organized in July by the Energy Stabilization Team, a group commissioned last fall by the Executive Council to study how JPL can reduce energy use.

The main driver for reducing energy use is a pair of executive orders signed by Presidents George Bush and Barack Obama. They require federal facilities like JPL to reduce energy usage by 30 percent by the end of fiscal year 2015, compared to 2003 levels.

"It's also the right thing to do," said Riley Duren, chief systems engineer of the Earth Science & Technology Directorate (8X), who leads the tiger team. "JPL researchers are telling us a lot about how our civilization's carbon emissions are changing the planet. It's only appropriate that we at the Lab do our part to mitigate that carbon footprint."

According to the team's research, JPL's demand for electricity has grown since 2003 by 3 to 4 percent per year on average. Last year, electricity accounted for 49 percent of the Lab's carbon emissions, followed by travel (23 percent), commuting (17 percent) and natural gas (11 percent).

Of the electricity, a whopping 70 percent is eaten up by air conditioning followed by electrical use by data centers (12 percent), lights (10 percent), lab equipment (4 percent) and office equipment (3 percent).

The biggest red flag for air conditioning is not office cooling. Rather, growth in this area is driven by the need to cool data centers, where racks of servers provide computing power for uses ranging from crunching science data from spacecraft missions to business applications. It's not the electricity actually consumed by the computers themselves that's the rub, but rather the power needed to keep such servers from overheating. This, in turn, can drive the cooling required for entire buildings.

Many factors complicate how much air conditioning is required to cool computer servers, the team found. Traditionally, projects and line organizations have tended to co-locate data centers that support their work near their office area or lab, meaning that many buildings on-Lab, even those mostly dedicated to office space, are often cooled around the clock just to maintain a single small data center. "As a result, nearly 90 percent of the Lab's current electricity use is associated with a 24/7 base-load dominated by air-conditioning for the largest buildings," said Duren.

To get better insight into the problem, the team installed a network of digital thermometers throughout some of the largest data centers at JPL, including the Woodbury complex. This showed that temperatures across a single room varied by 40 to 50 degrees Fahrenheit. A thermal map revealed hot spots at the air-intakes of a handful of computer racks. The net impact: the entire room and building are being cooled unnecessarily to keep a few computers from overheating.

Duren said the team is working with the Office of the CIO, Facilities and other Lab organizations to implement "low-hanging fruit" improvements such as improved air flow in JPL's largest data centers. Efforts will also be made to consolidate future data centers so buildings can be cooled more efficiently, rather than co-locating offices and computer servers. (Cloud computing—in other words, outsourcing the Lab's data processing—can help but not solve the problem, the team says. This is because the carbon footprint of remote data centers varies significantly with their location and efficiency, and federal requirements include responsibility for carbon emissions to outsourced activities.)

What about solar panels to supply at least some of JPL's electricity? While solar and other renewable energy sources are an important part of the mix, Duren noted, "We can't generate our way out of this problem." Even if solar panels were placed on every roof that can be accessed and other available areas at JPL, they would only supply about 6 percent of the Lab's energy needs. "Local generation of electricity can help offset the Lab's base-demand, but will not solve the growth problem," said Duren. "So a balanced approach is required to prioritize the application of limited resources."

On the travel front, the tiger team found that JPLers took about 17,000 round-trips last year. In the town hall meeting, Duren noted that some managers rightfully argue that face-to-face time in Washington is important to meet the needs of sponsors. Even so, the team argues that video and web conferencing could reduce the number of people traveling for regular programmatic status meetings and reviews. "Establishing the necessary remote presence infrastructure and project culture for using it will be key to achieving these goals," said Duren.

As for commuting, data compiled from annual ride-share surveys shows that half of JPL's workforce lives more than 20 miles away from the Lab, and 1,700 of them drive alone to work.

The team has put together an internal website at <http://goto/energy-carbon> that provides more background on the challenges and solution options, information on what JPL Facilities is doing to reduce energy consumption, and dashboards that let users follow the Lab's energy and carbon trends.

"There are ways that we can achieve major savings, both in energy and dollars," said Duren. "But we have to

stop thinking of energy and carbon as being free or really cheap, and take serious steps towards evolving our culture. It's the same challenge facing the rest of NASA, the U.S. government and industry; we can and should be on the cutting edge here."

In addition to Duren, the tiger team includes Mike Gunson and Athena Sparks of 8X, Steve Rigdon of Facilities, Eric Nilson and Dennis Horgan of the Office of CIO, Michael Kelsay of Division 33 and Matt Bennett, Michael Evans and Brian Cox of Division 31.

Act Locally

How can you help JPL reduce its carbon footprint? The tiger team urges employees and contractors to:

- **Learn. Understand the energy and carbon footprint of your activities.**
- **Make smart decisions.**
Be particularly mindful with data centers, travel and commuting.
- **Participate. Support data collection requests and facility tests to study energy usage. Look for creative ways to reduce energy demands.**
- **Stay informed: <http://goto/energy-carbon>**
- **Talk about it. Make energy/carbon awareness part of our culture.**

News Briefs



Robert Parks

Parks memorial Aug. 30

A memorial on Lab for JPL pioneer Robert Parks has been planned for Tuesday, Aug. 30 from 2 to 4 p.m. Guests are requested to arrive no earlier than 1:30 p.m.

Parking is available in the visitor lot, but carpooling is encouraged.

The program will include a short film documenting Parks' career at JPL. Refreshments will be served after the program.

RSVP is requested to rsvp.jpl.nasa.gov. Please indicate the number of people in your party, and whether you would like to make a few short remarks.

Honor Awards bestowed

JPL employees, affiliates and partners were recognized at the annual NASA Honor Awards ceremony in July.

Twelve categories of individual and group awards were bestowed. To view a list of the honorees and to learn more about JPL's awards programs, visit <http://hr.jpl.nasa.gov/compensation/reward/nasahonor.cfm>.

Alexander honored at Cape

George Alexander, former manager of JPL's Public Affairs Office, has been recognized as a key contributor to the communication of the nation's space program with the installation of his name on "The Chroniclers" wall in the Kennedy Space Center news center. The event was held the day before the July 8 liftoff of Space Shuttle Atlantis, the final launch of shuttle program.

With the honor, Alexander joins former JPL Public Affairs Manager Frank Colella on The Chroniclers. Alexander,

now retired, led JPL public affairs from 1988-99 after writing for Aviation Week (1960-67), Newsweek (1967-1972) and the Los Angeles Times (1972-1985).

NASA Administrator Charles Bolden and Kennedy Space Center Director Bob Cabana presented certificates of recognition to Alexander, New York Times reporter John Wilford and French broadcaster Jacques Tizou.

The Chroniclers showcases more than 50 names of print and broadcast journalists, photographers and government/industry publicists who reported from the Cape over the 50 years of the space program.

Cassini paper receives honor

Four JPL researchers have been honored with an award for the best paper submitted to a conference of the American Institute of Aeronautics and Astronautics last year.

The organization has recognized Antonette Feldman, Allan Lee, Glenn Macala and Eric Wang for "Estimation and Modeling of Enceladus Plume Jet Density Using Reaction Wheel Control Data," written for the 2010 Guidance Navigation and Control Conference.

The awards will be presented in early August at the organization's Modeling and Simulation Technologies Conference in Portland, Oregon.

Basics tutorial now a book

"Basics of Space Flight," the introductory tutorial, has been online and evolving for nearly two decades. It has now been made into a book, in both electronic and paperback formats.

The 20-megabyte PDF version is available for download free of charge from the JPL Basics website (<http://www.jpl.nasa.gov/basics>) for use on some portable devices. Find the "download" icon at the website's lower left

corner. The paperback is available in a color edition and a black and white edition (Bluroof Press 2011) is available from the JPL Store, as well as directly from Amazon.com.



Carol Lachata / JPL Photo Lab

Karl Bird is flanked by JPL Deputy Director Gene Tattini (left) and Willis Chapman at ceremony installing Bird as JPL's new representative to the Pasadena Chamber of Commerce.

Bird is new Chamber of Commerce rep

Karl Bird, manager of JPL's Acquisition Division, has been named JPL's representative to the Pasadena Chamber of Commerce.

Bird replaces Willis Chapman, manager of the Logistics and Technical Information Division, who had been a member of the chamber's board of directors for about 13 years and was the chamber's chairman for three years.

Bird has been with JPL since 2007 and leads a division of 165 people. His career includes contracting assignments with the Army, Navy, Marine Corps, Defense Logistics Agency and Air Force. Bird is a member of the National Contract Management Association and serves on its national board of directors.

"The Pasadena Chamber has enjoyed the active support and participation of JPL for 40 years," said Chamber president and CEO Paul Little. "I am very grateful to Willis Chapman for his service and leadership, especially during my first few years at the Chamber. I am confident Karl Bird will make a strong board member and continue building JPL's legacy of positive contributions to our chamber and our community."

JPL joined the Pasadena Chamber of Commerce in 1961 and is the largest single employer among its membership.

Passings



Martha Fredholm

Martha Fredholm, 59, an administrative assistant who contributed to numerous JPL organizations during her 33-year career at the Lab, died May 14.

Fredholm served the majority of her years at JPL as the executive staff assistant to six assistant Laboratory directors and directors for the Engineering and Science Directorate.

She is survived by her husband, Bruce; daughters Olivia, Anita and Erica; and grandchildren MaKenna and Michael. The family expresses their sincerest gratitude for the support and love shown during this most difficult time.

John W. Klein, 62, former deputy manager of the Mars Science Laboratory Project, died May 27.

Klein had been with JPL since 1980. He held a number of line and project supervisory positions, including supervisor of the Power Systems and Power Electronics groups, deputy manager of the Power Systems Section and manager of the Avionic Equipment Section. He was the assistant manager for flight



John W. Klein

projects within the Robotic Systems Division (34), then served as the division's deputy manager and later as manager. He served as Mars Science Laboratory's deputy manager from 2006 to 2009, and then returned to the Engineering and Science Directorate to oversee engineering operations.

Services were held June 6 at St. Bede the Venerable Catholic Church in La Cañada Flintridge.



Fernando Tolivar

Aurelio "Fernando" Tolivar, 65, a key leader in the development and management of technology programs at JPL, died June 6.

Tolivar joined JPL in 1975 and spent the majority of his career in the Autonomous Systems Division (34) in a variety

of technical and leadership positions, most recently as the division technologist. He held section management roles in guidance and control and in system engineering, and also spent eight years in the Astrophysics Directorate as system manager and project engineer for the Spitzer Space Telescope, for which he received a NASA Exceptional Achievement Medal in 2004.

He is survived by his wife, Carmen, and children Peter and Natalia. Services were held July 23 in Studio City.

Letters

I would like to thank JPL and Section 389 for their condolences at the recent loss of my grandmother. She lived a great life!

Martha Aviña

On behalf of myself and my husband Steve, I would like to thank all the members of my JPL family for their compassion on the passing of my mother. Your words and acts of encouragement, support and sympathy are much appreciated, and I'm reminded what an extraordinary place JPL is because of my wonderful colleagues. The plant is absolutely lovely, and will be a living reminder of a very rare and special person.

Deborah Watson

My son, Joseph, and I wish to thank all of our friends and colleagues for their expressions of sympathy at the

death of my father. Your flowers, cards and heartfelt words are deeply appreciated. We also thank the JPL Store for the beautiful plants. Sincerely,

Sheryl Bergstrom

Retirees

The following JPL employees retired in July:

Kenneth Harstad, 45 years, Section 3538; **John Rohr**, 44 years, Section 3452; **Edward Mettler**, 39 years, Section 3443; **Charles Porter**, 34 years, Section 3546; **Martha Mancilla-Wackley**, 32 years, Section 252H; **Juan Ayon**, 31 years, Section 312D; **Michael Hasbach**, 31 years, Section 3452; **Stephen Mitchell**, 31 years, Section 3451; **Philip Stevens**, 31 years, Section 3537; **Joseph F. Smith**, 25 years, Section 313B; **Nick Mardesich**, 24 years, Section 3466; **Peter Barry**, 22 years, Section 5150; **Susan Barry**, 21 years, Section 318L; **Christian Hidalgo**, 21 years, Section 1721; **Donna Yamada**, 21 years, Section 2200; **David Guarini**, 20 years, Section 5150; **Scott Hughes**, 20 years, Section 5122; **Sohrab Milanian**, 15 years, Section 313G; **John Alpay**, 14 years; **Richard Baron**, 14 years, Section 312C; **Dennis Harding**, 13 years, Section 382G; **Amin Mottiwala**, 13 years, Section 5126; **Michael Phillips**, 13 years, Section 3754; **Orin Serviss**, 13 years, Section 382D; **Peggy Park**, 10 years, Section 3262.



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