Jet Propulsion Laboratory

Universe

JANUARY 2010
VOLUME 40
NUMBER 1

2009 In Review

The Dec. 14 launch of Wide-field Infrared Survey Explorer capped a banner year in astronomy programs for JPL, with other highlights including the launches of Kepler and Herschel/Planck, and the successful transition of Spitzer to a warm mission after its coolant was depleted. JPLers also celebrated the return of Wide Field Planetary Camera 2 after a run of many years as the Hubble Space Telescope's prime instrument, delivering some of the most iconic images from deep space.

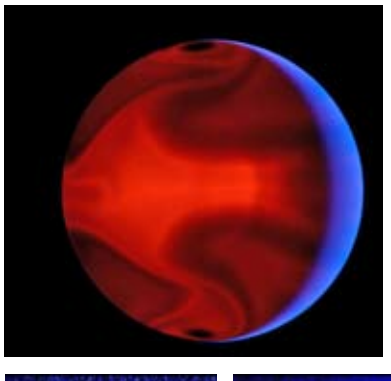
In planetary exploration, one of the year's highlights was Cassini's equinox flyby of Saturn in August. Dawn flew by Mars en route to its destination bodies in the asteroid belt, and JPL's Diviner instrument on the Lunar Reconnaissance Orbiter set out to Earth's natural satellite.

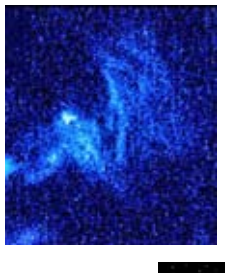
JPL's suite of Earth satellites and instruments continued to relay evidence of ice loss. After a decade in orbit, the Quick Scatterometer ended its observations of winds across the world's oceans. In a setback, the Orbiting Carbon Observatory was lost due to a launch vehicle failure in February.

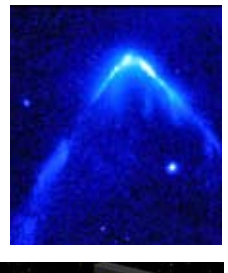
On Mars, the rovers continued to deliver science while Spirit was unable to free itself from soft soil. Mars Reconnaissance Orbiter successfully restarted science observations after being offline for three and a half months, and Mars Odyssey moved its orbit for a new perspective on the Red Planet.

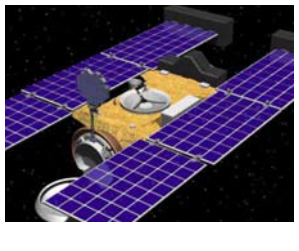
Here is a chronological list of JPL's major highlights for 2009:

January









Images from the Hubble Space Telescope taken by Raghvendra Sahai of JPL and colleagues revealed 14 young, runaway stars that are plowing through regions of dense interstellar gas, creating brilliant arrowhead structures and trailing tails of glowing gas. "We think we have found a new class of bright, high-velocity stellar interlopers," said Sahai. "Finding these stars is a complete surprise because we were not looking for them." … The Mars Exploration Rovers Spirit and Opportunity observed their fifth anniversary since being launched to the Red Planet on missions originally scheduled to last three months. … JPL's Stardust spacecraft flew within 9,000 kilometers (5,600 miles) of Earth Jan. 14 on the way to a Stardust-NExT mission encounter with comet Tempel 1 in February 2011. … JPL's Spitzer Space Telescope observed a planet that heats up to red-hot temperatures in a matter of hours before quickly cooling back down. The infrared observatory measured heat emanating from the planet as it whipped behind and close to its star. In just six hours, the planet's temperature rose from 800 to 1,500 kelvins (980 to 2,240 degrees Fahrenheit), marking the first time that weather changes were detected in real time on a planet outside our solar system. … Images of Saturn's moon Titan from JPL's Cassini spacecraft affirmed the presence of lakes of liquid hydrocarbons by capturing changes in the lakes brought on by rainfall. For several years, scientists had suspected that dark areas near Titan's north and south poles might be liquid-filled lakes. An analysis of Titan's south polar region revealed new lake features not seen in images of the same region taken a year earlier. The presence of extensive cloud systems covering the area in the intervening year suggests that the new lakes could be the result of a large rainstorm and that some lakes may thus owe their presence, size and distribution across Titan's surface to the moon's weather and changing seasons.

Continued on page 2

Former director Lew Allen dies

Lew Allen Jr., the retired U.S. Air Force general who served as JPL director from 1982 to 1990, died Jan. 4 at the age of 84.

During the years Allen led JPL, the Laboratory launched Galileo to Jupiter, Magellan to Venus and the Infrared Astronomical Satellite, and sent the Voyager 2 spacecraft on its flybys of Uranus and Neptune. A champion of technology, Allen invested money into research and development projects that paved the way for new capabilities in space science observations.

From the mid 1950s through the late 1960s, Allen worked as a physicist in the Los Alamos Scientific Laboratory, as a project officer for the Air Force Special Weapons Center, as special staff officer for the Space Technology Office of the Secretary of Defense, and director of the Secretary of the Air Force. By the 1970s, he was director of special projects and deputy commander of satellite programs for the Space and Missile Systems Organization; chief of staff, Headquarters Air Force Systems Command; director of the National Security Agency; and chief of staff of the U.S. Air Force. In 1982 he was recruited to JPL because of his expertise in the military space program.

Allen was the recipient of numerous military decorations and awards including the Department of Defense Joint Service Commendation Medal, Air Force Distinguished Service Medal, Legion of Merit with two oak

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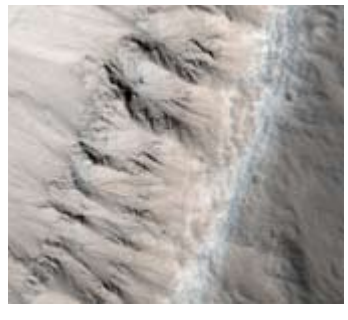
February



JPL senior research scientist Moustafa Chahine was elected to the National Academy of Engineering, one of the highest professional distinctions accorded to engineers and scientists.

JPL engineers and Caltech students revealed the prototype Axel rover, which can rappel off cliffs, travel nimbly over steep and rocky terrain and explore deep craters. The device might help future robotic spacecraft better explore and investigate foreign worlds such as Mars. On Earth, Axel might assist in search-and-rescue operations. … Based on his leadership in determining the structure and composition of Earth's atmosphere from space, JPL senior research scientist Moustafa Chahine was elected to the National Academy of Engineering, one of the highest professional distinctions accorded to engineers and scientists. … JPL's Dawn spacecraft flew by Mars for a gravity assist on its way to asteroid Vesta and the dwarf planet Ceres. … NASA 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 flagship missions. Plans call for the Europa Jupiter System Mission to use two orbiters to conduct highly detailed studies of Jupiter and its moons Io, Europa, Ganymede and Callisto. NASA would build the Jupiter Europa orbiter, while the European Space Agency would build the Jupiter Ganymede orbiter. The pair would launch in 2020 from different launch sites, with the orbiters reaching the Jupiter system in 2026. The Titan Saturn System Mission would consist of a NASA orbiter and a European Space Agency lander and research balloon. JPL will manage NASA's contributions to the projects. … JPL's Orbiting Carbon Observatory satellite failed to reach orbit after its liftoff from Vandenberg Air Force Base. The mission would have provided the initial steps in the quest to measure carbon dioxide from space. An investigation later revealed that the launch vehicle fairing failed to separate upon command, which prevented the satellite from reaching its planned orbit. … Images from JPL's Mars Reconnaissance Orbiter showed a type of rock fracturing that here on Earth is caused by rapid cooling of lava. Unique fractures in lavas on ancient Mars suggest water occasionally flooded portions of the planet's surface. The characteristics of the column-like fractures can help scientists understand the role of water in geologic processes on Mars. … Scientists at JPL and the National Taiwan University used data from satellite altimeters, measurements of ocean depth and temperature and an ocean model to analyze conditions present at the time of the sudden intensification of 2008's tropical cyclone Nargis just before its devastating landfall in Burma. Nargis intensified from a weak category 1 storm to a category 4 monster during its final 24 hours before making landfall in May, becoming Burma's worst natural disaster. "This research demonstrates a significant potential benefit of using altimeter data for operational weather forecasting and tropical cyclone intensity predictions," said study co-author Tim Liu of JPL.

March

JPL's Kepler mission successfully launched into space from Cape Canaveral Air Force Station.

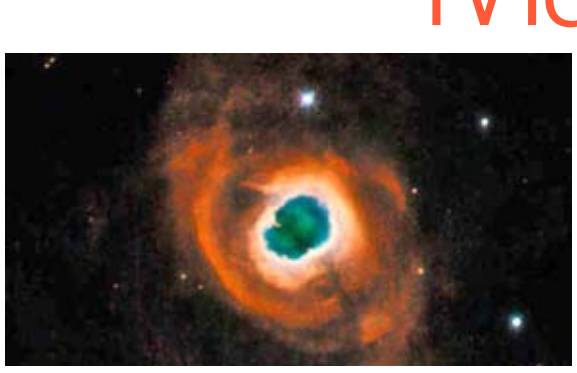
JPL's Kepler mission successfully launched into space from Cape Canaveral Air Force Station, Fla., aboard a United Launch Alliance Delta II on March 6. Kepler is designed to find the first Earth-size planets orbiting stars at distances where water could pool on the planet's surface. … JPL's Cassini spacecraft found within Saturn's G ring an embedded moonlet that appeared as a faint, moving pinprick of light. Scientists believe it is a main source of the G ring and its single ring arc. Cassini scientists analyzing images acquired over the course of about 600 days found the tiny moonlet, half a kilometer (about a third of a mile) across, embedded within a partial ring, or ring arc, previously found by Cassini in Saturn's tenuous G ring. … The U.S. House of Representatives passed a resolution to commend the scientific contributions of the Mars Exploration Rovers and the staff at JPL and Cornell University for successfully operating the rovers. … A new image from Spitzer showed a rare view of an imminent collision between the cores of two galaxies, each powered by a black hole with millions of times the mass of the sun. The galactic cores, located 400 million light-years away in the constellation Ophiuchus, are approaching each other at tremendous speeds and will crash into each other in a few million years, a relatively short period on a galactic timescale. … JPL's Mars rover Spirit exposed bright Martian soil on a recent drive heading southwest. An image from the rover's front hazard-avoidance camera showed how the front wheel churned up a long stripe of bright soil during this drive; where Spirit has found such bright soil in the past, subsequent analysis of the composition found concentrations of sulfur or silica that testified to past action of water at the site. … The team that developed and operated JPL's Phoenix Mars Lander received the 2009 John L. "Jack" Swigert Award for Space Exploration from the Space Foundation "in recognition of the technical developments that led to one of the most startling and meaningful discoveries of the new millennium." Phoenix operated in the Martian arctic from May to November 2008. The annual award honors the memory and legacy of Swigert, the Apollo 13 command module pilot.

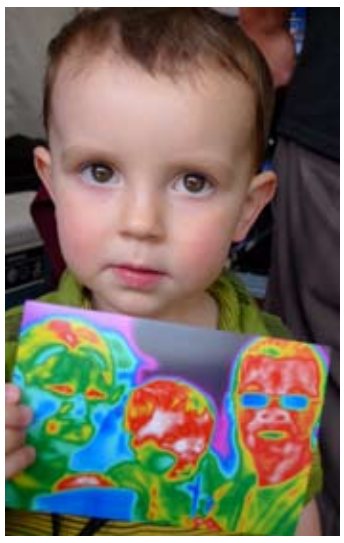
April

John Casani was honored with the National Air and Space Museum's prestigious Lifetime Achievement Award.

The parachute for JPL's Mars Science Laboratory passed flight-qualification testing inside the world's largest wind tunnel, at NASA Ames Research Center. The parachute, the largest ever built to fly on an extraterrestrial flight, is designed to survive deployment at Mach 2.2 in the Martian atmosphere, where it will generate up to 65,000 pounds of drag force. … Kepler took its "first light" images of the star-rich sky where it would soon begin hunting for planets like Earth. The images showed the mission's target patch of sky, a vast starry field in the Cygnus–Lyra region of our Milky Way galaxy. One image shows millions of stars in Kepler's full field of view, while two others zoom in on portions of the larger region. … Using observations from Spitzer, an international team of astronomers discovered streams of young stars flowing from their natal cocoons in distant galaxies. These distant rivers of stars provide an answer to one of astronomy's most fundamental puzzles: how do young stars that form clustered together in dense clouds of dust and gas disperse to form the large, smooth distribution seen in the disks of spiral galaxies like the Milky Way? … John Casani was honored with the National Air and Space Museum's prestigious Lifetime Achievement Award, the museum's highest honor, at the Smithsonian's National Air and Space Museum. Casani, currently special assistant to the director, is a JPL pioneer who has worked at the Lab since the mid 1950s.

May

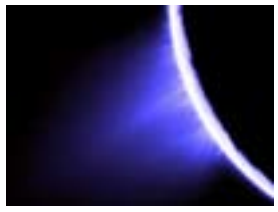


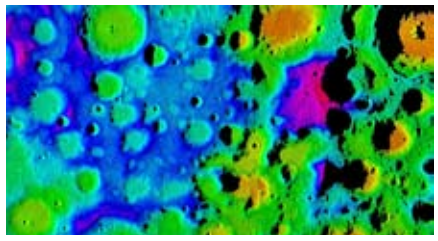


More than 30,000 people visited JPL for its annual open house May 2–3.

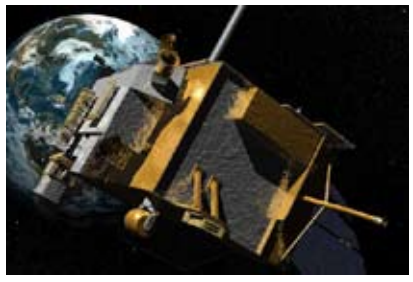
More than 30,000 people visited JPL for its annual open house May 2–3. JPL used such Web social-media tools as *Ustream.tv* and Twitter to reach people unable to attend the event in person. ... Scientists from JPL and Dryden Flight Research Center embarked on a two-month expedition to frigid Greenland and Iceland to test a pair of new, JPL-developed airborne radars that can help monitor climate change and better characterize how Arctic ice is changing. A pod beneath a modified NASA Gulfstream III aircraft's fuselage held the flying testbeds for evaluating tools and technologies for future space-based radars—the L-band wavelength Uninhabited Aerial Vehicle Synthetic Aperture Radar, which calibrates and supplements satellite data, and the proof-of-concept Ka-band wavelength radar called the Glacier and Land Ice Surface Topography Interferometer. … Spitzer's primary mission ended as the telescope ran out of the liquid helium needed to chill some of its instruments to operating temperatures. Spitzer started its "warm" mission with two channels of one instrument still working at full capacity. ... The Cassini mission Web site, *http://saturn.jpl.nasa.gov,* was selected for the top honor in the science category for the Webby awards. NASA's main Web site, *www.nasa.gov,* also won the People's Voice award for best government site. … In tribute to the Hubble Space Telescope's longest-running optical camera, the JPL-developed Wide Field Planetary Camera 2, a planetary nebula was imaged as the camera's final iconic image. The May 4 picture shows planetary nebula Kohoutek 4-55, where a bright inner ring is surrounded by a bipolar structure. The entire system is then surrounded by a faint red halo, seen in the emission by nitrogen gas. The camera was returned to Earth by the crew of Space Shuttle Atlantis on May 24. … In a dual launch, the European Space Agency's Herschel and Planck spacecraft successfully lifted off into space May 14 from French Guiana. Herschel will explore the earliest stages of star and galaxy birth in the universe and will help answer the question of how our sun and Milky Way galaxy came to be. Planck will look back to almost the beginning of time itself, gathering new details to help explain how our universe came to be. JPL contributed key technology to two of Herschel's three detector instruments: the Spectral and Photometric Imaging Receiver and the Heterodyne Instrument for the Far-Infrared. For Planck, JPL is providing most or all of the detectors, both of the bolometers in the "high-frequency" instrument and the heterodyne receivers in the "low-frequency" instrument.

June





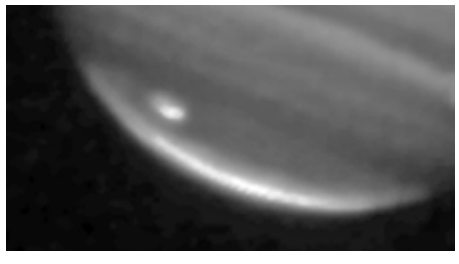
A new lunar topography map provided new information on the lunar surface's permanently shadowed craters.



JPL's Aquarius instrument shipped to Argentina June 1. The Aquarius/SAC-D mission, being developed by NASA and the Space Agency of Argentina for a 2010 launch, will study how salt affects ocean circulation, the water cycle and climate. … Twelve-year-old Clara Ma visited JPL to meet and sign the Mars Science Laboratory rover she named "Curiosity" to win a student contest … NASA launched the Lunar Reconnaissance Orbiter, a mission to comprehensively map the entire moon, on June 18. Onboard was the JPL-developed Diviner lunar radiometer experiment, which will make the first global survey of the temperature of the lunar surface. Diviner will, for the first time, characterize the entire thermal environment of the moon and will identify cold traps and potential ice deposits as well as landing hazards such as rough terrain or rocks. … A new lunar topography map with the highest resolution of the moon's rugged south polar region provided new information on the lunar surface's permanently shadowed craters. The map, created by JPL scientists who collected the data using the Deep Space Network's Goldstone Solar System Radar, helped Lunar Crater Observation and Sensing Satellite mission planners as they prepared for an impact with a permanently dark crater near the south pole. … The Mars Odyssey spacecraft completed an eight-month adjustment of its orbit, positioning itself to look down at the day side of the planet in mid-afternoon instead of late afternoon. The change gained sensitivity for infrared mapping of Martian minerals by Odyssey's Thermal Emission Imaging System camera. ... Scientists working on Cassini for the first time detected sodium salts in ice grains of Saturn's outermost ring. Detecting salty ice indicates that Saturn's moon Enceladus, which primarily replenishes the ring with material from discharging water-ice jets, could harbor a reservoir of liquid water—perhaps an ocean—beneath its surface. … JPL's Ulysses spacecraft, a joint NASA and European Space Agency mission, officially ceased operations June 30. Ulysses, which had an expected lifetime of five years, operated for more than 18 years and charted the unexplored regions of space above the poles of the sun, gathering unique information about the heliosphere, the bubble in space carved by the solar wind.

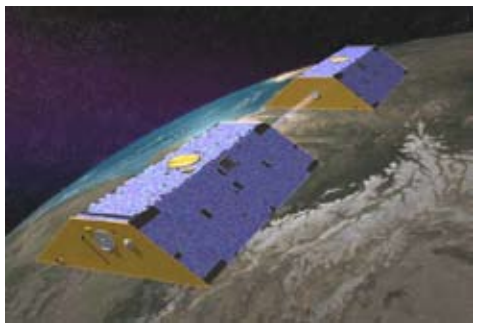
July

Spitzer imaged a wild creature of the dark—a coiled galaxy with an eye-like object at its center.



JPL oceanographer Josh Willis was named a winner of the 2009 Presidential Early Career Award for Scientists and Engineers, the highest honor bestowed by the U.S. government on young professionals in the early stages of their research careers. Willis uses satellite data as well as data collected at sea to study the impact of global warming on the ocean, and frequently lectures to the public and to students to educate them about climate-change issues and human impacts on global warming. … JPL and Caltech announced a partnership with the city of Los Angeles that will help provide innovative energy and water solutions directly to the city's Department of Water and Power. JPL and Caltech will apply their expertise in climate-change science, remote sensing, environmental engineering and systems design to assist the city in developing and deploying innovative technologies to improve energy efficiency, increase the use of renewable energy sources, conserve water and reduce greenhouse gas emissions. … Scientists found evidence that another object bombarded Jupiter, exactly 15 years after the first impacts by the comet Shoemaker-Levy 9. Following up on a tip by an amateur astronomer in Australia that a new dark "scar" had suddenly appeared on Jupiter, scientists at JPL, using NASA's Infrared Telescope Facility at Mauna Kea, Hawaii, gathered evidence indicating an impact. "We were extremely lucky to be seeing Jupiter at exactly the right time, the right hour, the right side of Jupiter to witness the event," said JPL scientist Glenn Orton. … JPL senior researcher Wolfgang Fink was part of a consortium that received one of R&D Magazine's 2009 R&D 100 awards for developing an artificial retina. Fink and a Caltech associate devised and implemented a versatile image-processing software system called the Artificial Retinal Implant Vision Simulator, which enhances and processes the images captured by a miniature camera; those processed images are then transmitted to the artificial retina's electrode array within the eye to electrically stimulate visual perception in the blind. … Spitzer imaged a wild creature of the dark—a coiled galaxy with an eye-like object at its center. The galaxy NGC 1097 is located 50 million light-years away. It is spiral-shaped like our Milky Way, with long, spindly arms of stars. The "eye" at the center of the galaxy is actually a monstrous black hole, about 100 million times the mass of our sun, surrounded by a ring of stars. Our Milky Way's central black hole is tame by comparison, with a mass of a few million suns.

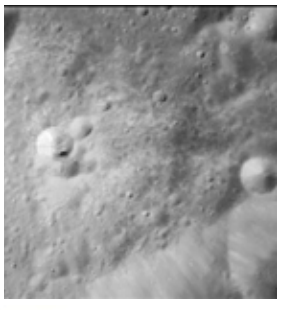
August

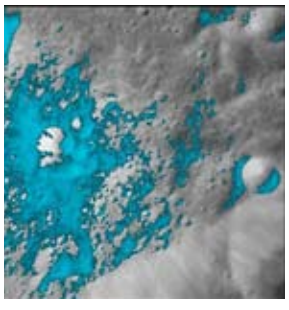


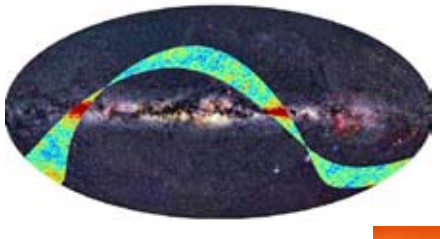
New data from Galaxy Evolution Explorer found proof that small stars come in even bigger bundles than previously believed.

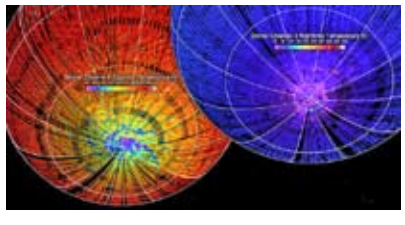
Using the Goldstone Solar System Radar, JPL scientists Marina Brozovic and Lance Benner discovered that near-Earth asteroid 1994 CC is a triple system. The asteroid encountered Earth within 2.52 million kilometers (1.56 million miles) on June 10. Prior to the flyby, very little was known about this celestial body. … Images captured by Cassini revealed new three-dimensional objects and structures in the planet's otherwise flat rings. A small object is visible in the outer portion of Saturn's B ring, casting a shadow on the rings as Saturn approaches its equinox. This new moonlet, situated about 300 miles (480 kilometers) inward from the outer edge of the B ring, was found by detection of its shadow that stretches 25 miles, or 41 kilometers, across the rings. … The high-resolution camera on JPL's Mars Reconnaissance Orbiter returned a dramatic oblique view of the Martian crater that the Mars Exploration Rover Opportunity explored for two years. The new view of Victoria Crater shows layers on steep crater walls, difficult to see from straight overhead, plus wheel tracks left by Opportunity between September 2006 and August 2008. ... Scientists discovered glycine, a fundamental building block of life, in samples of comet Wild 2 returned by JPL's Stardust spacecraft. Glycine is an amino acid used by living organisms to make proteins, and this is the first time an amino acid has been found in a comet. "Our discovery supports the theory that some of life's ingredients formed in space and were delivered to Earth long ago by meteorite and comet impacts," noted researcher Jamie Elsila of NASA's Goddard Space Flight Center. … New data from Galaxy Evolution Explorer found proof that small stars come in even bigger bundles than previously believed. For example, in some places in the cosmos, about 2,000 low-mass stars may form for each massive star. The little stars were there all along but masked by massive, brighter stars. … By applying a method of calculating gravity that was first developed for the moon to data from JPL's Gravity Recovery and Climate Experiment, JPL researchers found a way to measure the pressure at the bottom of the ocean. Just as knowing atmospheric pressure allows meteorologists to predict winds and weather patterns, measurements of ocean-bottom pressure provide oceanographers with fundamental information about currents and global ocean circulation, and also hold clues to questions about sea level and climate.

September









The largest fire in Los Angeles County history, the blaze came within one-eighth of a mile of JPL.

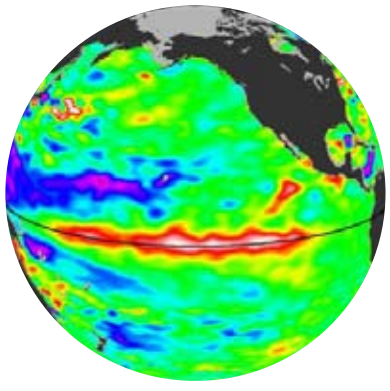
JPL escaped major damage from the Station Fire that ravaged the Angeles National Forest from late August into early September. The largest fire in Los Angeles County history, the blaze came within one-eighth of a mile of JPL but never reached Laboratory buildings. … NASA confirmed that the Nuclear Spectroscopic Telescope Array will launch in 2011. The mission will carry the first high-energy X-ray focusing telescopes into orbit, providing a much deeper, clearer view of phenomena such as black holes and supernova explosions than any previous instrument has shown in this region of the spectrum. JPL will manage this NASA Small Explorer mission, which is led by principal investigator Fiona Harrison, a professor of physics and astronomy at Caltech. … The Diviner experiment aboard Lunar Reconnaissance Orbiter revealed richly detailed thermal behavior throughout the moon's north and south polar regions, recording minimum daytime brightness temperatures in portions of craters of less than –397 degrees Fahrenheit, among the lowest that have been measured anywhere in the solar system. "Diviner has given us the first confirmation that these strange, permanently dark and extremely cold places actually exist on our moon," said science team member Ashwin Vasavada of JPL. "Their presence greatly increases the likelihood that water or other compounds are frozen there." … The Planck mission captured its first rough images of the sky. "We are beginning to observe ancient light that has traveled more than 13 billion years to reach us," said JPL's Charles Lawrence, the NASA project scientist for the mission. "It's tremendously exciting to see these very first data from Planck. They show that all systems are working well and give a preview of the all-sky images to come." … Three JPL instruments played a central role in the discovery of water molecules in the moon's polar regions—a possibility long imagined by scientists that could help provide resources for future humans living there. The JPL-managed Moon Mineralogy Mapper instrument aboard India's Chandrayaan-1 spacecraft reported the observations. Data from the Visual and Infrared Mapping Spectrometer on Cassini and the High-Resolution Infrared Imaging Spectrometer on the JPL-managed Epoxi spacecraft contributed to confirmation of the finding. … In a fortuitous and unexpected discovery, Mars Reconnaissance Orbiter revealed frozen water hiding just below the surface of the Red Planet's middle latitudes. The observations were obtained after meteorites excavated fresh craters. "This is our first insight into how water and climate have changed over the last 10,000 to 100,000 years," said Suzanne Smrekar, the mission's deputy project scientist.

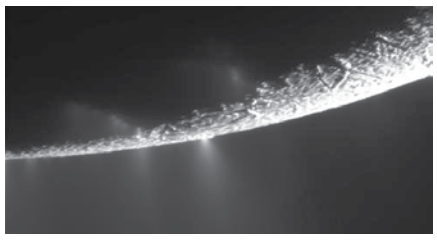
October

JPL chemist Adrian Ponce developed a new microscope-based method to rapidly assess any presence of microbial life on spacecraft.

JPL's Shuttle Radar Topography Mission provided two color-coded perspective views of the Independent State of Samoa and American Samoa, which were inundated by a tsunami generated by a major undersea earthquake Sept. 29. Digital topographic data such as those produced by SRTM can be used to aid planners in predicting which coastal regions are at the most risk. … Spitzer discovered an enormous ring around Saturn, by far the largest of the giant planet's many rings. The new belt lies at the far reaches of the Saturnian system, with an orbit tilted 27 degrees from the main ring plane. The bulk of its material starts about 3.7 million miles away from the planet and extends outward roughly another 7.4 million miles. One of Saturn's farthest moons, Phoebe, circles within the ring and is likely the source of its material. It would take about 1 billion Earths stacked together to fill the ring. … Using updated data, near-Earth object scientists Steve Chesley and Paul Chodas documented the path of a large asteroid. Computational techniques showed that the probability of an Earth encounter for Apophis in 2036 dropped from one in 45,000 to about four in a million. … JPL played a key role in what NASA termed "a smashing success" in the search for water ice on the moon. In addition to a JPL navigation team guiding the Lunar Crater Observation and Sensing Satellite to its target Oct. 9 for twin impacts to create debris plumes for later study, JPL's Diviner instrument on Lunar Reconnaissance Orbiter obtained infrared observations of the impact site from about 50 miles away. … JPL chemist Adrian Ponce developed a new microscope-based method to rapidly assess any presence of microbial life on spacecraft. The new method may also help the military test for disease-causing bacteria, such as a causative agent for anthrax, and may also be useful in the medical, pharmaceutical and other fields. … Researchers detected the basic chemistry for life in a second hot gas planet. Though not habitable, the planet has the same chemistry that, if found around a rocky planet in the future, could indicate the presence of life. "It's the second planet outside our solar system in which water, methane and carbon dioxide have been found, which are potentially important for biological processes in habitable planets," said JPL researcher Mark Swain, who with co-investigators used data from Hubble and Spitzer to study HD 209458b, a hot, gaseous giant planet bigger than Jupiter that orbits a sun-like star about 150 light-years away. … JPL opened the new, environmentally friendly Flight Projects Center Oct. 26. JPL was presented a gold certification under the Leadership in Energy and Environmental Design rating system, set up by the U.S. Green Building Council.

November

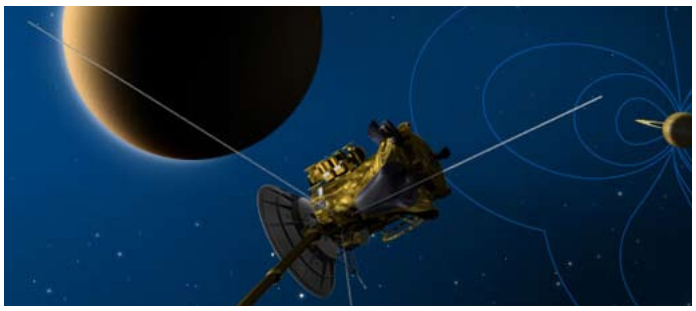


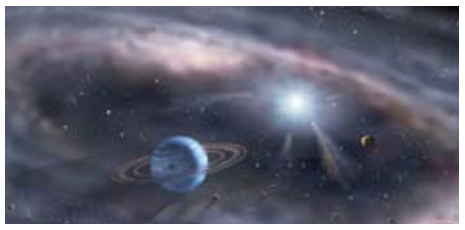


Kepler earned the 2009 Best of What's New Grand Award from Popular Science magazine and a 2009 Breakthrough Award from Popular Mechanics.

Sea-level-height data from the Ocean Surface Topography Mission/Jason-2 satellite showed that a sustained weakening of trade winds in the western and central equatorial Pacific in October triggered a Kelvin wave, a strong, eastward-moving wave of warm water. "In the American west, where we are struggling under serious drought conditions, this late-fall charge by El Niño is a pleasant surprise, upping the odds for much-needed rain and an above-normal winter snowpack," said JPL oceanographer Bill Patzert. … JPL's Wide Field and Planetary Camera 2, famed as the camera that saved the Hubble Space Telescope, was given a new home in the Smithsonian's National Air and Space Museum after being returned to Earth aboard Space Shuttle Atlantis in May. … Kepler earned the 2009 Best of What's New Grand Award from Popular Science magazine and a 2009 Breakthrough Award from Popular Mechanics. … Cassini sailed through its Nov. 21 flyby of Saturn's moon Enceladus and started transmitting uncalibrated temperature data and images of the rippling terrain, which will help scientists create the most-detailed-yet mosaic image of the southern part of the moon's Saturn-facing hemisphere and a thermal map of one of the "tiger stripe" features, with the highest resolution to date. "These first raw images are spectacular, and paint an even more fascinating picture of Enceladus," said Project Scientist Bob Pappalardo. ... Mission managers assessed options for future operations of JPL's QuikScat satellite following the failure of a mechanism that spins the scatterometer antenna. This degradation was fully expected, as the spin mechanism was designed to last about five years. QuikScat launched in 1999. … Using data from the JPL-developed Gravity Recovery and Climate Experiment mission, scientists found that the East Antarctic ice sheet—home to about 90 percent of Earth's solid fresh water and previously considered stable—may have begun to lose ice. The team used the data to estimate the ice mass between 2002 and 2009. Their results found that the ice sheet is losing mass, mostly in coastal regions, at an estimated rate of 57 gigatonnes a year. A gigatonne is more than 2.2 trillion pounds. The ice loss there may have begun as early as 2006. The study also confirmed previous results showing that West Antarctica is losing about 132 gigatonnes of ice per year. … Researchers at JPL, Caltech and other institutions suggested that the eccentricity of Saturn's orbit around the sun might be responsible for the unusually uneven distribution of lakes over Titan's polar regions. As revealed by synthetic aperture radar imaging data from Cassini, liquid methane and ethane lakes in Titan's northern high latitudes cover 20 times more area than lakes in the southern high latitudes.

December





The Wide-field Infrared Survey Explorer launched on its journey to scan the whole sky in infrared light to uncover the coolest stars, dark asteroids and the most luminous galaxies. … Researchers received new data from Mars Reconnaissance Orbiter after its six science instruments resumed observations Dec. 16. Observations had been suspended since a computer reset Aug. 26. … Cassini's visual and infrared mapping spectrometer captured the first flash of sunlight reflected off a lake on Saturn's moon Titan, confirming the presence of liquid on the part of the moon dotted with many large, lake-shaped basins. But Titan's northern hemisphere, which has more lakes than the southern hemisphere, has been veiled in winter darkness. … For the first time, astronomers using the W.M. Keck Observatory measured the properties of a young solar system at distances closer to the star than Venus is from our sun. The team used the Keck Interferometer to combine infrared light gathered by both of the observatory's twin 10-meter (98-foot) telescopes, which provides the effective resolution of a single 85-meter telescope—several times larger than any now planned. … NASA selected three proposals as candidates for the agency's next solar system mission, two of which would be managed by JPL if selected for development. The Surface and Atmosphere Geochemical Explorer mission to Venus would release an instrumented probe to descend through the planet's atmosphere to obtain meteorological and other data before landing on the planet's surface. MoonRise: Lunar South Pole–Aitken Basin Sample Return Mission would place a lander near the moon's south pole and return about two pounds of lunar materials for study. Final project selection is slated for mid-2011.

Habitat for Humanity: building homes, helping families

By Mark Whalen

JPLers sought to pitch in for local communities

Photo courtesy of Victor Luo

Standing, from second left, JPLers Caroline Chouinard, Elizabeth Deems, Alexander Menzies and Victor Luo join colleagues from the Aerospace Corp. in building a home for Habitat for Humanity.

Around the holidays, many citizens choose to bestow gifts in a different way, having nothing to do with shopping malls and everything to do with the spirit of giving. JPLers, traditionally generous, can now participate in helping a local family achieve their version of the American dream.

In January, the Laboratory will begin collaboration with Habitat for Humanity, a nonprofit organization that builds and rehabilitates houses with the help of volunteer labor and partner families. The homes are then sold to families without profit and are financed by affordable, no-interest loans.

The San Gabriel Valley office of Habitat for Humanity is working with JPL to develop a network of volunteers to perform support work at a local home construction site on Saturdays or RDO Fridays.

No construction experience is necessary; for those who don't mind getting down and dirty, instruction on the use of tools and a safety orientation are provided. However, not all volunteers will swing a hammer, fire up a power drill or engage in other physical activities typically associated with homebuilding. Volunteers are also needed to staff the San Gabriel Valley organization's ReStores in Pasadena and Azusa, which sell discounted home improvement materials.

Elizabeth Deems of the Exploration Systems Concepts Group organized a small group of JPL volunteers early last year to donate time to help build a house in Inglewood. A friend from the Aerospace Corp. was going, so Deems, who had been searching for a way to do more volunteering, decided to come along and also put out a call through an e-mail list of new JPLers.

"It was rewarding to me to not only help build a house but also to get more people involved," said Deems, who has also organized volunteer efforts at a local food bank.

Victor Luo of the Planning Software Systems Group, who joined Deems in Inglewood, had never before done anything related to house building, but that didn't matter. "It's quite simple," he said. "If we can build spaceships here, building a house isn't that hard."

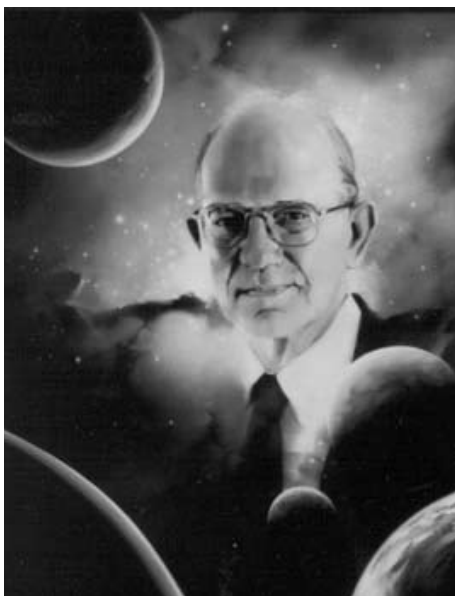
"By the end of the day, we had dug a huge ditch and laid down all the pipes for the plumbing and electricity lines," he said. "We felt we had really accomplished something. It was cool. It was a good break from work and I got to help out the community."

Founded in 1990, the San Gabriel Valley chapter of Habitat for Humanity has built 39 houses, with 15 more under construction. The local organization says that homes built by volunteers are typically about 1,200 square feet, with three bedrooms, one and a half bathrooms and two-car garages. Homes cost families an average of $150,000, with monthly payments to not exceed 30 percent of the family's gross monthly income. The homeowners' 1 percent down payments and monthly mortgage payments go into a revolving "Fund for Humanity" that is used to build more houses. Each homeowner family invests at least 500 "sweat equity" hours into the building of their house and the houses of others.

The volunteer effort will be coordinated through JPL's Diversity and Inclusion Committee. For more information, visit *http://hr.jpl.nasa.gov/diversity* or contact Susan Merrill, ext. 4-9209, or via e-mail. For more on Habitat for Humanity's San Gabriel Valley office, see *http://www.sgvhabitat.org.*

Allen (continued from page 1)

leaf clusters, and the National Intelligence Distinguished Service Medal. In addition, Allen was awarded the George W. Goddard Award from the Society of Photo-Optical Instrumentation Engineers/International Society for Optical Engineering, the Rotary National Space Trophy, and the Goddard Memorial Trophy.



Two awards were named in his honor: The Lew Allen Award for Excellence given at JPL and the General Lew Allen, Jr. Award presented by the Air Force. The JPL award, established in 1990, is given in recognition of significant accomplishments, leadership in scientific research or technological innovation, in the early years of an individual's professional career. The Air Force award, presented annually, recognizes sustained job performance, job knowledge, proven leadership, direct sortie involvement and military qualities.

Funeral and memorial services were pending.

News Briefs

Bruce Tsurutani

Tsurutani earns honors

JPL senior research scientist Bruce Tsurutani has received the John A. Fleming Medal from the American Geophysical Union, an honor bestowed annually for original research and technical leadership in geomagnetism, atmospheric electricity, aeronomy, space physics and related sciences.

Tsurutani has been with JPL since 1972. A former manager of the Space Physics and Astrophysics Section, he has twice earned NASA Exceptional Service Medals (1985 and 2001) along with numerous other NASA and science-community awards.

The award honoring Fleming was established in 1960 in recognition of his important contributions to the establishment of magnetic standards and measurements. Fleming was general secretary of the American Geophysical Union from 1925 to 1947. For more information, visit *http://www.agu.org/about/honors/union/fleming.*

Bar-Cohen publishes book

Yoseph Bar-Cohen, supervisor of the Advanced Technologies Group (355N) and chair of JPL's Senior Research Scientists Council, is the coeditor and coauthor of a new book titled "Drilling in Extreme Environments: Penetration and Sampling on Earth and Other Planets."

The book, Bar-Cohen's sixth, covers terrestrial (ground, ice and underwater) and extraterrestrial drilling as well as sample handling, analysis, planetary protection, principles of excavation, and methods, tools and examples of applications in NASA and other space agencies.

Yoseph Bar-Cohen

The foreword was coauthored by Apollo 17 astronaut Harrison Schmitt, the first geologist to drill on the moon. Several of the chapters' coauthors and reviewers are experts from JPL and NASA on drilling, robotics, analytical instruments and planetary protection.

"It is increasingly being recognized that in-situ sampling at other planets in future NASA missions is a significant challenge, particularly when it is performed at extreme conditions," Bar-Cohen said.

Bar-Cohen, a physicist and senior research scientist, joined JPL in 1991. That year, he established the Nondestructive Evaluation and Advance Actuatators Lab (*http://ndeaa.jpl.nasa.gov*), which has been responsible for innovative concepts and mechanisms for planetary exploration, medical, commercial and other applications.

Lab proposals funded

Five JPL proposals were recently selected for funding through NASA's Astronomy and Physics Research and Analysis Program.

Brian Drouin is principal investigator for "Measurements of State-to-State Collision Rates for Water." Water is often the primary coolant during star formation, making the coupling of collisions and radiation the critical part in controlling the star- and planet-formation process. The study proposes extension of collisional measurements for para hydrogen as well as furthering pump/probe measurements that will more directly measure state-to-state collisional rates.

"The Quantum Capacitor Detector: A Single Cooper Pair Box Based Readout for Pair Breaking Photodetectors" proposes to exploit the extreme susceptibility of superconducting single Cooper-Pair devices to the presence of quasi-particle excitations arising from pair-breaking radiation to enable single-photon detection at far-infrared and submillimeter frequencies. Pierre Echternach is principal investigator.

Charles Lawrence is principal investigator for "Ultra-low-noise Cryogenic Amplifiers and Polarimeters," a proposal to develop ultra-low-noise amplifiers and polarimeters based on a new generation of indium-phosphide devices with dramatically improved high frequency and low-noise performance. Development of this fundamental technology will enable massive arrays with unprecedented capability for cosmic microwave background temperature and polarization measurements, high-resolution spectroscopy and imaging interferometry over a wide range of frequencies.

"Development of Vortex Phase Mask Coronagraphic Techniques for Exoplanet Detection" proposes to address the challenges of imaging mature extrasolar Jovian and terrestrial planets in reflected light and the critical need to identify and develop techniques capable of operating at very small inner working angles, such as phase mask coronagraphs. Two types have been identified as closest to the ideal case, one of which is the vortex phase-mask coronagraph. Gene Serabyn is principal investigator.

"Advanced MKIDs for Far-Infrared Astrophysics" represents a continuation of the NASA-funded effort at Caltech and JPL to develop microwave kinetic inductance detectors, which have the potential to transform astrophysics across the electromagnetic spectrum. The proposed work will explore a number of new ideas for improving detector performance with an ultimate goal to advance the field of millimeter/submillimeter/far-infrared astrophysics. Jonas Zmuidzinas is principal investigator.

A JPL proposal was recently selected for funding through NASA's Astrophysics Data Analysis Program. "Protostellar Jets and Wide-Angle Outflows: The Big Picture from a Large Spitzer Sample" proposes to assemble a sample of more than 200 Spitzer-observed protostars and characterize the collimated jets, bow shocks and the wide-angle wind outflows by applying uniform methodology and making it available to the science community. Thangasamy Velusamy is the principal investigator.

Universe

Editor
Mark Whalen

Design
Audrey Steffan

Production
David Hinkle

Photography
JPL Photo Lab

Universe is published by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

Passings

James Daniels, 81, retired from the Space Instrument Implementation Section, died May 22.

Daniels joined the Lab in 1984 and retired in 2000. He served as experiment manager for the internal discharge monitor in the Defense Space Program Office.

Herbert Gordon Blackhall, a retired mechanical design engineer, died Sept. 4.

Blackhall's work involved development of flight instruments on many JPL spacecraft. He retired in 2004.

Fred Friedlander, 72, retired from the Accounting Section, died Sept. 5.

Friedlander joined the Lab in 1962 and retired in 1998.

Rocco Barbieri, 80, a retired administrator, died Nov. 4.

Barbieri worked at JPL from 1962 to 1990. During his tenure Barbieri was operations administrator for JPL's Arroyo Center (Office 880) and served as senior staff assistant in the Information Systems Division and Mission Support Operations Office.

He is survived by his wife, Virginia, four children, six grandchildren and one great grandchild.

Richard McKinney, 75, a retired electrical engineer, died Nov. 8.

McKinney worked at the Lab from 1975 to 2001. He is survived by his children, Richard Jr., Donna, Charles, Michael and Patrick.

Services were held at First United Methodist Church in Temple City.

Jeanne Stevens

Jeanne Stevens, 75, a retired executive secretary, died Nov. 24.

Stevens joined JPL in 1971 and retired in 2000 from the Applications Development Section. She is survived by daughter Michele, son Jeff, five grandchildren and three great grandchildren. Services were held at the Center for Spiritual Living in La Crescenta.

Brad Houser, 81, retired business manager for JPL's Mariner missions of the 1960s and 1970s, died Dec. 1.

Houser joined the Lab in 1965. At JPL he also served as assistant manager of the Transportation Systems Section. He retired in 1986. He is survived by his wife, Ruth, and daughter Carla.

Allan Dunk, 88, a retired mechanical engineer, died Dec. 2.

Dunk joined the Lab as a faculty summer employee in 1963 and later worked full time in the Mechanical Systems Division until 1973. He was responsible for the mechanical/optical design of the telescope for the camera on Ranger 3 and later on instruments for Surveyor.

He is survived by his second wife, Dorothy; children Milton, Malcolm, Marilyn Raymont and Margaret Bourke; Dorothy's three children; and their combined children and grandchildren.

Jack Rhoads, 76, a retired member of technical staff in Section 343, died Dec. 28.

Rhoads worked at JPL from 1965 to 2001, providing support on guidance and control analysis software, ground software, operations and celestial sensors for the Mariner, Venus-Mercury, Viking and Voyager projects.

He is survived by daughters Karen Luza, Kathleen Jelleff and Barbara Welling. Memorial services are planned for Jan. 20 at Community Church in Apple Valley.

Letters

I'd like to thank all of my JPL colleagues for their thoughts and words at the recent passing of both my brother and mother. My family and I appreciate the plants, support and kindness shown during this difficult time.

Al Barlaan

My wife and I wish to express our heartfelt gratitude to our friends and colleagues at JPL for their unwavering support during the recent loss of my father-in-law and her father. These past few months have been particularly burdensome, but the JPL family never failed to offer assistance or a shoulder to cry on. We are forever grateful.

Karl Strauss, Section 345

Retirees

The following JPL employees retired in December: **John Stagner,** 40 years, Section 315F; **Deanna Rowe,** 38 years, Section 5114; **Andrew Morrison,** 31 years, Section 3242; **Kathryn Harris**, 25 years, Section 1174; **Debra Sgrignoli,** 23 years, Section 3813.