

JANUARY

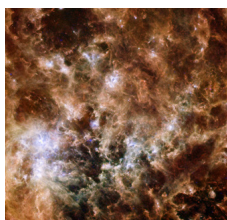
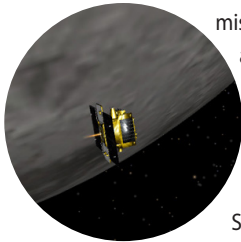
The second of JPL's two Gravity Recovery and Interior Laboratory (Grail) spacecraft enters a synchronized lunar orbit Jan. 1. The twin satellites—later named Ebb and

Flow in a student contest—begin their mission to create the moon's most-accurate-ever gravitational field.

■ Images combining observations from the JPL-managed Spitzer Space Telescope and the Herschel Space Observatory, a European Space Agency-led mission with JPL

participation,

reveal cold dust that builds blazing stars. The new images map the dust in the galaxies known as the Large and Small Magellanic Clouds, two of the closest neighbors to our own Milky Way galaxy.

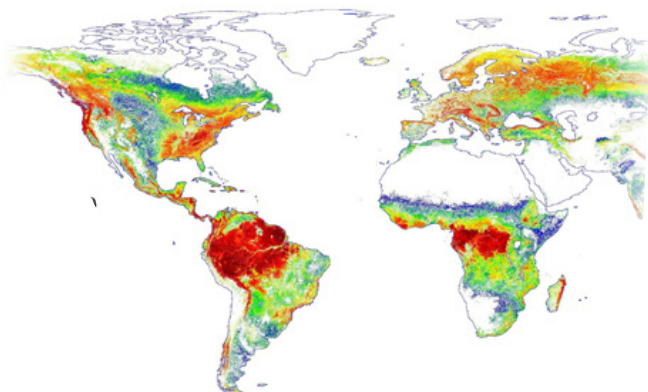


FEBRUARY

An international team of geologists including JPL's Eric Fielding report the most comprehensive before-and-after picture yet of an earthquake zone, using data from the magnitude 7.2 event that struck near Mexicali, northern Mexico in April 2010. "This study provides new informa-



tion on how rocks in and around fault zones are deformed during earthquakes," said Fielding. ■ A team led by JPL researcher Marc Simard created a high-resolution map of the height of Earth's forests that can be used to improve global efforts to monitor carbon and will help scientists better understand the role forests play in climate change. The map was created by using 2.5 million laser pulse measurements from space. The light detection and ranging (lidar) data were collected by the Geoscience Laser Altimeter System instrument on NASA's Ice, Cloud and land Elevation Satellite mission.



2012

A Year in Review

MARK WHALEN

The **successful touchdown of Mars Science Laboratory's Curiosity rover, the launch of NuStar's mission to explore black holes and the conclusion of Dawn's orbital mission at Vesta and departure for another world, Ceres, are among the major notable achievements for JPL in 2012. Following is a chronological list of major highlights for the year.**

MARCH



The Kepler mission to search for Earth-size planets, which was developed by JPL, receives the 2012 Aviation Week Laureate Award in the Space category. Former JPL Project Manager Jim Fanson (above middle) accepts the award with Roger Hunter (left), the Kepler project manager at Ames Research Center, and Frank Moring Jr. of Aviation Week. ■ JPL's Cassini mission receives the Smithsonian National Air and Space Museum's highest group honor, the

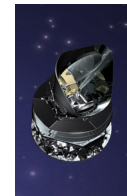
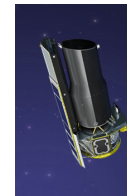


Trophy for Current Achievement, an annual award that recognizes outstanding achievements in aerospace science and technology. Cassini Program Manager Bob Mitchell (center) accepts the trophy with Wayne Clough, secretary of the Smithsonian (left) and Gen. Jack Dailey, director of the museum.

APRIL

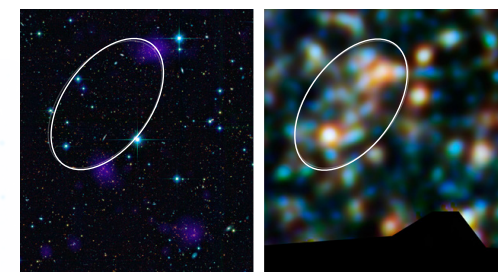
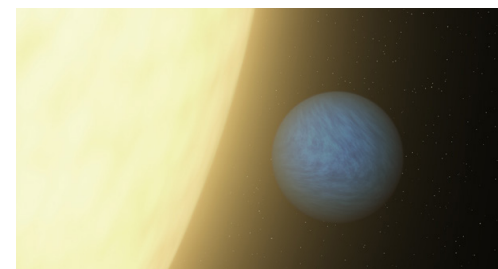
NASA announces extensions of three missions affiliated with JPL—Kepler, the Spitzer Space Telescope and the U.S. portion of the European Space Agency's Planck mission. The agency extended Spitzer and Kepler for two additional years and the U.S. portion of Planck for one year. (From top are artist's concepts of Spitzer, Planck and Kepler.) ■ Data from multiple spacecraft instruments and a computer model of the chemistry, geophysics and geology of Saturn's moon Phoebe show it was a planetesimal, or remnant planetary building block.

"Objects like Phoebe give scientists clues about what conditions were like around the time of the birth of planets and their moons," said Cassini scientist Julie Castillo-Rogez.

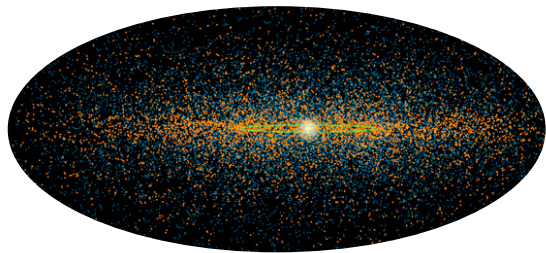


MAY

Spitzer detects light emanating from a "super-Earth" planet beyond our solar system for the first time. The planet—about twice as big and eight times as massive as Earth— orbits a bright star, called 55 Cancri, in 18 hours. While the planet is not habitable, the detection is considered a historic



step toward the eventual search for signs of life on other planets. ■ Observations from the asteroid-hunting portion of the Wide-field Infrared Survey Explorer mission lead to the best assessment yet of the solar system's population of potentially hazardous asteroids. The new findings from Neowise show about 4,700 such asteroids, plus or minus 1,500, with diameters larger than 330 feet. So far, an estimated 20 to 30 percent of these objects have been found. ■ The Herschel Space Observatory—a European Space Agency mission with contributions from JPL—discovers a giant, galaxy-packed filament ablaze with billions of



new stars (above). The filament connects two clusters of galaxies that, along with a third cluster, will smash together and give rise to one of the largest galaxy superclusters in the universe.

JUNE

More than 38,000 visitors attend JPL's annual open house June 9–10. Among the popular attractions was "The Voyage," a new mobile-phone scavenger hunt that attracted about 5,000 participants. ■ The JPL-managed Nuclear

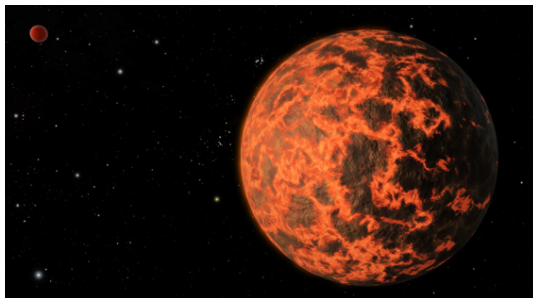


Spectroscopic Telescope Array launches over the central Pacific Ocean June 13. NuStar can see through gas and dust to reveal black holes and other exotic objects in the Milky Way as well as those hidden in faraway galaxies. About a week after liftoff, the spacecraft successfully deployed its lengthy mast, giving it the ability to see the highest-energy X-rays.



JULY

Spitzer astronomers detect what they believe is a planet two-thirds the size of Earth. The exoplanet candidate, called UCF-1.01, is located a mere 33 light-years away, making it possibly the nearest world to our solar system that



is smaller than Earth. ■ JPL's Ian Clark (left) is one of six people from NASA to receive the 2011 Presidential Early Career Award for Scientists and Engineers. Clark was recognized for exceptional leadership and achievement in the pursuit of advanced entry, descent and landing technologies and techniques. The awards represent the highest honor bestowed by the U.S. government on scientists and engineers beginning their independent careers.

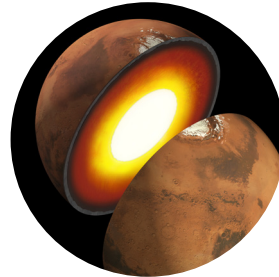
AUGUST

The Mars Science Laboratory spacecraft, carrying the one-ton rover Curiosity, succeeds in every step of the most complex landing ever attempted on the Red Planet with its touchdown inside Gale Crater the evening of Aug. 5. During its nearly two-year prime mission, the rover will investigate whether the region ever offered conditions favorable for



microbial life. "What you've accomplished embodies the American spirit," said President Obama in a congratulatory call to JPL Aug. 13. "Our expectation is that Curiosity is going to be telling us things we did not know before and laying the groundwork for an even more audacious undertaking in the future, and that's a human mission to Mars."

■ NASA announces the selection of a new Discovery-class mission, Interior Exploration using Seismic Investigations, Geodesy and Heat Transport, or InSight, which will probe Mars at new depths by looking into the planet's deep interior. Led by JPL's Bruce Banerdt, the mission is scheduled for launch in 2016.



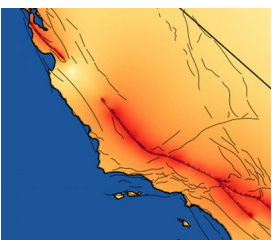
SEPTEMBER

The Dawn spacecraft departs from the giant asteroid Vesta (below) on Sept. 5 and heads to its second destination, the



dwarf planet Ceres. It's expected to arrive in February 2015.

■ The Mars Exploration Rovers mission team receives the Haley Space Flight Award from the American Institute of Aeronautics and Astronautics. "It is especially gratifying that this comes right as Opportunity is conducting one of the most significant campaigns in the eight-and-a-half years since landing," said Project Manager John Callas. "We still are going strong, with perhaps the most exciting exploration still ahead." ■ QuakeSim, a software tool for simulating earthquake fault processes and



improving earthquake forecasting, is named a co-winner of NASA's 2012 Software of the Year Award. The JPL QuakeSim team includes principal investigator Andrea Donnellan, Jay Parker, Robert Granat, Charles Norton and Greg Lyzenga. ■ As part of its tour of California landmarks to end its flight career, Space Shuttle Endeavour flies over JPL atop a NASA 747 aircraft Sept. 21. The shuttle is now on permanent display at the California Science Center in Los Angeles.

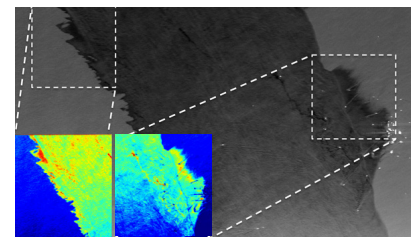
OCTOBER

The Voyager mission receives a Breakthrough Award from Popular Mechanics. The awards are given for projects that dramatically advance the disciplines of technology, space exploration and other fields. The two Voyager spacecraft, launched in 1977, are still sending back data as they draw close to crossing into interstellar space. At a ceremony in New York (below) are, from left, Project Scientist Ed Stone, Project Manager Suzanne



Dodd and Mission Operations Manager Jefferson Hall. ■ JPL astronomer Olivier Guyon (below) is named a 2012 MacArthur Fellow for his contributions and creative potential toward the study of planets outside

the solar system and for his vision of involving the public in their discovery. The \$500,000 award is given annually to "talented individuals who have shown extraordinary originality and dedication in their creative pursuits and a marked capacity for self-direction." Guyon uses his expertise in optics to design telescopes that investigate contemporary astronomy, particularly the search for Earth-like planets outside the solar system. ■ Research-

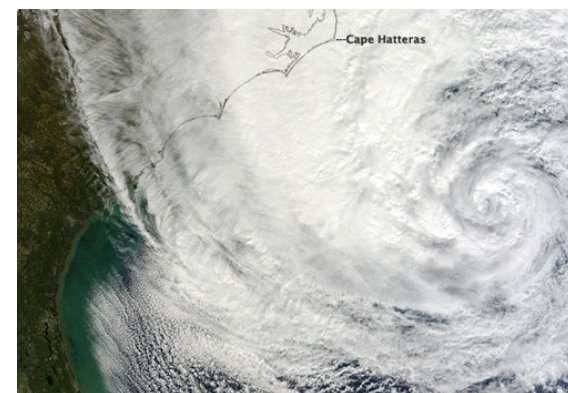


ers at JPL and Caltech develop a method to use a 3-D imaging radar to characterize the oil in oil spills—such as the 2010 BP

Deepwater Horizon spill in the Gulf of Mexico—that can be used to improve response operations. Caltech graduate student Brent Minchew and JPL researchers Cathleen Jones and Ben Holt analyzed radar imagery collected over the main slick of the oil spill on June 22–23, 2010.

NOVEMBER

Scientists from JPL, UCLA and the University of Hawaii analyze data from the Atmospheric Infrared Sounder instrument on NASA's Aqua spacecraft for nearly 200 North Atlantic hurricanes between 2002 and 2010. The AIRS data were then compared with post-storm data collected by the National Oceanic and Atmospheric Administration's National Hurri-



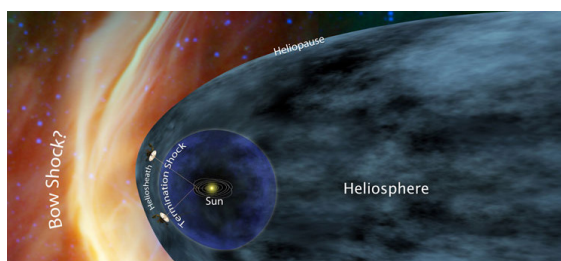
cane Center. Lead author Longtao Wu, an assistant researcher at the UCLA–JPL Joint Institute for Regional Earth System Science and Engineering, said the study could lead to improvements in hurricane intensity forecasts. ■ An international team of experts combine data from multiple satellites and aircraft to produce the



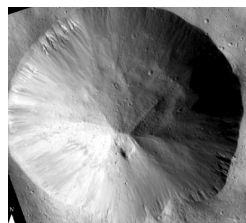
most comprehensive and accurate assessment to date of ice-sheet losses in Greenland and Antarctica and their contributions to sea-level rise. “Both ice sheets appear to be losing more ice now than 20 years ago, but the pace of ice loss from Greenland is extraordinary, with nearly a five-fold increase since the mid-1990s,” said JPL research scientist Erik Ivins.

DECEMBER

Voyager 1 enters a new region at the far reaches of the solar system that scientists feel is the final area the spacecraft has to cross before reaching interstellar space. “We believe this is

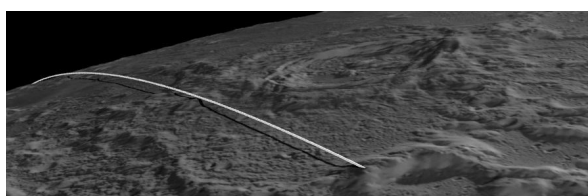


the last leg of our journey to interstellar space,” said Project Scientist Ed Stone. “Our best guess is it’s likely just a few months to a couple years away. The new region isn’t what we expected, but we’ve come to expect the unexpected from Voyager.” ■ NASA announces plans for a multi-year Mars program including a new science rover to launch in 2020 that will be assigned to JPL. The future rover development and design will be based on the Mars Science Laboratory architecture, which will ensure mission costs and risks are as low as possible while still delivering a highly capable rover with a proven landing system. The mission will build on the science of prior missions, including Curiosity, and support the National Research Council’s Planetary Decadal Survey recommendation that the next strategic mission should make progress towards Mars sample return. ■ In a preliminary analysis of images from the Dawn mission, scientists spot intriguing gullies that sculpt the walls of geologically young craters on the giant



asteroid Vesta. “On Earth, similar features—seen at places like Meteor Crater in Arizona—are carved by liquid water,” said principal investigator Christopher Russell. “On Mars, there is still a debate about what has caused them. We need to analyze

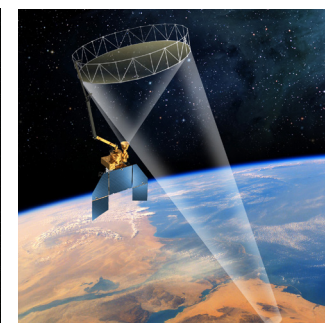
the Vesta gullies very carefully before definitively specifying their source.” ■ Ebb and Flow, the Grail mission probes, hit a mountain near the lunar north pole Dec. 17, bringing their successful prime and extended science missions to an end. The orbiters were sent purposely into the lunar surface because their low orbit and low fuel levels preclude further scientific operations.



A Look Ahead

MARK WHALEN

2013 will be busy as JPLers prepare for upcoming launches and mind the controls of currently operating missions. Here is a look at major plans for the year.



From left:
Curiosity, Juno,
Soil Moisture
Active Passive.

At the Red Planet, Curiosity will be making headway toward its main destination, the slopes of Mount Sharp, during 2013. Early in the year, it will be finishing work in the flatter Glenelg area north of the mountain, where the team plans its first onboard analysis of powdered rock material acquired with the rover’s hammering drill.

The durable Mars Exploration Rover Opportunity will reach the milestone of an Earth decade on Mars on Jan. 24. The rover team plans in 2013 to continue investigating outcrops on the western rim of Endeavour Crater. Mars Reconnaissance Orbiter and Mars Odyssey are scheduled to continue studying processes of change on Mars and continue relaying communications from Mars rovers to Earth.

The JPL-managed Mars Program will oversee preparations for the launch of the Mars Atmosphere and Volatile Evolution, or MAVEN, mission, managed by Goddard Space Flight Center, aboard an Atlas V from Cape Canaveral Air Force Station. Launch window is Nov. 18 to Dec. 7.

JPL’s Juno mission is scheduled to execute an Earth flyby gravity-assist maneuver Oct. 9 on its way to a 2016 arrival at Jupiter.

Back at the home planet, in 2013 JPL Earth science is participating in a number of airborne campaigns in support of key global measurements, including:

- The Carbon in Arctic Reservoirs Vulnerability Experiment mission, which will measure greenhouse gases in the Alaskan Arctic and demonstrate new remote sensing and improved modeling capabilities.
- The Airborne Tropical Tropopause Experiment, due to start in August, which will assess the impacts of stratospheric water vapor on Earth’s climate and energy budget.
- The Airborne Microwave Observatory of Subcanopy and Subsurface investigation, which provides high-resolution observations of root-zone soil moisture over regions representative of the major North American climatic habitats.
- The Hurricane and Severe Storm Sentinel, targeted to enhance the understanding of the processes that underlie hurricane intensity change in the Atlantic Ocean basin.
- The Active Sensing of CO₂ Emissions over Nights, Days and Seasons, or Ascends mission, which will provide improved ability to predict and model long-term changes in the climate cycle.
- The Multiangle SpectroPolarimetric Imager, developed by a team of JPL and University of Arizona collaborators, is a new prototype instrument for a next-generation satellite mission that would survey the impacts of aerosols and clouds on global climate change. A second prototype developed by the team, AirMSPI, has eight spectral bands from the ultraviolet to near infrared and is aimed at deployment aboard NASA’s ER-2 aircraft.

Preparations for four new Earth science missions with launches in 2014—RapidScat, Orbiting Carbon Observatory-2, Soil Moisture Active Passive and Jason 3—will continue apace in 2013.

News Briefs



Andrea Donnellan

Donnellan takes leadership post

JPL geophysicist Andrea Donnellan has been named president-elect of the Nonlinear Geophysics Focus Group for the American Geophysical Union.

Section and focus group presidents and presidents-elect serve on the union's council, which has roles in policy formation, idea generation/science deliberation and science and member issues. The organization said

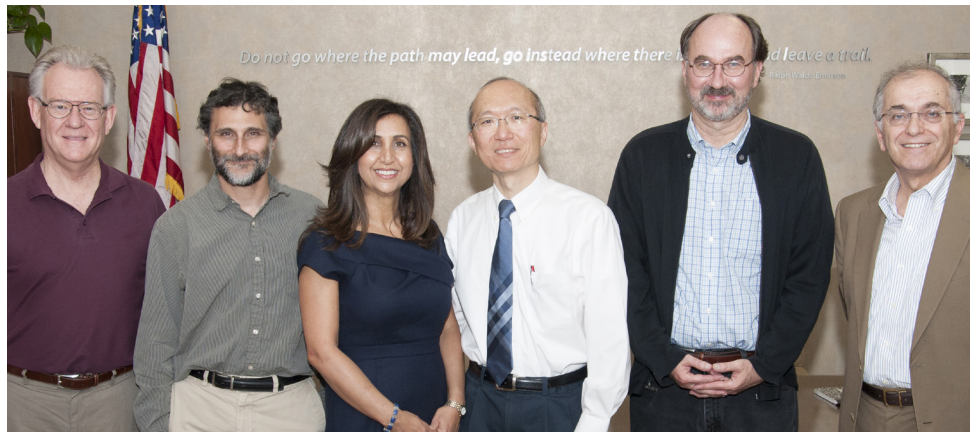
the group leaders also bring a valuable perspective that represents the union's diversity of science.

Her two-year term begins Jan. 1, followed by a second two-year term as the group's president.

Donnellan has been with JPL since 1993. She is a former deputy manager of the Science Division and is currently the principal investigator for QuakeSim, a JPL-developed tool for simulating and

understanding earthquake fault processes and improving earthquake forecasting that was a co-winner of NASA's 2012 Software of the Year Award.

Her honors include the Presidential Early Career Award for Scientists and Engineers, Women in Aerospace Award for Outstanding Achievement, Muses of the California Science Center Foundation Woman of the Year and the JPL Lew Allen Award for Excellence.



From left: JPL Chief Scientist Daniel McCleese, Todd Gaier, Shouleh Nikzad, David Ting, John Prestage, JPL Director Charles Elachi. Not shown are honorees Charles Lawrence and Graeme Stephens.

Program helps attract and retain the best

The establishment of JPL's Senior Research Scientist Program has demonstrated the Laboratory's recognition of research in science, technology and engineering as a vital and integral part of its programs and projects.

Eligibility for the senior research scientist appointment requires that an individual has demonstrated research achievements comparable to those required for a full professorship at Caltech or equivalent university. Appointments will depend on research ability as established by peer review, the individual's active participation in research programs related to JPL's goals, and research leadership at JPL.

Candidates are nominated by their division managers to the Office of the Chief Scientist, which administers the selection process. A key part of the evaluation comes from assessments of candidates' qualifications by peers in the non-JPL community. The chief scientist then convenes a review board of standing senior research scientists to recommend candidates for confirmation by the JPL director and Caltech provost.

About 90 JPLers have been named senior research scientists since the beginning of the program in 1979. Benefits of the appointment include eligibility to receive \$50,000 per year for two straight years from JPL burden funds for

the exploration of new ideas or new areas of research, as well as eligibility for leave-with-pay privileges similar to sabbatical leaves available to Caltech faculty.

Here are the recently named senior research scientists:

Todd Gaier (Ph.D. physics, UC Santa Barbara, 1993) is an expert in low-noise cryogenic millimeter-wave transistor amplifiers. He has made hardware contributions to JPL astrophysics and Earth science projects and instruments, including Herschel/HIFI, Planck/LFI, the High Altitude Monolithic Microwave Integrating Circuit Sounding Radiometer flying on NASA's Global Hawk uninhabited aerial vehicle, as well as ground-based instruments for studying the cosmic microwave background radiation.

Charles Lawrence (Ph.D. physics, MIT, 1983) works in the fields of astrophysics and observational cosmology. The project scientist for the U.S. portion of the Planck project, he has made important contributions to the study of the cosmic background radiation and the unification of radio galaxies and quasars, as well as major contributions to JPL and NASA through his initiation of high electron mobility transistor amplifier development, his work on the Spitzer Space Telescope, and numerous other activities.

Shouleh Nikzad (Ph.D. applied physics, Caltech, 1990) has

pioneered the development of high-performance ultraviolet and low-energy particle semiconductor detectors. She has contributed to instrument-design architecture by developing a curved focal-plane technology enabling compact instruments with very large (giga-pixel) focal planes to be designed and fabricated.

John Prestage (Ph.D. physics, Yale, 1983) is a physicist in atomic-clock science and technology. Ground-based clocks based on Prestage's designs are used operationally in the Deep Space Network. His recent work on miniaturized space-qualified clocks has generated interest at NASA and the Department of Defense. He received a NASA Exceptional Technology Achievement Medal and

the highest award granted by the Institute of Electrical and Electronics Engineers in clock science and technology, the I.I. Rabi Award, which also has been won by several Nobel Prize winners.

Graeme Stephens (Ph.D. meteorology, University of Melbourne, 1977) is the principal investigator on CloudSat and a champion of the interdisciplinary examination of the Earth system through multi-sensor analysis. Stephens' honors include the Jule G. Charney and Henry G. Houghton Awards from the American Meteorological Society. A former professor in the Atmospheric Science Department at Colorado State University, he is the founding director of the JPL Center for Climate Sciences.

David Ting (Ph.D. physics, University of Illinois at Urbana-Champaign, 1986) works in semiconductor physics and device research. His interests range from spintronic devices, solar cells, lasers and infrared detectors to applications of infrared imaging, and he has played an important role in propelling JPL to the forefront of quantum structure infrared detector technology. His contributions played a major role in the selection of JPL as the Infrared Center of Excellence under the Department of Defense's Vital Infrared Sensor Technology Acceleration program.



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Passings

Frank Mastrogiovanni, 87, a retired Deep Space Network engineer, died Sept. 7.

Mastrogiovanni worked at JPL from 1964 to 1981. He is survived by his wife, Magda Kari, daughter Christina, son Gregory, his sister Amelia Simone and her children and grandchildren. Funeral services were held at Desert Memorial Park in Cathedral City, Calif.

friends and co-workers for the absolutely gorgeous plant and their support, in the untimely passing of my brother on Monday, Dec. 10. I can't thank them enough for their helpful support and condolences during this incredibly difficult time for my family. My brother was only 45, and his wit and sense of humor charmed all who knew him. He will be forever missed. Gratefully,

Samantha Harvey

Retirees

The following employees retired in December: **Stephen Gunter**, 51 years, Section 313B; **Robert Hausmann**, 12 years, Section 356B.

Letters

Many, many thanks to JPL, my supervisor, Alice Wessen, and all of my