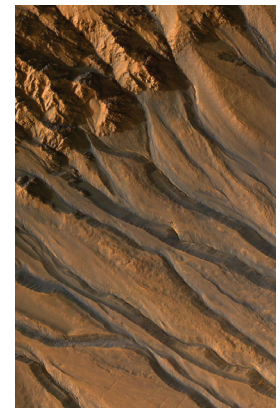
Jet Propulsion Laboratory

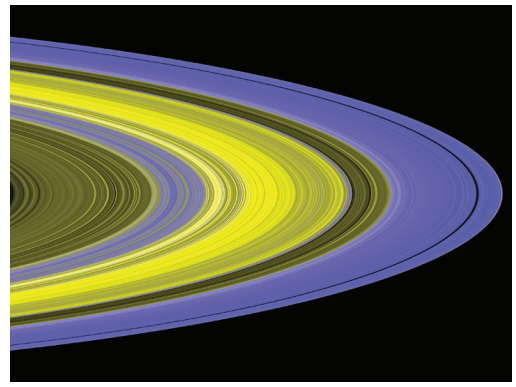
Universe

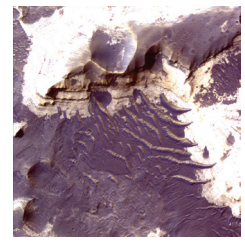
JANUARY
2008
VOLUME 38
NUMBER 1

2007 IN REVIEW

By Mark Whalen







Top row, from left: Spitzer Space Telescope shows the Helix nebula, a gas cloud with an eerie resemblance to a giant eye; Mars Global Surveyor; Mars Reconnaissance Orbiter image shows gully channels in a crater in Mars' southern highlands; the most detailed true-color image of Earth to date. A new JPL-developed technique estimates Earth's center of mass to within 1 millimeter a year.

Bottom row: Cassini image shows Saturn's largest ring is composed of tightly packed clumps of particles separated by nearly empty gaps; layers inside Holden Crater in Mars' southern hemisphere, also from Reconnaissance Orbiter.

As 2007 comes to a close, JPL is buoyed with new challenges for the future.

In December, the Lab was named to manage the Gravity Recovery and Interior Laboratory (Grail) mission, scheduled to launch in 2011. Grail will fly twin spacecraft in tandem orbits around the moon to measure its gravity field in unprecedented detail. The mission also will answer longstanding questions about Earth's moon and provide scientists a better understanding of how Earth and other rocky planets in the solar system formed.

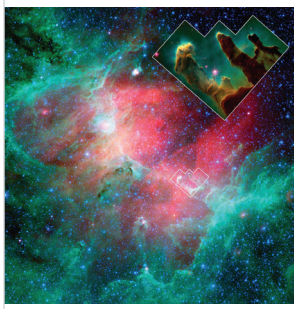
The study technique Grail will use was pioneered by the joint U.S.–German Earth-observing Gravity Recovery and Climate Experiment (Grace), also managed by JPL. The Grace satellites measure gravity changes related to the movement of mass within Earth, such as the melting of ice at the poles and changes in ocean circulation.

It was also announced in December that JPL will lead a retargeting of the Epoxi mission for a flyby of comet Hartley 2 in October 2010. Hartley 2 was chosen as Epoxi's destination after the initial target, comet Boethin, could not be found. Epoxi melds two compelling science investigations—the Extrasolar Planet Observation and Characterization and the Deep Impact Extended Investigation. Both will be performed using JPL's Deep Impact spacecraft.

A Nov. 1 rocket burn changing the spacecraft's velocity put Epoxi on a new trajectory that sets the stage for three Earth flybys, the first of which occurred on Dec. 31, 2007. The spacecraft is now in an orbital "holding pattern" until the optimal encounter of Hartley 2 in 2010.

In the meantime, here is a chronological list of JPL highlights for 2007.

JANUARY



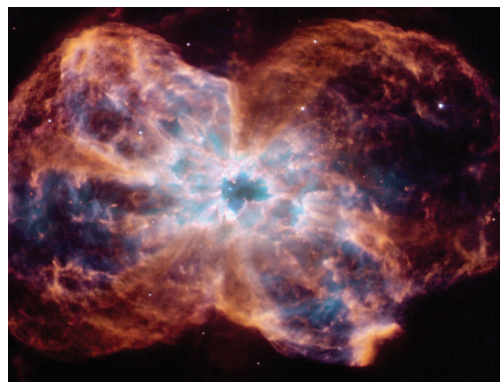
JPL will build and manage the **Urey Mars Organic and Oxidant Detector** to investigate organics and oxidant materials on Mars using three complementary detection systems. A JPL proposal selected for technology development may lead to further NASA contributions to ExoMars or other Mars missions. … A new image from JPL's **Spitzer Space Telescope** showed that the three iconic "Pillars of Creation" dust towers photographed by the **Hubble Space Telescope** in 1995 (left) might have met their demise. The new Spitzer image shows the trio next to a giant cloud of hot dust thought to have been scorched by the blast of a star that exploded, and astronomers speculate that the supernova's shock wave could have already reached the dusty towers, causing them to topple about 6,000 years ago. … The high-resolution camera on the **Mars Reconnaissance Orbiter** imaged the 1997 landing site of Mars Pathfinder, revealing new details of hardware on the surface and the geology of the region. … A team of scientists from JPL and the University of Colorado used the observations of the **Tropospheric Emission Spectrometer** instrument on the Aura satellite to retrace the "history" of water over oceans and continents, from ice and liquid to vapor and back again. The team was able to deduce the sources and processes that cycle water vapor, the most abundant greenhouse gas in Earth's atmosphere. …

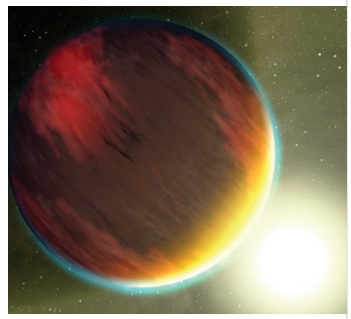
Continued on page 2

2007 IN REVIEW CONT'D

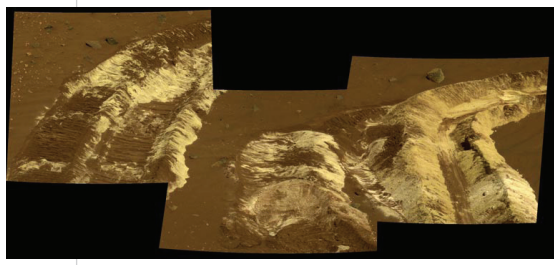
FEBRUARY

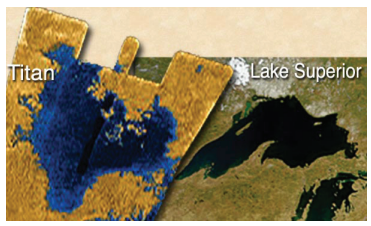
The **Ulysses** spacecraft (bottom) reached maximum latitude in its exploration of the heliosphere, the bubble in space blown out by the solar wind. This phase of the mission is expected to return high-priority scientific observations revealing the changing sun and its effect on space during the ongoing minimum in the 11-year sunspot cycle. … An image from JPL's **Wide Field and Planetary Camera 2** aboard NASA's Hubble Space Telescope showed the colorful "last hurrah" of a star like our sun. The burned-out star, called a white dwarf, is the white dot in the center (top). … Liquid or gas flowed through cracks penetrating underground rock on ancient Mars, according to a report based on some of the first observations by **Mars Reconnaissance Orbiter**, which showed features as small as approximately 3 feet (1 meter) across. The fluids may have produced conditions to support possible habitats for microbial life. … **Spitzer** captured for the first time enough light from planets outside our solar system to identify molecules in their atmospheres (right). "This is an amazing surprise," said Project Scientist Michael Werner. "We had no idea when we designed Spitzer that it would make such a dramatic step in characterizing exoplanets."





MARCH



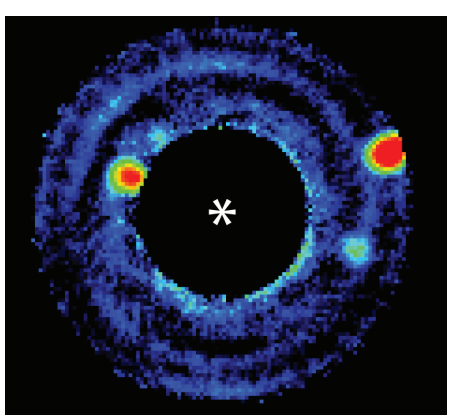


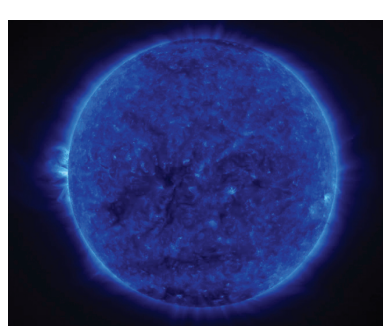
The **Cassini** mission released never-before-seen views of Saturn from perspectives high above and below the planet's rings, "… like exploring an alien world we've never seen before," said Carolyn Porco, the imaging team leader. … Cassini found evidence for seas, likely filled with liquid methane or ethane, on Saturn's moon Titan. One such feature is larger than any of North America's Great Lakes (right). … Researchers studying data from the Spirit rover were intrigued by some bright Martian soil containing lots of sulfur and a trace of water (left). The material could have been left behind by water that dissolved these minerals underground, then came to the surface and evaporated, or it could be a volcanic deposit formed around ancient gas vents. …

Data from the NASA–Italian Space Agency's **Mars Advanced Radar for Subsurface and Ionospheric Sounding** instrument on the European Space Agency's Mars Express spacecraft indicated extensive frozen water on Mars' south polar region, which contains enough frozen water to cover the whole planet in a liquid layer about 11 meters (36 feet) deep. "The amount of water they contain has been estimated before, but never with the level of confidence this radar makes possible," said JPL's Jeff Plaut, co-principal investigator. … Average temperatures in California rose almost 2 degrees Fahrenheit during the second half of the 20th century, according to data analyzed by JPL's Bill Patzert and colleagues, who looked for patterns of climate warming and cooling in each of the state's seven major climatic subregions and found great variations in temperature patterns throughout the state. The largest temperature increases were in the state's urban areas, led by Southern California and the San Francisco Bay area. … A new study found that in 2005 the Arctic replaced very little of the thick sea ice it normally loses and replenishes each year. Using satellite data from **QuikScat** and other data, JPL researcher Ron Kwok studied six annual cycles of Arctic perennial ice coverage from 2000 to 2006. He said recent studies indicate Arctic perennial ice is declining 7 to 10 percent each decade.

APRIL

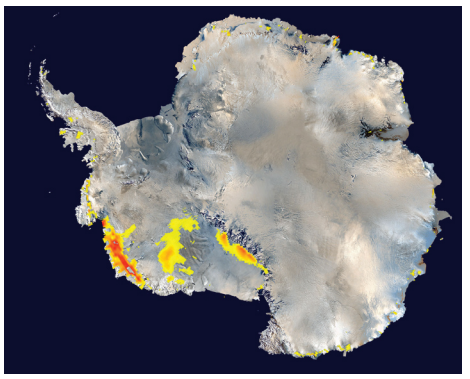
Two JPL researchers successfully demonstrated in a laboratory that a space telescope rigged with special masks and mirrors could snap a photo of an Earth-like planet orbiting a nearby star (below), marking a dramatic step forward for missions like the proposed **Terrestrial Planet Finder**. "Our experiment demonstrates the suppression of glare extremely close to a star, clearing a field dark enough to allow us to see an Earth twin," said John Trauger, lead author of a paper appearing in Nature that described the system, called the High Contrast Imaging Testbed. "This is at least a thousand times better than anything demonstrated previously." … An internal review board's preliminary report on why **Mars Global Surveyor** went silent in November 2006 said the orbiter appeared to have succumbed to battery failure caused by a complex sequence of events involving the onboard computer memory and ground commands. The board said the loss of the spacecraft was linked to a computer error made five months before the likely battery failure, and concluded that the Global Surveyor team followed existing procedures, but that procedures were insufficient to catch the mistakes. … NASA's twin **Solar Terrestrial Relations Observatory** spacecraft made the first three-dimensional images of the sun (below). The new 3-D images were generated by JPL. The new view will greatly aid scientists' ability to understand solar physics and thereby improve space weather forecasting. …

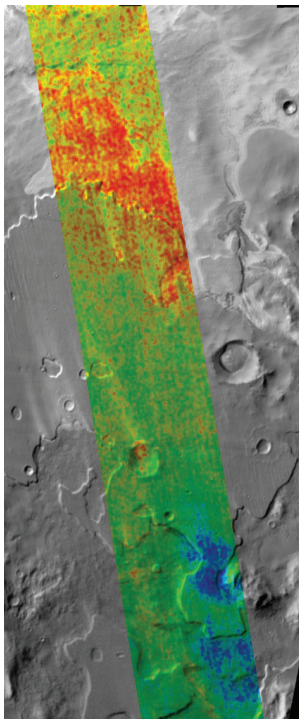




Mars Odyssey images showed that water ice lies at variable depths over small-scale patches on the planet (far right). The findings drew a much more detailed picture of underground ice on Mars than was previously available, suggesting that when the **Phoenix Lander** starts digging in May 2008, it might find the ice's depth differs in trenches just a few feet apart. … Researchers working with high-precision planetary radars, including JPL's **Goldstone Solar System Radar**, discovered strong evidence that Mercury has a molten core. Measuring the echo of particular surface patterns from the surface of Mercury allowed scientists to calculate the planet's spin rate to an accuracy of one-thousandth of a percent. … The **Mars Exploration Rover Spirit** discovered evidence of an ancient volcanic explosion at "Home Plate," a plateau of layered bedrock approximately 2 meters (6 feet) high within the "Inner Basin" of Columbia Hills, at the rover's landing site in Gusev Crater (top). This is the first explosive volcanic deposit identified with a high degree of confidence by Spirit or its twin, Opportunity. "When you look at composition of the rocks in detail, there are hints that water may have been involved," said Steve Squyres, principal investigator for the rovers' science instruments. … JPL's Son Nghiem and a University of Colorado colleague found clear evidence that extensive areas of snow melted in west Antarctica (right) in January 2005 in response to warm temperatures. This was the first widespread Antarctic melting ever detected with JPL's **QuikScat** satellite and the most significant melt observed using satellites during the past three decades. …

MAY



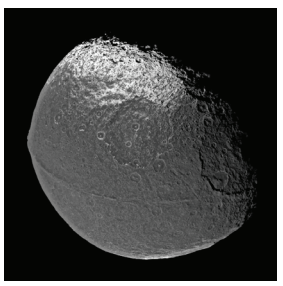


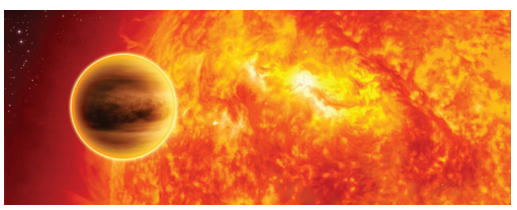
JUNE

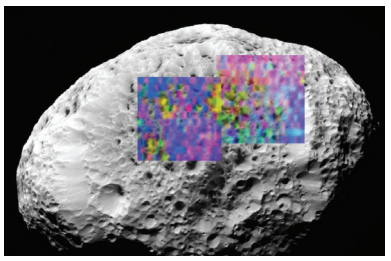
Thanks to the **ArterioVision** software initially developed at JPL (below), hospitals and doctors around the country are better diagnosing and monitoring treatments for hardening of the arteries in its early stages, before it causes heart attacks and strokes. … A new study proposed how to more precisely locate Earth's center of mass and how it moves through space, information that is vital to the study of global sea-level change, earthquakes, volcanoes and Earth's response to the retreat of ice sheets. JPL's Donald Argus developed the new technique, which estimates Earth's center of mass to within 1 millimeter (.04 inches) a year. … **Cassini** data showed that Saturn's moons Tethys and Dione are flinging great streams of particles into space, suggesting the possibility of some sort of geological activity, perhaps even volcanic, on these icy worlds. The particles were traced to the two moons because of the dramatic outward movement of electrically charged gas, which could be mapped back to the moons' orbits in Saturn's magnetic environment. … Two JPL proposals were selected under the **Lunar Sortie Science Opportunities Program**, part of an effort to develop new opportunities to conduct important science investigations during the planned renewal of human exploration of the moon. William Banerdt is principal investigator for **"Autonomous Lunar Geophysical Experiment Package"** and Slava Turyshev is principal investigator for **"Lunar Laser Transponder and Retroreflector Science."** …

The **Cassini** spacecraft revealed for the first time surface details of Saturn's moon Hyperion (below right), including cup-like craters filled with hydrocarbons that may indicate more widespread presence in our solar system of basic chemicals necessary for life. Water and carbon dioxide ices were found, as well as dark material that fits the spectral profile of hydrocarbons. … **Spitzer** revealed that a scorching-hot gas planet beyond our solar system, called HD 189733b, is steaming up with water vapor (above right). Astronomers had predicted that planets of this class, termed "hot Jupiters," would contain water vapor in their atmospheres. These latest data are the most convincing yet that hot Jupiters are "wet." … Cassini showed that Saturn's distinctive moon Iapetus (left) is cryogenically frozen in the equivalent of its teenage years. The moon has retained the youthful figure and bulging waistline it sported more than 3 billion years ago. "Iapetus spun fast, froze young, and left behind a body with lasting curves," said JPL Cassini scientist Julie Castillo. …

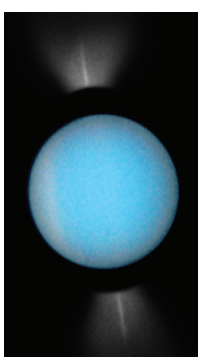
JULY

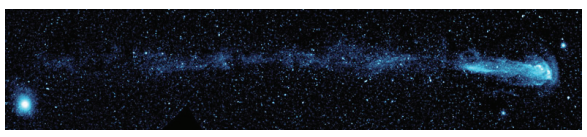






AUGUST





JPL's **Phoenix** mission lifted off Aug. 4 (top left), aiming for a May 25, 2008, arrival at Mars and a close-up examination of the surface of the northern polar region. Phoenix's robotic arm will dig into an icy layer believed to lie just beneath the surface. The mission will also monitor weather of the polar region and investigate whether the subsurface environment in the far-northern plains of Mars has ever been favorable for sustaining microbial life. … **Spitzer** spotted four galaxies slamming into each other and kicking up billions of stars in one of the largest cosmic smash-ups ever observed. The clashing galaxies will eventually merge into a single, behemoth galaxy up to

Continued on page 4

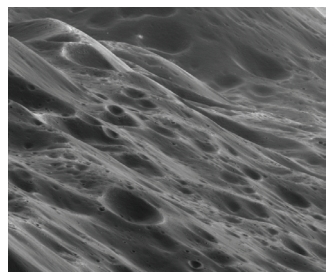
2007 IN REVIEW CONT'D

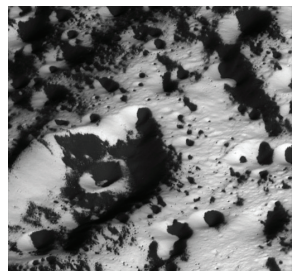
AUGUST (cont'd)

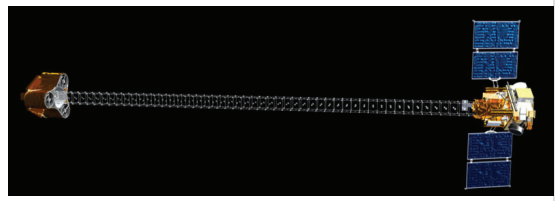
10 times as massive as our own Milky Way. … JPL's **Galaxy Evolution Explorer** spotted an amazingly long comet-like tail behind a star streaking through space at supersonic speeds (below left). The star, Mira, sheds massive amounts of surface material that is forming a wake 13 light-years long, or about 20,000 times the average distance of Pluto from the sun. Nothing like this has ever been seen before around a star. As Mira hurtles along, its tail sheds carbon, oxygen and other important elements needed for new stars, planets and possibly even life to form. … A rare image of the ring system of the planet Uranus (right) was captured by the **Hubble Space Telescope**, using JPL's onboard **Wide Field Planetary Camera 2**. Earthbound astronomers only see the rings' edge every 42 years as the planet follows an 84-year orbit about the sun. … After six weeks of surviving raging dust storms that limited solar power, both **Mars Exploration Rovers** resumed driving, with Opportunity toward the edge of Victoria Crater on Aug. 21. … Spitzer detected enough water vapor to fill the oceans on Earth five times inside the collapsing nest of a forming star system. The observations provided the first direct look at how water begins to make its way into planets, possibly even rocky ones like our own. …

The **Hubble** and **Spitzer** telescopes joined forces to discover nine of the smallest, faintest, most compact galaxies ever observed in the distant universe (above left), each 100 to 1,000 times smaller than the Milky Way. These nine Lego-like "building block" galaxies initially detected by Hubble likely contributed to the construction of the universe as we know it. … Images from Cassini's Sept. 10 flyby of Saturn's two-toned moon Iapetus (above right, below left) showed a white hemisphere resembling snow and another as black as tar. The moon's irregular walnut shape, the mountain ridge that lies almost directly on the equator and Iapetus' brightness contrast are among the key mysteries scientists are trying to solve. … An international team of astronomers discovered that Neptune's south pole is much hotter than the rest of the planet. "The temperatures are so high that methane gas, which should be frozen out in the upper part of Neptune's atmosphere, can leak out through this region," said JPL's Glenn Orton. The findings were made using Chile's Very Large Telescope, operated by the European Organization for Astronomical Research in the Southern Hemisphere. … **Mars Reconnaissance Orbiter** examined several features that address the role of water at different times in the planet's history. The orbiter's advanced instruments examined material deposited in two gullies within the past eight years, polar ice layers formed in the recent geologic past and signs of water released by large impacts when Mars was younger. In 2006, discovery of the fresh gully deposits from before-and-after images taken since 1999 by **Mars Global Surveyor** raised hopes that modern flows of liquid water had been detected. Observations by the newer orbiter suggested the deposits might instead have resulted from landslides of loose, dry materials. … The **Odyssey** orbiter discovered entrances to seven possible caves on the slopes of a Martian volcano. Using Odyssey's infrared camera to check the daytime and nighttime temperatures of the circles, scientists concluded that they could be windows into underground spaces. … NASA restarted the JPL-managed **Nuclear Spectroscopic Telescope**

SEPTEMBER







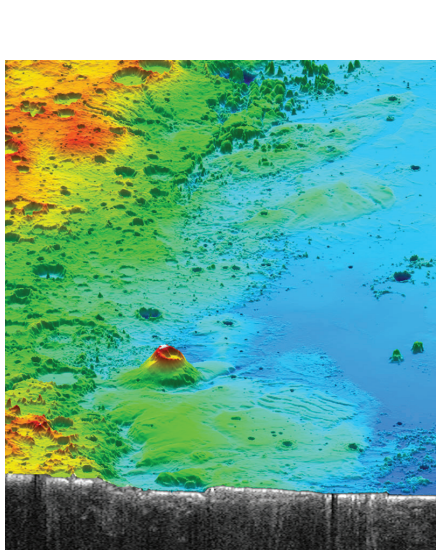
Array (NuStar) mission (below right), which will have greater capability than any existing instrument for detecting black holes in the local universe. NASA had stopped the study effort on the mission in 2006 due to funding pressures. The mission will bridge the gap between the 2009 launch of the Wide-field Infrared Survey Explorer and the 2013 launch of the **James Webb Space Telescope**. … JPL's **Dawn** spacecraft launched its 4.9-billion-kilometer (3-billion-mile) journey through the inner solar system to study asteroid Vesta in 2011 and the dwarf planet Ceres in 2015 on a mission that will characterize the early solar system and the processes that dominated its formation. …

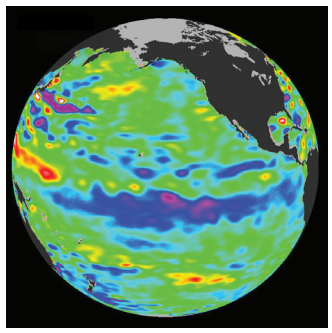
OCTOBER

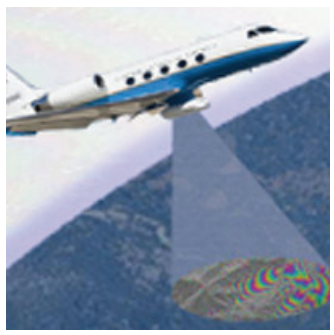
A team led JPL's Son Nghiem found a 23 percent loss in the extent of the Arctic's thick, year-round sea ice cover (above left) during the past two winters. This drastic reduction of perennial winter sea ice is the primary cause of this summer's fastest-ever sea ice retreat on record and subsequent smallest-ever extent of total Arctic coverage. The team studied trends in Arctic perennial ice cover by combining data from **QuikScat** with a computing model based on observations of sea ice drift from the International Arctic Buoy Program. Between winter 2005 and winter 2007, the perennial ice shrunk by an area the size of Texas and California combined. … Newly assembled radar images from Cassini's Oct. 2 flyby provided the best view of the hydrocarbon lakes and seas on the north pole of Saturn's moon Titan, while a new radar image revealed that Titan's south polar region also has lakes. "This is our version of mapping Alaska, the northern parts of Canada, Greenland, Scandinavia and Northern Russia," said Cassini radar scientist Rosaly Lopes. … For a fifth time, NASA extended the activities of the Spirit and Opportunity (above right) rovers, keeping the trailblazing mobile robotic

OCTOBER (cont'd)

pioneers active on opposite sides of Mars, possibly through 2009. … Astronomers using the **Spitzer** and **Chandra** space telescopes unmasked hundreds of massive, growing black holes (bottom) hiding deep inside dusty galaxies billions of light-years away. The discovery implies there were hundreds of millions of additional black holes growing in our young universe, more than doubling the total amount known at that distance. …



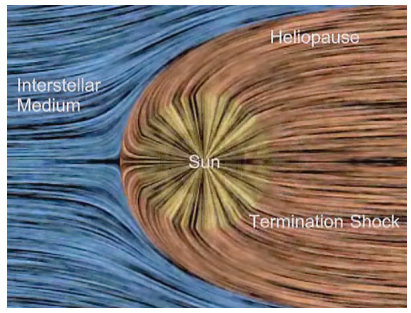




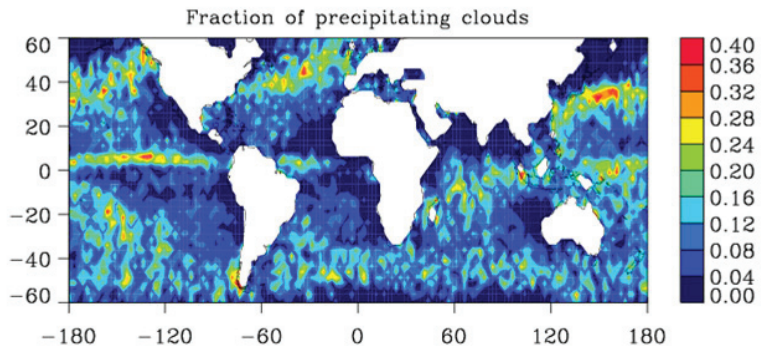
NOVEMBER

JPL, Colorado State University and Massachusetts Institute of Technology scientists developed a promising new technique for estimating the intensity of tropical cyclones from space, a method that could one day improve disaster preparedness and recovery efforts. The method uses data that include simultaneous, accurate measurements of cloud-top temperatures from the **Moderate Resolution Imaging Spectroradiometer** on NASA's **Aqua** satellite, and cloud-top height and cloud profiling data from JPL's **CloudSat** satellite, both of which fly in formation as part of NASA's "A-Train" of Earth-observing satellites. … The radar system on the European Space Agency's **Mars Express** orbiter uncovered new details about some of the most mysterious deposits on Mars: the Medusae Fossae Formation (far left). Found near the Martian equator along a divide between highlands and lowlands, they may represent some of the youngest deposits on the surface of the planet. … The tropical Pacific Ocean remained in the grips of a cool La Niña, as shown by new data of sea-level heights from mid-October 2007 (top right) collected by the U.S–French Jason satellite. "This La Niña could deepen the drought in the already parched Southwest and Southeast United States," said JPL's Bill Patzert." … A team of NASA and university scientists using data from JPL's **Gravity Recovery and Climate Experiment** (Grace) and from deep-sea pressure gauges detected an ongoing reversal in Arctic Ocean circulation triggered by atmospheric circulation changes that vary on decade-long time scales. The results suggest not all the large changes seen in Arctic climate in recent years are a result of long-term trends associated with global warming. … Observations from **Spitzer** suggested that moons like Earth's—that formed out of tremendous collisions—are uncommon in the universe, arising at most in only 5 to 10 percent of planetary systems. The study said when a moon forms from a violent collision, dust should be blasted everywhere. … JPL and Dryden Flight Research Center announced a partnership in the development of the **Unmanned Aerial Vehicle Synthetic Aperture Radar**, a flying testbed (below right) for developing the tools and technologies for future space-based radars. A modified NASA Gulfstream III aircraft carries the JPL-developed radar in a custom-built pod under the aircraft's fuselage during its development phase. The sensor detects and measures small changes in Earth's surface of geophysical interest, such as volcanoes, earthquake faults, landslides and glaciers. …

NASA selected three teams of scientists—one led by JPL principal investigator Eugene Serabyn—to begin studying disks of dust around nearby stars starting in February 2008 using the **Keck Interferometer** (left) in Mauna Kea, Hawaii. This new system combines the observing power of the two large Keck telescopes into a single mega-telescope. … Researchers using the twin Mars rovers were sorting out two possible origins for one of Spirit's most important discoveries. The puzzle is what produced a patch of nearly pure silica—the main ingredient of window glass—that Spirit found last May. It could have come from either a hot-spring environment or an environment called a fumarole, in which acidic steam rises through cracks. On Earth, both of these types of settings teem with microbial life. Halfway around Mars from Spirit, Opportunity continued adding information about types of wet environments on ancient Mars other than hot springs or fumaroles. … JPL's **Voyager 2** followed its twin, **Voyager 1**, into a vast region at the edge of the solar system where the solar



DECEMBER



wind runs up against the thin gas between the stars (right). Voyager 2 also confirmed that the solar system is "squashed" or "dented"—that the bubble carved into interstellar space by the solar wind is not perfectly round. … New findings from **CloudSat** and other "A-Train" constellation spacecraft offered important insights into 2007's record reduction of Arctic sea ice, global rainfall patterns and the effects of pollution on clouds (above). One study found the total cloud cover over the western Arctic, where most of the ice loss occurred, was 16 percent less over the 2007 melt season than in 2006. A separate CloudSat study found it rains more often and in greater amounts over the oceans than previously estimated, suggesting it may be necessary to reassess climate-model estimates of Earth's water cycle intensity. Another study combining data from CloudSat and instruments on the **Aqua** satellite found the first global evidence that pollution of clouds by aerosols is making clouds brighter and more reflective, reducing the amount of sunlight available to warm the surface. These indirect aerosol effects create major uncertainties in climate models. …

Explorer's 50th in January

A series of commemorations and celebrations in January will mark the 50th anniversary of JPL's Explorer 1, the United States' first spacecraft and the world's first space-science satellite, which launched Jan. 31, 1958.

JPL historian Erik Conway will deliver a talk on the history of Explorer 1 on Thursday, Jan. 24, at noon in von Kármán Auditorium. That evening will mark the premiere public screening of the new documentary "Explorer 1: JPL and the Beginnings of the Space Age," which will be shown at 7 p.m. in Caltech's Beckman Auditorium. Blaine Baggett, JPL's executive manager of communications and education, wrote, produced and directed the film and will take questions and answers following the screening.

JPLers will have the chance to see the documentary on Friday, Jan. 25, at 11:30 a.m. and 12:45 p.m. in von Kármán Auditorium. It will also be shown Friday at 7 p.m. in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd.

On the weekend of Jan. 26–27, JPL will be offering workshops on the history of spaceflight in von Kármán Auditorium for more than 100 middle school, high school and community college educators.

On Monday, Jan. 28, the new documentary will again be shown for JPL staff at 11:30 a.m. and 12:45 p.m. in von Kármán. Thursday, Jan. 31 will be Employee/Explorer Alumni Day, with free lunch, demonstrations and conversation on the mall. That evening, the new documentary will air on the cable network Discovery HD Theater at 8 p.m.; it will be repeated on the network throughout early February.

Explorer 1 was celebrated with the JPL/Caltech float "50 Years of Space Exploration" that appeared Jan. 1 in Pasadena's Tournament of Roses Parade. Pasadena will also install commemorative banners throughout the city to mark the event. And before the holidays, JPL employees received the new book "The World of Explorer 1," chronicling the people behind the historic mission.

Cash awards go to JPL innovators

JPL Deputy Director Gene Tattini, left, helps retiree Tom Otoshi display certificates for seven Space Act Awards he received during November ceremonies.

More than 200 JPL employees and contractors were recently honored with cash awards for their outstanding scientific and technical innovations in support of the NASA mission.

The November ceremony recognized winners of the NASA Inventions and Contributions Board Action Awards, one of the four types of NASA Space Act Awards. The Action Awards are given twice a year at JPL.

In all, 212 JPL employees and contractors received a total of $259,550 for their significant accomplishments.

One key highlight of the ceremony was the recognition of JPL retiree Tom Otoshi, who received seven Board Action Awards. Otoshi was recognized for his contributions to the Deep Space Network, some of which involve technologies developed more than 30 years ago but were only recently reported through the New Technology Reporting system. Otoshi also received eight awards for his contributions in April ceremonies. He now has 16 Space Act Awards. "It is nice that as a retiree, I can apply for work that I had done in the past 30 or more years as long as the innovation was significant and continues to be used for the space program," he said.

"Dr. Otoshi is an excellent example that it is never too late to receive recognition for contributions to NASA," noted Christopher Jaggers, the NASA Space Act Awards Liaison Officer who oversees the program at JPL.

In overall NASA Space Act Awards, JPL technologists received $960,450 in fiscal year 2007, representing more than 50 percent of the total amount awarded to all NASA centers combined. The dollar amount awarded to JPL increased from $837,950 for fiscal year 2006.

The NASA Space Act Awards program consists of monetary awards for scientific and technical contributions that have significant value in the conduct of aeronautical and space activities. These awards consist of awards to contributors whose innovations have been published in NASA Tech Briefs ($350 per author); for software that has been approved for release to qualified users ($1,000 for a sole author, $500 each for multiple authors), or inventions that have received approval for a patent application ($1,000 for a sole inventor, $500 each for multiple inventors). The Board Action Awards, which can range from $500 to $100,000 based on the significance and value to NASA, are determined by the NASA Inventions and Contributions Board.

The NASA Space Act Award Program is managed at JPL through the Innovative Technology Assets Management Office as part of the New Technology Reporting process. For more information on the program, including the determination of eligible technologies, visit *http://ntr/pages/space_acts.htm*, or contact Space Act Awards administrator Rani Kamarga, ext. 3-7995.

Fellow Kansan helps students in need

By Susan Braunheim-Kalogerakos

Photos courtesy of Todd Barber

A tornado in May destroyed about 95 percent of the residential and commercial buildings in Greensburg, Kansas.

When Todd Barber, lead propulsion engineer for the Cassini mission, learned of the recent devastation experienced by a farm town back home in Kansas, he wanted to help.

On May 4 a massive tornado swept through Greensburg, a town of 1,450 people, killing 12 and destroying about 95 percent of all residential and commercial buildings.

Barber grew up in Wichita, about 110 miles east of Greensburg. He had visited the town on a 2005 road trip to gaze upon the world's largest hand-dug well and an impressive 1,100-pound pallasite meteorite. He was particularly stricken with the town's loveliness.

"After I learned about the tornado I wondered what I could do for these brave residents of my home state, other than typical actions like donating to the Red Cross," Barber said.

Over the summer, many Greensburg residents struggled with the decision of whether or not to rebuild and return to their decimated community. The school children were of significant concern.

After thinking about dispersing the students to nearby schools, the townspeople decided to bring in Federal Emergency Management Agency trailers for the students and begin the slow process of rebuilding. A temporary trailer town was built and the school trailers were placed at the site of the destroyed school.

"At this point, I knew how I could help out this community in a very small way. I decided to offer the school principals a day of NASA and JPL outreach for every kindergarten through 12th-grade student," Barber said.

Barber has been at JPL for 17 years and a member of JPL's Speakers Bureau for 12. "With the Speakers Bureau I give about one talk a month but I knew this one might end up being the most memorable," he said.

After cold-calling the elementary, middle and high school principals, Barber organized a day of NASA learning for the town's students on the Tuesday before Thanksgiving. Luckily this coincided with another trip he was taking to Wichita for the holiday.

Remarkably, the first permanent school structure, the gymnasium, was completed just a week before Barber's arrival, providing him a place to speak.

Barber ended up giving three presentations Nov. 20 to 206 students of the tornado-stricken town. "For each student group, I started by telling them I was there essentially to say 'thank you' for making me feel so proud to be a fellow Kansan," he said.

"The younger kids were so sweet, bright-eyed and inquisitive," Barber said. "I had to interrupt the presentation many times for their wonderful questions about the cosmos, fate of the sun, Cassini and the Mars rovers. The high schoolers had great questions and were so polite."

The stickers and handouts provided by the Cassini and Mars outreach teams were much appreciated by Barber and the students.

"During each presentation, I told them that at NASA we feel like pioneers and explorers, but their pioneering spirit that brought them back to Greensburg, rebuilding the town while living and going to school in emergency trailers, was truly a wonderful example for the nation," Barber said. "Naturally, I also hoped to spur their interest in math and science."

Staci Derstein, principal of Delmer Day Elementary and Greensburg Junior High, noted that Barber "has a very good rapport with kids that put them at ease. As a result, we may now have some future scientists at Delmer Day Elementary. Barber has opened the door to many young minds about the many possibilities for their future careers."

During the day, the 80 high school students held a Thanksgiving potluck for each other, the teachers and principals in the gym. "I was able to break bread with these wonderful students and share in their camaraderie and sense of community," Barber said. "Given what the town endured six months ago, I found this high school very different than most. Everyone seemed to be looking out for everyone else."

Barber knew he would not be the same after going to Greensburg. "I have realized how good and decent people really are, especially after collectively going through a horrific event. I really felt honored and privileged to be a part of this wonderful community, even for a day," he said. "They still have a monumental task ahead of them, but seeing the level of optimism among the students and staff energized me immediately."

Todd Barber speaks to students in a Greensburg, Kansas, school gymnasium.

News Briefs

Fred Hadaegh

Josette Bellan

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.

Grace team earns Pecora honors

The Gravity Recovery and Climate Experiment (Grace) mission team has been recognized with the prestigious William T. Pecora Award. JPL provides mission design and instrumentation for the joint U.S.–German mission that consists of two spacecraft flying in tandem to very precisely measure Earth's gravitational field.

The annual award is granted by NASA and the U.S. Department of the Interior to honor outstanding contributions in the field of remote sensing and its application to understanding Earth. The award was established in 1974 to honor the memory of Pecora, former director of the U.S. Geological Survey and undersecretary of the Department of the Interior.

The award was presented Dec. 10 at the American Geophysical Union fall meeting in San Francisco.

Hadaegh receives fellow grade

Fred Hadaegh, supervisor of the Guidance and Control Analysis Group in Section 343, has been elected fellow of the Institute of Electronics and Electrical Engineering, the highest grade of membership in the organization.

Hadaegh, a senior research scientist and manager of JPL's Distributed Spacecraft Technology Program, received the honor for contributions to autonomous guidance and control systems for space vehicles and multi-spacecraft formations.

A JPL employee since 1984, Hadaegh's research interests are in the areas of optimal estimation and control of distributed spacecraft.

Hadaegh is also a fellow of the American Institute of Aeronautics and Astronautics, and has received NASA's Exceptional Service Medal, Exceptional Achievement Medal and Space Act Board Award.

Bellan earns fellow designation

Senior Research Scientist Josette Bellan has been elected to the grade of fellow of the American Institute of Aeronautics and Astronautics, the highest accolade bestowed to the institute's membership.

Bellan works in the Propulsion and Materials Engineering Section 353. Her areas of interest include multi-phase flow phenomena, fluid behavior, phase change, heat transfer, combustion and numerical techniques.

She will receive the award in May 2008 in Washington, D.C. The fellow distinction is earned by those "who have made notable and valuable contributions to the arts, sciences or technology thereof in aeronautics or astronautics."

Bellan is also a fellow of the American Society of Mechanical Engineers and an associate fellow of the American Institute of Aeronautics and Astronautics.

Fellow election for Liu

Tim Liu

Senior Research Scientist W. Timothy Liu has been elected a fellow of the American Association for the Advancement of Science.

Liu has been a principal investigator on studies concerning air–sea interaction and satellite oceanography since he joined JPL in 1979. He serves as science leader for the Quikscat project and was project scientist for the NASA Scatterometer mission. His JPL work has earned him the NASA Medal for Exceptional Scientific Achievement for his pioneering work in ocean surface heat flux as well as numerous NASA Group Achievement Awards and NASA Certificates of Recognition.

Liu was recognized by the association's Section on Atmospheric and Hydrospheric Sciences. His award will be bestowed in February 2008 during the group's annual meeting in Boston.

Saiz-Lopez gets European honor

JPL postdoc Alfonso Saiz-Lopez was recently named winner of the European Geophysical Union's Outstanding Young Scientist Award.

Alfonso Saiz-Lopez

Saiz-Lopez works in the Lab Studies and Modeling Group of the Earth Sciences Section (328). His research interests include atmospheric modeling, ground-based measurements and satellite retrievals of halogen-containing molecules in the polar boundary layer, and their impact on tropospheric ozone.

The award recognizes scientific achievements in the geosciences to those under the age of 35. Saiz-Lopez will receive the award in Vienna, Austria, in April 2008.

Patzert cited by water district

JPL oceanographer Bill Patzert was honored by the Metropolitan Water District of Southern California for outstanding contributions to the science of climatology and its effect on water resources. The board thanked him for "unlocking the secrets of the ocean to help tell the story of climate change."

Patzert received a crystal plaque and citation Dec. 10 from the district's board of directors at water district headquarters in Los Angeles.

Bill Patzert

Passings

Gordon A. Smith, 84, retired from Section 373, died Oct. 27, 2006.

Smith joined JPL in 1970 and retired in 1989. He is survived by his wife, Diane, and children Sharon, Greg, Cris and Kathy.

Memorial services were held Oct. 27, 2007.

James Painter, 76, a retired operations supply and service center general administrator, died Sept. 2.

Painter worked at the Lab from 1979 to 1999. He is survived by sisters Shirley Marie MacDermott and Alma Greeley, and brother Bill.

Services were held Oct. 13 at Oakdale Memorial Park in Glendora.

Herbert Trostle, 76, a retired technical manager in Section 790, died Oct. 23.

Trostle worked at JPL from 1957 to 1989. He is survived by his wife, Eve, and children Jonathan, Jess, Andrew and Elizabeth. Services were held in Vancouver, Wash.

Orlando Figueroa, 82, retired from Section 622, died Oct. 24.

Figueroa joined the Lab in 1964 and retired in 1990. During his career he worked on such missions as Mariner 9, Voyager, Viking, Topex/Poseidon and Galileo.

He is survived by his wife, Myrna; daughter Brenda DeShon and her husband Eric; sons Brian and Brad (and wife Seana Rae-Pasco); granddaughter Karisa and great grandson Daniel Trujillo.

Services were held Nov. 1 at Our Savior Lutheran Church in Arcadia.

Elizabeth Kreyer, 77, a retired senior executive secretary in Sectin 660, died Oct. 25.

Kreyer worked at JPL from 1971 to 1994. She is survived by daughter Kathy Bachtel.

Retiree **Robert Powner**, 75, died Oct. 27.

Powner joined JPL in 1965 and retired in 1979. He is survived by his wife, Alice.

Letters

My family and I would like to express our sincerest appreciation and heartfelt thanks to our JPL friends and colleagues in Division 27 and the Education Office for their support during the recent passing of my mother, Sue Johnson. Your kind words of encouragement and sympathy, the beautiful flowers, and cards touched us deeply. Thank you also to JPL for the beautiful plant.

Martin and Debbie Johnson

Walter Larkin was born in San Francisco on Dec. 30, 1923 and grew up in the Bay Area during the depression. Walt was a self-made man. He was on his own at an early age, living in boarding houses and supporting himself. He worked nights and Saturdays repairing electronics to get through high school. He enlisted in the U.S. Navy following Pearl Harbor and served in the Pacific for the remainder of World War II, reaching the rank of Chief Petty Officer. Walt did not have the luxury of a college education. But his technical training in electronics and radar and his native intelligence allowed him to play a key role in the U.S. space program at JPL over his 31-year career. In his JPL assignments overseas as the Tracking & Data Acquisition rep, Walt was an ambassador for the U.S. space program. Even without a college degree, he was at ease in the presence of the Ph.D.s of space science and engineering, astronauts, ambassadors and prime ministers. Walt did not know the unconditional love of a father or mother and he had no model or mentor. Yet he developed personal traits of the most admirable quality. He was a warm and gracious man of unfailing modesty and civility. He had a strength of character and moral integrity that were never compromised. He was never bitter, resentful, cynical or cold. He rejected hatred in all its forms. He was a faithful and devoted husband for 54 years to his dearest love Pat, who passed away in 2005. He was a wonderful father to six children. Walt was greatly loved by his family, friends and others he touched through his life and work.

Frederick Stuhr

My heartfelt thanks to all of my JPL colleagues for the many expressions of sympathy over the past two months while my father, Joseph A. Peterson, was dying. A retired environmental technology engineer for Northrop, my dad was overjoyed when I was hired at JPL. He was always happy to visit the Lab for lectures, awards, special events and open houses. At his funeral, one of his former colleagues told me that he and Dad actually commuted to JPL for a period in the '60s as partners in the Mariner program. Although I am an editor and not an engineer, I am honored to have had this workplace in common with Dad. The cards, the e-mails, the conversations, the plants, the labors of love that I have received from JPLers throughout this time of loss—all of these have been very comforting to me and have reinforced my gratitude for being your colleague. Thank you!

Claire Marie-Peterson

I would like to thank my friends and colleagues in the Office of Communications and Education for their concern and support upon the passing of my dad. Thanks also to JPL for the memorial plant sent to our home.

Mark Whalen

Retirees

The following JPL employees retired in January: **David Newell**, 25 years, Section 3824; **Joyce Donato**, 23 years, Section 352. **Catherine Yee**, 30 years, Section 252E, retired in December.