

NASA VISION  
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# VISION

## NASA SHARES VISION WITH STUDENTS



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# Administrator's Corner

Just as the original Peace Corps bill steered many young Americans to begin their careers in public service, legislation signed into law last month by President Bush promises to infuse NASA with fresh talent. The NASA Flexibility Act of 2004, sponsored by Senator George Voinovich (R-OH) and Rep. Sherwood Boehlert (R-NY), provides NASA new flexibilities to restructure and revitalize our existing work force.

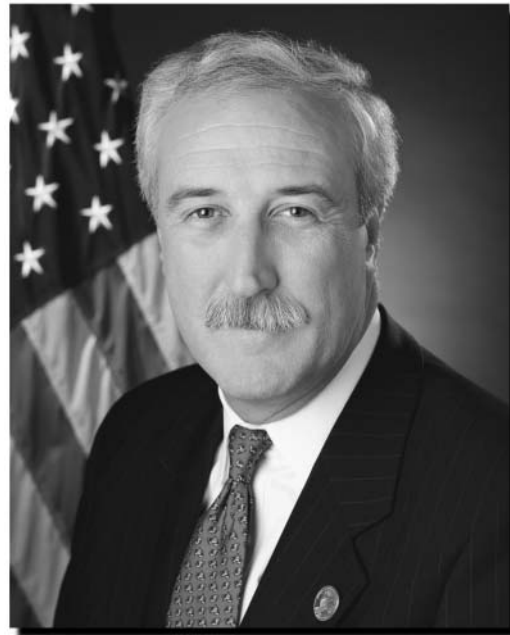
With fewer students entering math and science studies, there's greater competition to attract those graduates who do make science and technology a career. This law now gives us additional tools to address the 21st century challenges we face in recruiting and retaining the exceptional talent required to carry out NASA's mission of exploration and discovery.

It provides the agency the ability to improve recruitment and retention, and to compete with the private sector. The legislation also establishes a Science and Technology Scholarship for Service Program, which provides financial assistance to students in exchange for a commitment to work for NASA.

NASA created a Human Capital Legislation Implementation Team in August to begin work on the many tasks that must be accomplished before using the new authorities provided in the act. The team also is leading the change-management initiatives underway to ensure effective communication with the entire NASA work force regarding the human capital legislation.

*Deputy Administrator Frederick D. Gregory shares NASA's new vision for space exploration with students at Ann Beers Elementary School.*

*Front page photo credit: NASA/Chris Gunn*



*Photo credit: NASA/Bill Ingalls*

The bill adheres to existing merit principles, veterans' preference and equal employment opportunity guidelines, as well as supports the rights of labor organizations. NASA involved its unions, the American Federation of Government Employees (AFGE) and the International Federation of Professional and Technical Engineers (IFPTE), in pursuing this important legislation. Last year, the IFPTE, NASA's largest union, endorsed the measure.

A quarter of our work force will be eligible to retire in a few years. We have to take creative steps to get students interested in these important fields and energize them about contributing to America's technology future. If we are going to fulfill the President's space exploration vision, we must continue to inspire the next generation of explorers and include the best among them in our NASA family. I am pleased this legislation gives us some very useful tools to help achieve this objective. For additional information, visit: [nasapeople.nasa.gov/hclwp/index.htm](http://nasapeople.nasa.gov/hclwp/index.htm)

## Opportunity Finds Strong Evidence of Water on Mars

Scientists have concluded that the part of Mars NASA's Opportunity rover is exploring was soaking wet in the past.

Evidence the rover found in a rock outcrop led scientists to the conclusion. Clues from the rocks' composition, such as the presence of sulfates and the rocks' physical appearance, such as niches where crystals grew, helped make the case for a watery history.

"Liquid water once flowed through these rocks. It changed their texture, and it changed their chemistry," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the science instruments on Opportunity and its twin, Spirit. "We've been able to read the tell-tale clues the water left behind, giving us confidence in that conclusion," he said.

Dr. James Garvin, lead scientist for Mars and lunar exploration at NASA Headquarters, Washington, D.C. said, "NASA launched the Mars Exploration Rover mission specifically to check whether at least one part of Mars ever had a persistently wet environment that could possibly have been hospitable to life. Today we have strong evidence for an exciting answer: Yes."

Opportunity has more work ahead. It will try to determine whether, besides being exposed to water after they formed, the rocks may have originally been laid down by minerals precipitating out of solution at the bottom of a salty lake or sea.

On Earth, rocks with as much salt as this Mars rock either have formed in water or, after formation, have been highly altered by long exposures to water. The water evidence from the rocks' physical appearance comes in at least three categories, said Dr. John Grotzinger, sedimentary geologist from the Massachusetts Institute of Technology, Cambridge: indentations called "vugs," spherules and crossbedding.

Pictures from the rover's panoramic camera and microscopic imager reveal the target rock, dubbed "El Capitan," is thoroughly pocked with random indentations about a centimeter (0.4 inch) long and one-fourth or less that wide. This distinctive texture is familiar to geologists as the sites where crystals of salt minerals form within rocks that sit in briny water. When the crystals later disappear, either by erosion or by dissolving in less-salty water, the voids left behind are called "vugs," and in this case they conform to the geometry of possible former evaporite minerals.

Round particles the size of BBs are embedded in the outcrop. From shape alone, these spherules might be formed from volcanic eruptions, from lofting of molten droplets by a meteor impact, or from accumulation of minerals coming out of solution inside a porous, water-soaked rock. Opportunity's observations

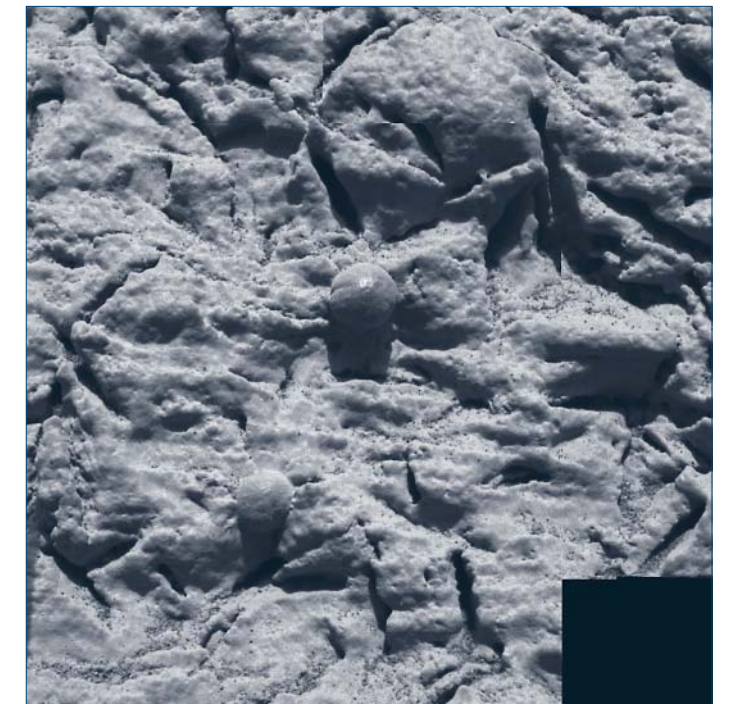
that the spherules are not concentrated at particular layers in the outcrop weigh against a volcanic or impact origin, but do not completely rule out those origins.

Layers in the rock that lie at an angle to the main layers, a pattern called crossbedding, can result from the action of wind or water. Preliminary views by Opportunity hint that the crossbedding bears hallmarks of water action, such as the small scale of the crossbedding and possible concave patterns formed by sinuous crests of underwater ridges.

The images obtained to date are not adequate for a definitive answer, so scientists plan to maneuver Opportunity closer to the features for a better look. "We have tantalizing clues, and we're planning to evaluate this possibility in the near future," Grotzinger said.

JPL, a division of the California Institute of Technology in Pasadena, Calif., manages the Mars Exploration Rover project for NASA's Office of Space Science, Washington, D.C.

For information about NASA and the Mars mission on the Internet, visit: [www.nasa.gov](http://www.nasa.gov)



*This mosaic image, taken by the microscopic imager on the Mars Exploration Rover Opportunity, shows a portion of the rock outcrop at Meridiani Planum, Mars, dubbed "Guadalupe." Several images, each showing a different part of "Guadalupe" in good focus, were merged to produce this view.*

VISION

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# Around the Centers

## *AMES*researchcenter

Ames Research Center will dedicate its newest supercomputer to the memory of astronaut Kalpana "K.C." Chawla, one of the seven crewmembers aboard the Space Shuttle Columbia, lost just over a year ago. Chawla, who worked at Ames from 1988 to 1995, was the first Indian-born woman to fly in space. As a flight engineer and mission control specialist aboard Columbia, she was responsible for maneuvering the spacecraft during several innovative experiments. The SGI® Altix™ 3000 supercomputer to be named "Kalpana" will develop more realistic simulation models to better assess the evolution and behavior of the Earth's climate. The Altix is the world's first 512-processor, single-system image (SSI) supercomputer. It was acquired as part of a joint effort among NASA's Earth Science Technology Office and Space Science Office; NASA Jet Propulsion Laboratory, Pasadena, Calif.; NASA Ames Research Center; and NASA Goddard Space Flight Center, Greenbelt, Md.

## *DRYDEN*flightresearchcenter

To support a new NASA Airborne Science mission, Dryden Flight Research Center will use advanced technology to improve our understanding of biological and cultural resources and their sustainable development. The mission, called Central and South America AirSAR 2004, will use an Airborne Synthetic Aperture Radar (AirSAR) aboard NASA's DC-8 aircraft. The mission will take place during the first and second weeks of March. Areas covered by the flights will include Costa Rica, Chile, Patagonia and the Antarctic Peninsula.

## *GLENN*researchcenter

Dr. Kathleen Tacina, Turbomachinery and Propulsion Systems Division, was selected the Cleveland area Young Engineer of the Year by the Cleveland Area National Engineers Week Committee. Tacina was selected for her outstanding accomplishments in aerospace engineering and ongoing involvement in the community. Also during National Engineers Week, over 80 engineers and scientists from Glenn Research Center visited local schools to inspire students and encourage them to pursue careers in engineering and science.

## *GODDARD*spaceflightcenter

Goddard Space Flight Center hosted the NASA Explorer School teachers for Winter Camp 2004 – History of Winter (HOW), at Northwood School, Lake Placid, N.Y., the week of Feb. 15–21. HOW is a science learning camp that allows teachers to live among and work alongside scientists as they study snow and lake ice. Twenty-one teachers from twelve states participated, some coming from as far away as Oregon and Florida. The teacher teams investigated ice crystal patterns from Lake Placid, Cascade Lake and the Icefall at the Cascade Lake site. After the snow and ice studies are complete, teachers will use their winter experience to develop an innovative science curriculum that meets National Science Education Standards. For more information check out the Web site at [www.historyofwinter.org](http://www.historyofwinter.org)

## *KENNEDY*spacecenter

Kennedy Space Center now has a consolidated, centralized safety and mission assurance organization, which will provide support to the Center's new Independent Technical Authority (ITA). The organization is led by Bert Garrido. Another new organization will perform functions of the Chief Engineer and System Management Office and will manage ITA. This office will be led by Oscar Toledo and will perform the Center's business systems management function, which currently resides within the Safety, Health and Independent Assessment Directorate. Additionally, the Spaceport Engineering and Technology Directorate will realign internally to provide the ITA with engineering technical support.

## *JET*propulsionlaboratory

No submission.

## *JOHNSON*spacecenter

As the one-year anniversary of the Columbia accident drew near, Johnson Space Center (JSC) Director Jefferson D. Howell Jr., encouraged employees to keep striving for excellence in human spaceflight. "It would be an insult to the crew if we gave up," Howell said at a memorial service Jan. 30. Later that day, JSC hosted the 2004 Capital One College All-Star Football Challenge. Broadcast on Super Bowl Sunday, the event pitted several of college football's brightest stars against each other, passing, kicking and running through the obstacle course. The Super Bowl itself, held at Houston's Reliant Stadium, featured a NASA-themed pregame ceremony. Images of the STS-107 crew were shown while singer Josh Groban sang "You Lift Me Up." The STS-114 crew stood by on the field, symbolizing NASA's resolve to return to flight and keep exploring.

## *LANGLEY*researchcenter

Edward Browell, senior research scientist in Langley's Atmospheric Sciences Competency, was selected as a Fellow of the American Geophysical Union (AGU). The AGU recognized Browell for his contributions to atmospheric science research through his use of active remote-sensing systems. Browell's pioneering development of airborne lidar systems has enabled remote measurements of ozone, water vapor, aerosols and clouds in the troposphere and lower stratosphere. The lidar-based instruments created under Browell's direction have been used in more than 30 field experiments from the Amazon Basin to the Arctic. The AGU will present Browell with his Fellow's certificate during the Honors Ceremony in Montreal, Canada, in May.

## *MARSHALL*spaceflightcenter

On Feb. 19, eight Huntsville-area high school engineering teams gave the news media a preview of the robots they designed and built for "Frenzy," this year's annual robotics showdown hosted by the national organization FIRST (For Inspiration and Recognition of Science and Technology). Huntsville-based student teams are sponsored by NASA Marshall Space Flight Center (MSFC), as well as by local industry. Regional FIRST competitions start March 3; the championship event kicks off April 15 at the Georgia Dome in Atlanta. MSFC also remembered retired SSME Chief Engineer Jerry Thomson, 76, who passed away February 1. Thomson served as test engineer during the Mercury, Gemini and Apollo programs during the development of the H-1, J-2 and F-1 engines for NASA. In 1968, he was selected to begin preliminary design studies in development of the Space Shuttle Main Engine. From 1971 to 1986, Thomson was chief engineer for the Space Shuttle Main Engine, and in that position organized the engineering at Marshall — supporting 23 Shuttle flights.

## *STENNIS*spacecenter

The Propulsion Test Directorate at Stennis Space Center is busy preparing to support Return to Flight activities with Space Shuttle Main Propulsion System Flow-liner testing, scheduled to begin in summer and fall 2004. Testing will be conducted on Stennis' A-1 engine test stand and E-1 component test facility. Different flow-liners will be installed, tested and inspected. Data gathered will be used to help anchor ongoing engineering analysis of this Space Shuttle Program investigation activity.

# Black Hole Rips Apart Star

Thanks to two orbiting X-ray observatories, astronomers have the first strong evidence of a supermassive black hole ripping apart a star and consuming a portion of it.

The event, captured by NASA's Chandra and ESA's XMM-Newton X-ray Observatories, had long been theorized, but never confirmed.

"Stars can survive being stretched a small amount, as they are in binary star systems, but this star was stretched beyond its breaking point," said Stefanie Komossa of the Max Planck Institute for Extraterrestrial Physics (MPE) in Germany, leader of the international team of researchers. "This unlucky star just wandered into the wrong neighborhood."

While other observations have hinted stars are destroyed by black holes (events known as "stellar tidal disruptions"), these new results are the first strong evidence. Looking for tidal disruptions represents a completely independent way to search for black holes. "Now, with all the data in hand, we have the smoking gun proof that this spectacular event has occurred," said coauthor Guenther Hasinger, also of MPE.

The black hole in the center of RXJ1242-11 is estimated to have a mass of about 100 million times Earth's sun. By contrast, the star probably had a mass equal to the sun, making it a lopsided battle of gravity. "This is the ultimate David versus Goliath battle, but here David loses," said Hasinger.

The astronomers estimated about one percent of the star's mass was ultimately consumed, or accreted, by the black hole. This small amount is consistent with predictions the momentum and energy of the accretion process will cause most of the destroyed star's gas to be flung away from the black hole.

The force that disrupted the star in RXJ1242-11 is an extreme example of the tidal force caused by differences

in gravity acting on the front and back of an object. The tidal force from the moon causes tides in Earth's oceans. A tidal force from Jupiter pulled Comet Shoemaker-Levy apart, before it plunged into the giant planet.

Other dramatic flares have been seen from galaxies, but this is the first studied with the high-spatial resolution of Chandra and the high-spectral resolution of XMM-Newton. Both instruments made a critical advance. Chandra showed the RXJ1242-11 event occurred in the center of a galaxy, where the black hole lurks. The XMM-Newton spectrum revealed the fingerprints expected for the surroundings of a black hole, ruling out other possible astronomical explanations.

Information and images about the event are available on the Internet at: [chandra.harvard.edu](http://chandra.harvard.edu) and [chandra.nasa.gov](http://chandra.nasa.gov)



# CASSINI CAPTURES STUNNING VIEW OF SATURN

Four months before its scheduled arrival at Saturn, the Cassini-Huygens spacecraft sent its best color postcard of the ringed world back to Earth. The spacecraft is expected to send weekly postcards as it gets closer to the gas giant.

"We very much want everyone to enjoy Cassini's tour of this magnificent planetary system," said Dr. Carolyn Porco, leader of the Cassini imaging science team at the Space Science Institute in Boulder, Colo. "And I can say right now the views out the window will be stunning," Porco said.

Cassini was 69.4 million kilometers (43.2 million miles) from Saturn when the images were taken. The smallest features visible in the image are approximately 540 kilometers (336 miles) across. Finer details in the rings and atmosphere than previously seen are beginning to emerge and will grow in sharpness and clarity over the coming months. Image highlights will include regular, multi-wavelength pictures of Saturn and its rings; imaging of Titan, beginning in April; Titan movie



*The above image is an artist's rendition of the Cassini spacecraft approaching the planet Saturn and its magnificent rings. The glint of light behind the magnetometer boom at the bottom of the spacecraft represents the reflection of the sun. Since Saturn is 930 million miles away from the sun, and consequently about 746 million miles away from Earth, from this perspective one can get a sense in the image just how far the Cassini spacecraft has to travel to reach the mysterious ringed planet.*

sequences, starting in late May, when the resolution exceeds that obtainable from Earth; and a flyby of Saturn's distant moon, Phoebe, in June, at a spacecraft altitude of 2,000 kilometers (1,243 miles).

Through Cassini, about 260 scientists from 17 countries hope to gain a better understanding of Saturn, its famous rings, its magnetosphere, Titan and its other icy moons. "Cassini is probably the most ambitious exploration mission ever launched and is the fruit of an active international collaboration," said Dr. Andre Brahic, imaging team member and professor at Université Paris 7-Denis Diderot, France. "It should be the prelude of our future, the exploration of our surroundings by humanity," Brahic said.

Cassini will begin a four-year prime mission in orbit around Saturn when it arrives July 1. It will release its piggybacked Huygens probe about six months later for descent through Titan's thick atmosphere. The probe could impact in what may be a liquid methane ocean.

The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for Office of Space Science, Washington. Cassini-Huygens is a cooperative mission of NASA, the European Space Agency and the Italian Space Agency.

For the first image and other weekly images on the Internet each Friday, visit: [www.nasa.gov](http://www.nasa.gov)



*This montage of the Saturnian System was prepared from an assemblage of images taken by the Voyager 1 spacecraft during its Saturn encounter in November 1980. This artist's arrangement shows Dione in the forefront, Saturn rising behind, Tethys and Mimas fading in the distance to the right, Enceladus and Rhea off Saturn's rings to the left, and Titan in its distant orbit at the top.*



# NASA Takes Space Vision to Local School

On Thursday, Feb. 19, Dr. Charles Elachi, director of NASA's Jet Propulsion Laboratory, Pasadena, Calif., visited Shirley Avenue Elementary School in Reseda, Calif., to share his insights on the current Mars rover missions and NASA's new direction for human and robotic exploration. Richard Cook, project manager for the Mars Exploration Rover mission, and astronaut Dr. Michael Barratt also visited the school and met with students.

"The recent success of the Spirit and Opportunity rovers has captured the imagination of the entire world, and they have been especially inspiring to younger Americans," said Dr. Elachi. "Robotic exploration is one part of a far grander vision of robotic and human space exploration that's been put forth by the president. NASA's task is to turn this vision into reality. Inspiring the next generation of explorers is a critical element of this vision, because these students will be the ones who may very well be the first to step foot on Mars."

Shirley Avenue Elementary School is a part of NASA's Explorer Schools program, a three-year partnership of scientific and engineering adventures to engage students using unique NASA resources and capabilities. The program's goal is to inspire students to

pursue careers in science, mathematics and technology, so they can become the nation's space explorers and forward thinkers of tomorrow.

For information about the NASA Explorer Schools program, visit: [explorerschools.nasa.gov](http://explorerschools.nasa.gov)



# Space Flight Leadership Council Meets

Members of NASA's Space Flight Leadership Council (SFLC), charged with making decisions about the agency's Return-to-Flight efforts, met February 19 at the Johnson Space Center and moved the target window for the next flight of the Space Shuttle to March 6 – April 18, 2005.

Co-chaired by William Readdy, Associate Administrator for Space Flight, and Dr. Michael Greenfield, Associate Deputy Administrator for Technical Programs, the SFLC's decision came after an extensive, day-long review of Space Shuttle Program activities.

"We've said for months that we'd be driven by milestones, not a calendar. When we successfully reach those milestones, that's when the Space Shuttle will return to safe flight," Readdy said. "This decision reflects our commitment to taking the time we need to make the Space Shuttle safer."

The Council decided more time was needed to analyze and test a larger area of the Space Shuttle's external fuel tank for potential foam insulation loss; design and build a new camera/laser system mounted on a boom that would be used



by the Space Shuttle's robotic arm to help inspect for possible damage while in orbit; and assess the condition of the Rudder Speed Brake Actuators on the orbiters.

# Vision Inspires Students in Moonbuggy Race

Students across the nation are already working to support the new NASA vision for space exploration. Teams from New Jersey to Arizona are creating human-powered vehicles, similar to the first that roamed the lunar surface in the 1960s, to compete in NASA's Great Moonbuggy Race in Huntsville, Ala., April 2-3.

Their challenge, and the Great Moonbuggy competition, is inspired by the first lunar roving vehicles, created more than 40 years ago at NASA Marshall Space Flight Center (MSFC) in Huntsville. Students are working on their moonbuggies hoping the skills they learn now may one day put them on the moon, or that their designs may be used in the future on the lunar or martian surface.

"This competition prepares young men and women to study science, engineering and technology needed to take explorers to the moon, Mars and beyond," said Durlean Bradford, Moonbuggy Race coordinator in MSFC's education department. "Some of these moonbuggy racers could be chosen to make the trips or design and build the machines that will help our nation reach those goals. That's something to be excited about."

The teams competing in the Great Moonbuggy Race face some of the same challenges overcome by the original Lunar Rover team in the 1960s. That team, managed by engineers at MSFC, was challenged to design a vehicle that was compact, durable and able to handle the rigors of a tough, unflinching environment. They met that challenge. Astronauts used separate Lunar Rovers on the final three Moon missions – Apollo 15, 16 and 17 – to travel 52.51 miles (84.5 kilometers), gather 620.6 pounds (281.5 kilograms) of rock and soil samples and return them to Earth.

The student's moonbuggy challenge is to design a human-powered vehicle to fit into a space no more than 4-feet

by 4-feet by 4-feet, that also can be quickly unfolded and ready to ride, yet light enough for its two drivers to carry. During the race, the two operators – one male, one female – power and drive the vehicle over a half-mile obstacle course of simulated moonscape terrain. In 2003, 55 teams from 20 states and Puerto Rico participated. This year, high school teams will race April 2 and college teams will compete April 3.

"For some schools, this challenge has become part of their curriculum," Bradford said. "They work on their

moonbuggies for several months before making the trip to Huntsville to compete. We're expecting big fields this year, both in the high school and college races."

Prizes are awarded not only for the fastest vehicles, but also to the team whose design represents the best technical approach to solving the engineering problem of navigating a simulated lunar surface.

For event details, course information and photos, visit: [moonbuggy.msfc.nasa.gov](http://moonbuggy.msfc.nasa.gov) and [education.nasa.gov](http://education.nasa.gov)



Strength, agility and a well-designed "buggy" are needed to navigate the obstacles at NASA's "Great Moonbuggy Race." The team from the University of South Alabama in Mobile made it through several "craters" like this one on its way to place third in the 10th annual event held at the U.S. Space & Rocket Center in Huntsville, Ala.



# Profile

## Dr. Catherine Weitz

**Briefly describe your current position:** Program Scientist for the Mars Exploration Rover (MER) and Mars Express missions. As the MER program scientist, I oversaw the development and testing of the science instruments on MER. I worked with both scientists in the community and engineers on the Project to select the landing sites for the two rovers. Currently, I work closely with the U.S. scientists on both MER and Mars Express to maximize scientific research and ensure data from the instruments will be available to the science community in a reasonable time period.

**Describe your career history:** After earning a bachelor's degree in Geology from Cornell University and a master's degree in Planetary Sciences from Caltech, I spent three years working at the Jet Propulsion Laboratory (JPL), Pasadena, Calif. As a research scientist on the Magellan mission to Venus, I helped uncover geological mysteries of the planet. After the Magellan mission, I worked on the Shuttle Imaging Radar Project (SIR-C). During the mission, I worked at Johnson Space Center in Houston to update science targets for the radar, based on the shuttle's latest orbit predictions. In 1994, I returned to graduate school at Brown University where I received my Ph.D. in Geology. I spent another year at JPL as a National Research Council Associate before transferring my associate position to work at NASA Headquarters on the Mars Program.



Photo credit: NASA/Bill Ingalls

**Hometown, hobbies and family:** I was born in Columbus, Ohio, but grew up in Newton, Mass. I enjoy working out in the NASA gym and braving a run outdoors when the weather is nice enough. Recently, I have taken up art, and enjoy painting the stunning pictures taken by the Hubble Space Telescope. Soon, I hope to be able to draw some of the new images taken by Spirit at Gusev Crater and Opportunity at Meridiani Planum.

## Historic Spacewalk For ISS Crew

The Expedition 8 crew has conducted the first-ever two-person spacewalk from the International Space Station without a crewmember inside, but the planned five-and-a-half-hour spacewalk was cut short by a cooling system problem with one of the Russian Orlan suits.

The spacewalk by Expedition 8 Commander Mike Foale and Flight Engineer Alexander Kaleri proceeded smoothly until Kaleri reported, after three hours, that drops of water were beginning to form inside his helmet visor and that his suit temperature was a little warm.

Within minutes, Russian flight controllers reported an apparent problem

with the system that provides cooling for Kaleri's suit. Kaleri was never in any danger, and suit temperatures never rose to uncomfortable levels.

The crew went back inside the Station, and Foale quickly detected a kink in one of the liquid-cooling-garment tubes that provide the flow of water throughout Kaleri's suit. The kink was straightened out and water began to flow normally once again in Kaleri's suit.

Foale and Kaleri began their spacewalk at 4:17 p.m. EST. It was the first time the Station had not been occupied during a so-called "extravehicular activity," and all Station

systems operated flawlessly in their autonomous configuration during the abbreviated spacewalk.

Before the activity was cut short by the suit problem, Foale and Kaleri were able to complete about 75 percent of their planned tasks, including installation of a device called the Matryoshka, which will provide data on radiation exposure to the human body during space flight.

It was the 52nd spacewalk in support of Station assembly and maintenance, the 27th staged from the Station itself, the fourth for Foale and Kaleri's fifth.

## NASA Embarks On a Sweeping Airborne Expedition

An international team of scientists from NASA and other research institutions embarked on a three-week expedition of discovery that will take them from the lush, dense rain forests of Central America to the frigid isolation of Antarctica.

Armed with the Airborne Synthetic Aperture Radar (AirSar), the team is surveying selected sites in Central America to unearth archaeological secrets and preserve natural resources. Then scientists are off to South America's Patagonia ice fields and Antarctica to conduct topographic surveys of ice to better gauge the effect of climate change.

Carried aboard a NASA DC-8 laboratory, AirSar can penetrate clouds and also collect data at night. Its high-resolution sensors "see" beneath treetops, through thin sand, and under dry snow pack, to produce topographic models. AirSar is expected to detect features such as fortifications, causeways, walls and other evidence of advanced civilizations hidden beneath the forest.

In South America and Antarctica, AirSar will collect imagery and high-precision topography data to help determine whether the increasing trend of Southern Hemisphere glaciers' contribution to sea level rise due to climate change is continuing. AirSar will also provide a precise topographic reference for comparison with satellite laser-altimetry data from NASA's Icesat satellite and previous airborne data.

AirSar's 2004 campaign is a collaboration of many U.S. and Central American institutions and scientists, including NASA;



This is a photograph of the left side of NASA's DC-8 aircraft conducting science over Honduras as part of the AirSar 2004 research campaign.

the National Science Foundation; the Smithsonian Institute; National Geographic; Conservation International; the Organization of Tropical Studies; the Central American Commission for Environment and Development; and the Inter-American Development Bank.

## "M2K4" Feature Earns Web Honor

NASA's interactive Web feature highlighting the Mars Exploration Rovers earned a coveted spot as Macromedia's "Site of the Day" on Feb. 6, 2004.

Sought by Web designers worldwide, the honor recognizes projects that use Macromedia's Flash software. Macromedia's Web site lists "strong visual design, technical execution, usability" and "interesting and/or timely content" as criteria for the award.

Designed by Richard Sangillo and Robert Brown of the Office of Public Affairs' Internet Services Group, "M2K4: Roaming the Red Planet" brought Spirit and Opportunity to the forefront on the NASA Web portal, [www.nasa.gov](http://www.nasa.gov). The site offers the latest video and images from the Red Planet, but also invites users to dig deeper into the mission with a compelling mix of interactive features.

Since Spirit's landing on Jan. 3, the NASA Home Page, Mars Exploration Rovers Web site and other elements of the portal have received more than 7 billion hits. More than 49,000 people tuned in to NASA TV via webcast for coverage of Opportunity's landing on Jan. 25.

Visitors to M2K4 can learn about humankind's age-old fascination with Mars and the challenges of getting there, or



test their knowledge with a trivia quiz. They can also get a unique view of the rovers by zooming in on various parts or manipulating a 360-degree model. In the site's "Multimedia" section, users can download screensavers and desktop wallpaper, or check out three "trailers" promoting the mission.

To see the site, visit: [www.m2k4.com](http://www.m2k4.com)



## LANDSAT 5 CELEBRATES 20 YEARS

March 1, 2004, marks the 20th anniversary of Landsat 5 operations as the NASA/USGS “workhorse” satellite. It continues to provide important observations of the landmass of the planet, and has established a record for reliability in the civilian space fleet.

Launched from Vandenberg Air Base in California, Landsat was expected to operate effectively for two years, with a goal of three years of data collections. Instead, after over 100,000 orbits and the acquisition of over 29 million images, Landsat 5 continues to operate successfully.

“The longevity and importance of the Landsat 5 mission is nothing short of incredible,” said Darrel Williams, Landsat 7 Project Scientist at NASA’s Goddard Space Flight Center. “The imagery provided over its 20-year history has helped us to develop a far better understanding of the land surface features on our home planet, as well as how man has acted to modify those features. It has resulted in the creation of an unsurpassed digital photo album of Earth that will be repeatedly opened and reviewed by generations to come.”

While Landsat 5 continues to operate, Landsat program managers are working on a replacement vehicle. The expected end-of-life, based on fuel reserves, is projected for early 2009. Until then, the NASA/USGS Landsat 5 will continue to provide records of a changing world.

*This image shows wide-area coverage of the Washington metropolitan area.*