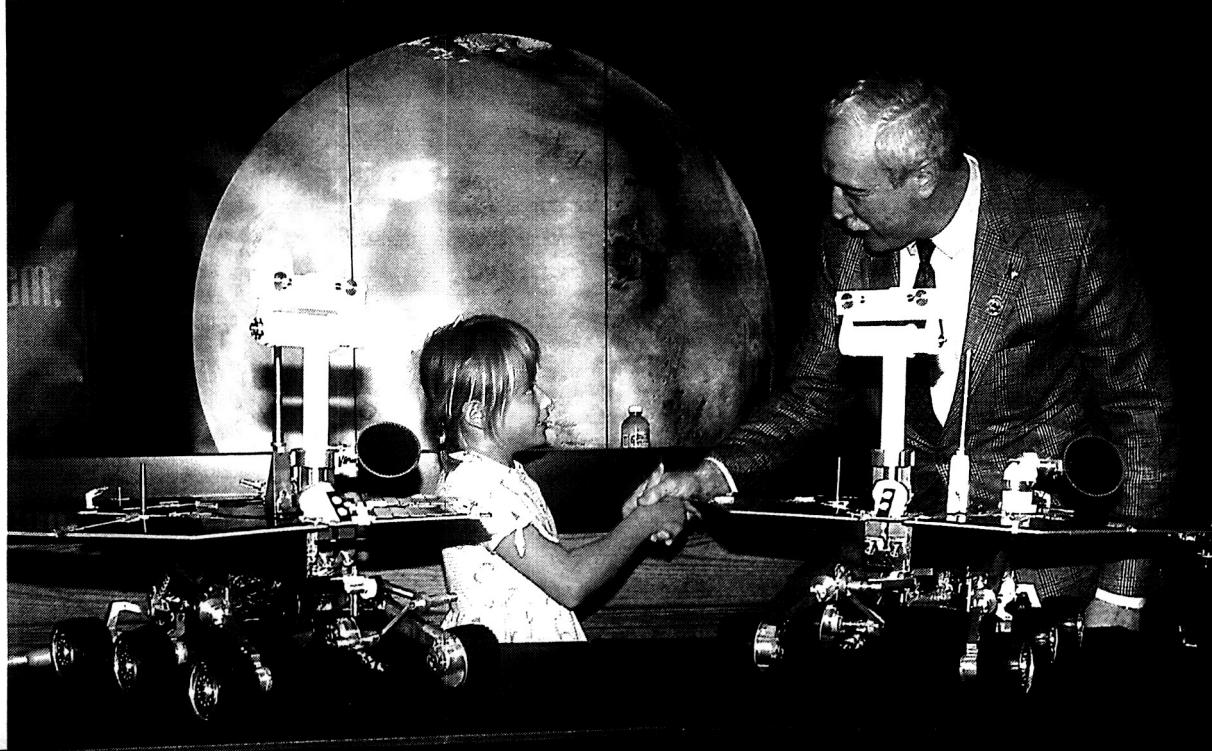


NASA VISION
JULY 2003
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VISION

SPIRIT AND OPPORTUNITY

Nine-year-old Sofi Collis (left) is congratulated by NASA Administrator Sean O'Keefe for selecting the names of the Mars Exploration Rovers — "Spirit" and "Opportunity" — during a press conference. The names Sofi suggested were chosen from more than 10,000 student entries in an essay contest managed for NASA by the LEGO Company. NASA's twin Mars Exploration Rovers are designed to study the history of water on Mars. These robotic geologists are equipped with a robotic arm, a drilling tool, three spectrometers and four pairs of cameras that allow them to have a human-like, 3-D view of the terrain. Each rover could travel as far as 100 meters in one day to act as Mars scientists' eyes and hands, exploring an environment where humans are not yet able to go. MER-A, with the rover Spirit aboard, launched on June 10 at 1:58 p.m. EDT, and MER-B, with Opportunity aboard, is scheduled to launch July 2.



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SPIRIT
OPPORTUNITY

Administrator's Corner

Fittingly, once a year NASA takes the opportunity with its Honor Awards Ceremony to pay tribute to so many of the dedicated individuals and groups who have made extraordinary contributions to our nation's aeronautics and space programs. We honor a select group of NASA and contractor employees for their outstanding work on NASA's programs.

It is indeed the NASA workforce's passion for research and exploration, commitment to excellence and teamwork that have produced tangible and lasting benefits that have been greatly valued by the American public during our storied 45-year history.

We are making great strides in our efforts to improve aviation safety and efficiency, probe more deeply into the mysteries of the universe, learn how to propel robotic emissaries more swiftly throughout the solar system and work to better understand the dynamics of Earth's climatic system.

Group Achievement Award

Agency Competitive Sourcing Team, Budget Formulation Team, Competency Management System Team, Flags for Heroes and Families Campaign Team, Genesis Mission Management and Support Team, Hubble Space Telescope Servicing Mission 3B Management Team, Human Capital Legislation Team, IMAX Camera Systems Project Team, International Space Station Utilization Management Concept Development Team, JPL Negotiation Team, NASA Awards and Recognition Study Team, NASA Exploration Team, NASA Multilateral Partner Program Team, National Recruitment Initiative Team, Nuclear Systems Initiative Team, Office of External Relations Assessments and Technology Division Support Staff, Performance Measurement and Reporting Team, Ramaty High Energy Solar Spectroscopic Imager (RHESSI) Principle Investigator Team, Strategic Planning Team, X-43A Mishap Investigation Team

Distinguished Service Medal

John J. Adamczyk, Daniel W. Bursch, Franklin Chang-Diaz, Kenneth D. Cockrell, Nancy J. Currie, Joseph Fries, C. Gordon Fullerton, John M. Grunsfeld, Charles E. Kohlhase, Jr., James H. Newman, Ellen Ochoa, Paul G. Pastorek, Jerry L. Ross, Axel Roth, John D. Schumacher, Steven L. Smith, Carl E. Walz, James D. Wetherbee

Public Service Medal

Jean-Bernard Minster

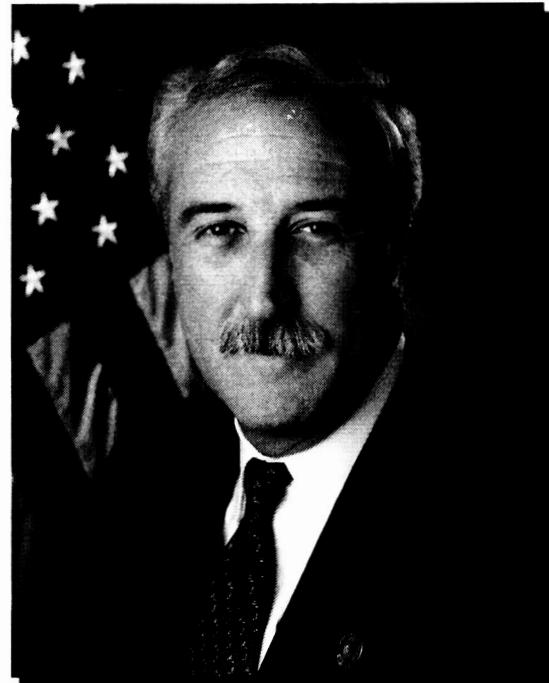


Photo credit: NASA/Bill Ingalls

As a public servant, I feel very privileged to be associated with NASA and its amazing workforce. Please join me for the ceremony in the NASA Auditorium on Wednesday, July 9, at 1:30 p.m. All employees are encouraged to attend and share in the spirit of recognition for the following individuals and groups:

Exceptional Technology Achievement Medal

John C. Mankins

Outstanding Leadership Medal

Patrick A. Ciganer, Angela Phillips Diaz, Jefferson D. Howell, Jr., Steven J. Isakowitz, James L. Jennings, Mary E. Kicza, Michael C. Kostelnik, J. Victor Lebacqz, Adena Williams Loston, Vicki A. Novak, Bryan D. O'Connor, Jeffrey D. Rosenthal

Exceptional Service Medal

Lucille L. Baker, Stephen E. Ballard, Donald J. Campbell, James C. Dodge, Paula L. Geisz, Laura M. Giza, Renee S. Green, Douglas J. Koupash, Shannon W. Lucid, Thomas S. Luedtke, Glenn Mahone, Randie M. Marinari, Dennis McSweeney, Altonell L. Mumford, Jeffrey E. Sutton, Bobby J. Watkins

Exceptional Scientific Achievement Medal

Philip R. Christensen, Geoffrey W. Marcy

Exceptional Achievement Medal

Donald E. Anderson, Jr., Theron M. Bradley, Jr., Gwendolyn Brown, William C. Hill

Distinguished Public Service Medal

Eric J. Barron, Roger J. Brissenden, Daniel J. Jacob, Valery G. Korzun, Pedro Medelius, Yury I. Onufrienko, Sergei Y. Treschev, Hugh Wilson

On Tuesday, June 10, a NASA robotic geologist named Spirit began its seven-month journey to Mars at 1:58:47 p.m. Eastern Daylight Time (10:58:47 a.m. Pacific Daylight Time) when its Delta II launch vehicle thundered aloft from Cape Canaveral Air Force Station, Fla.

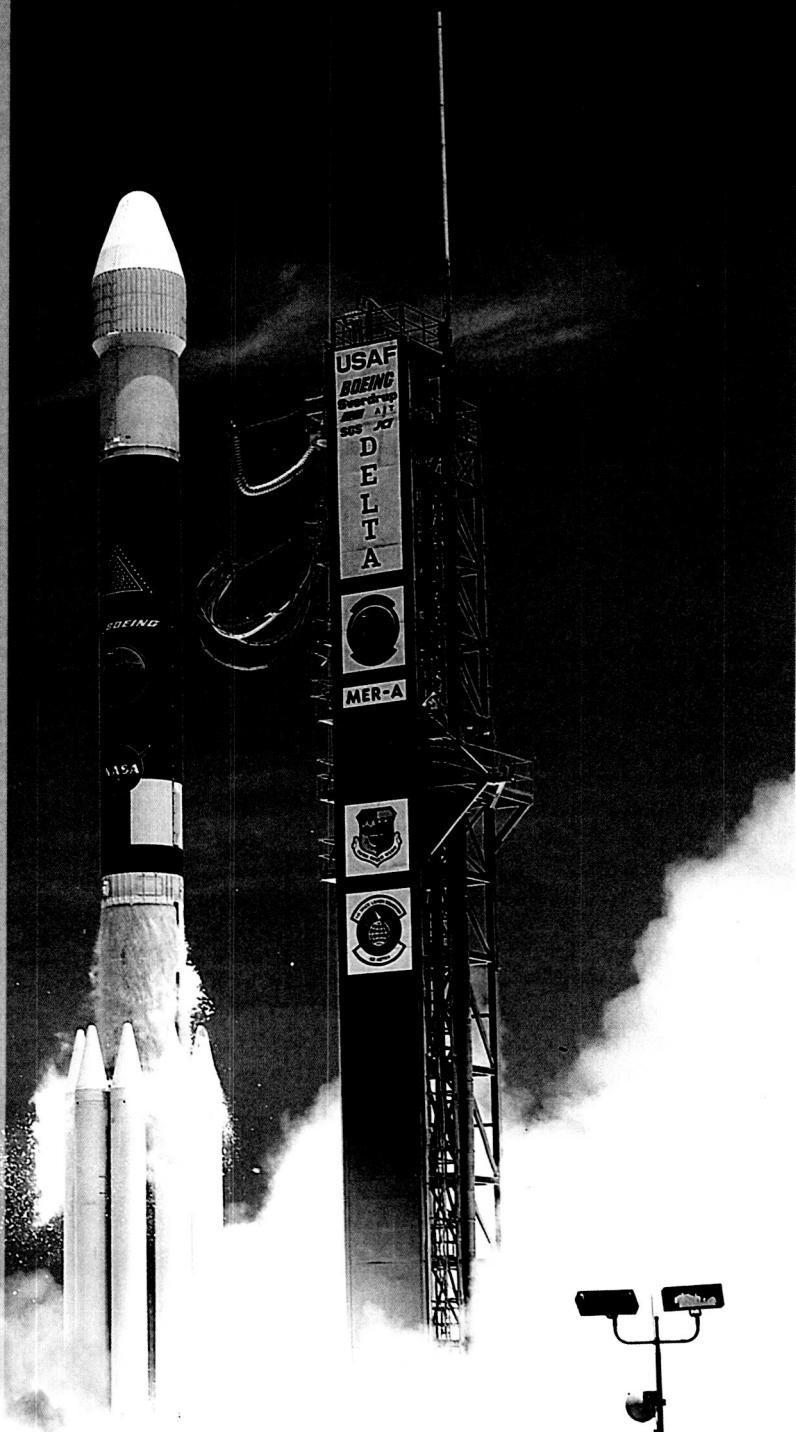
The spacecraft, first of a twin pair in NASA's Mars Exploration Rover project, separated successfully from the Delta's third stage about 36 minutes after launch, while over the Indian Ocean. Flight controllers at NASA's Jet Propulsion Laboratory, Pasadena, Calif., received a signal from the spacecraft at 2:48 p.m. Eastern Daylight Time (11:48 a.m. Pacific Daylight Time) via the Canberra, Australia, antenna complex of NASA's Deep Space Network. All systems are operating as expected.

Spirit will roam a landing area on Mars that bears evidence of a wet history. The rover will examine rocks and soil for clues to whether the site may have been a hospitable place for life. Spirit's twin, Opportunity, which is currently scheduled to launch on Wednesday, July 2 at 11:17 p.m. EDT, will be targeted to a separate site with different signs of a watery past.

"We have plenty of challenges ahead, but this launch went so well, we're delighted," said JPL's Pete Theisinger, Project Manager for the Mars Exploration Rover missions.

The spacecraft's cruise-phase schedule before arriving at Mars next Jan. 4, Universal Time (Jan. 3 in Eastern and Pacific time zones), includes a series of tests and calibrations, plus six opportunities for maneuvers to adjust its trajectory. Jet Propulsion Laboratory, a division of the California Institute of Technology, Pasadena, manages the Mars Exploration Rover project for the NASA Office of Space Science, Washington, D.C.

Information about the rovers and the scientific instruments they carry is available online at: mars.jpl.nasa.gov/mer and from Cornell University in New York at: athena.cornell.edu



VISION

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Around the Centers



AMESresearchcenter

NASA Ames Research Center is collaborating with the San Francisco Bay area affiliate of Telemundo, the Spanish-language television network, on a series of technology feature stories with Spanish-speaking scientists and engineers. The first interview will feature Carolina Blake discussing NASA's commercial technology program. Future speakers will include Dr. Orlando Santos of the Fundamental Space Biology Office and Dr. Liam Pedersen talking about Ames' K9 rover instrument placement project. NASA Ames' efforts to reach out to a Spanish-speaking audience also include a Spanish version of its Public Affairs Office Web site and an e-mail distribution list for Spanish versions of select Ames news releases.

DRYDENflightresearchcenter

The NASA and AeroVironment flight team is reviewing data from the last two checkout flights of the Helios Prototype solar-electric flying wing, that was recently equipped with a revolutionary fuel cell system for night time flight. During the first shakedown flight on June 7, the Helios was aloft for about 15 hours at altitudes up to 52,000 feet while engineers checked out modifications and upgrades made over the past two years. On June 26, the remotely operated Helios Prototype aircraft was destroyed when it crashed into the Pacific Ocean, during its most recent checkout flight from the U.S. Navy Pacific Missile Range Facility (PMRF) on Kauai, Hawaii. No property damage, other than the prototype, or injuries occurred as a result of the mishap. The remotely piloted aircraft came down in the ocean, within the confines of the PMRF test range, west of the facility. The cause of the mishap is under investigation. In additional news, DFRC's summer internships and other programs will consist of: 12 High school programs students; 34 college programs students and 17 graduate programs students.

JOHNSONspacecenter

The Expedition Six crew received a hero's welcome at Johnson Space Center (JSC) on May 27. The crew — Commander Ken Bowersox, ISS Science Officer Don Pettit and Flight Engineer Nikolai Budarin—arrived to the ceremonial ringing of the bell at their Crew Return Ceremony at JSC, along with applause and cheers from their families and JSC employees. The crew was praised by each guest speaker at the event, including Center Director Jefferson D. Howell, Jr., ISS Program Manager Bill Gerstenmaier, Chief of the Astronaut Office Kent Rominger and Russian Aviation and Space Agency liaison Sergei Ripkin. Ripkin thanked the crew members for their dedication to keeping the station operating following the Columbia accident, saying "It is because of you that the ISS, the brightest star on the horizon, continues to shine."

LANGLEYresearchcenter

The annual "summer surge" has brought over 250 additional employees — faculty, pre-service teachers, university and high school students — to Langley Research Center. Five educators are in residence for eight weeks attending curriculum workshops. Another 37 teachers are participating in the Summer Faculty Fellowship program. Named one of the top 100 internships in the nation by the Princeton Review, the Langley Aerospace Summer Scholars program employs 150 university juniors, seniors and first-year graduate students who are working in research, program and business areas. Fifteen high school students are exploring their interest in aerospace via the Governor's School, a five-week mentorship program in aeronautics and atmospheric, space and computer science. Another 23 students make up the Summer High School Apprentice Research Program. New this year, 24 educators will participate in NASA Explorer School workshops.

GLENNresearchcenter

Six new technologies leading to cleaner, quieter, safer, more affordable and more efficient air travel received awards for innovativeness at the Turning Goals into Reality 2003 Conference from NASA's Office of Aerospace Technology. The Glenn-developed, award-winning technologies include: Secure, Mobile, Wireless Network Technology; Miniaturized Smart Leak Detection Sensor; Turbine Airfoil System; Fan Noise Reduction; SATS Airborne Internet; and GRCop-84 Alloy Development. Glenn Research Center summer internships and other programs will include: 26 freshmen, 33 sophomores, 61 juniors, 51 seniors, 26 master's and 8 Ph.D. students.

GODDARDspaceflightcenter

In the spirit of inspiring as only NASA can, Goddard will be welcoming more than 400 of this country's best and brightest students in the fields of science, engineering and mathematics this summer. These potential next-generation explorers are being welcomed for a brief stay within the working environment of leading-edge aerospace technology with NASA. "The work done at Goddard is so compelling that it will ultimately inspire, but the question is how do we give students that compelling experience," said Dr. Robert Gabrys, Education Officer, NASA Goddard Space Flight Center.

KENNEDYspacecenter

A research and development team from Kennedy Space Center (KSC) recently used a new hazardous gas-detection system to study volcanic emissions in Costa Rica. The new prototype system named the Aircraft-based Volcanic Emission Mass Spectrometer (AVEMS) also will have a direct application to the Space Shuttle program. The AVEMS is a step toward an advanced system that will be able to detect toxic gas leaks and emissions in the Space Shuttle aft engine compartment and the crew compartment, providing an added level of protection for the astronauts and the vehicle. The new system shows promise for commercial applications in a variety of environments and industries such as semiconductor, petrochemical, automotive, refrigeration and cathode ray tube.

MARSHALLspaceflightcenter

The Chandra X-ray Observatory Program will sponsor a three-day symposium, "Four Years of Chandra Observations: A Tribute to Riccardo Giacconi," in Huntsville beginning Tuesday, Sept. 16, through Thursday, Sept. 18. The Science Organizing Committee (SOC) is chaired by the Chandra Project Scientist, Martin C. Weisskopf. Michael Smith, Chandra Program Office, MSFC, is chairing the Local Organizing Committee (LOC) for this symposium. The symposium will focus on current results from Chandra but is open to the full sweep of high-energy astrophysics. The emphasis at the meeting will be high-energy astrophysics science — not mission (or future) planning. For further details, visit mi.msfc.nasa.gov/chandra/index.html

STENNISspacecenter

Stennis Space Center (SSC) personnel recently traveled to Camden Yards in Baltimore, Md., to present Astro Camp activities at the 2nd Annual African American Heritage Festival. Approximately 5,000 children participated in Astro Camp over the course of the three-day event. Astro Camp is offered at StenniSphere, the visitor center at SSC, for seven weeks during the summer months with 250 children enrolled in the weeklong day camps. The theme of this year's camp, "From First Flight to Space Flight," teaches children about the development and future of space flight. This summer, nearly 100 high school and college students and educators are also at SSC to participate in various educational programs offered by NASA.

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Government & Law Winner

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NASA Web Site Wins Webby . . .

The NASA Web portal and Earth Observatory Web sites both received a Webby Award — the leading international honor for the world's best Web sites. The NASA Web portal won in the Government + Law category, and Earth Observatory won in the Education category. In addition, both sites won The People's Voice Award in their categories.

The International Academy of Digital Arts and Sciences nominates and awards The Webby

Award to the world's best Web sites. While members of The International Academy of Digital Arts and Sciences select the winners for The Webby Awards, the online community determines the winners of The People's Voice Awards. Nearly 200,000 people in our online audience casted votes this year. The winners were announced June 5 online, and we were honored to accept The People's Voice Award for the second year running.

. . . And Undergoes Relaunch

In other Web news, the NASA Web portal, originally launched Jan. 31, was relaunched June 15 with a variety of new features, including:

- expanded sections under the "Life on Earth," "Humans in Space" and "Exploring the Universe" categories on the NASA Home Page.
- a customizable "MyNASA" section. Users can create their own version of the NASA Home Page by selecting from nine "channels" of content. MyNASA automatically brings users news, features and multimedia from the areas in which they are most interested.
- expanded games and interactive features in the "For Kids" section.
- NASA-wide Web content categorized by subject areas, similar to the Yahoo! online directory. (click on "Advanced Search" on the NASA Home Page, then on "Category Search.")
- an "Image of the Day" and other multimedia features directly on the Home Page.

Hosted in redundant commercial facilities, the NASA Web portal can easily handle large numbers of users during high-visibility events. The portal served up 2,200 simultaneous Webcast streams of the launch of Mars Exploration Rover-A.

Internet users at large have responded positively to the new site, downloading nearly 500,000 pages each day, and giving the site generally higher ratings on a customer survey than it had received at the same time the previous year.

The site reached a milestone on June 4, when it received its one billionth hit since its January launch. For more information, visit: www.nasa.gov and www.webbyawards.com/main/webby_awards/index.html

ANASA-Department of Energy jointly funded study concludes Earth has been greening over the past 20 years. As climate changed, plants found it easier to grow.

The globally comprehensive, multi-discipling study appeared in *Science* magazine. The article states climate changes have provided extra doses of water, heat and sunlight in areas where one or more of those ingredients may have been lacking. Plants flourished in places where climatic conditions previously limited growth.

"Our study proposes climatic changes as the leading cause for the increases in plant growth over the last two decades, with lesser contribution from carbon dioxide

fertilization and forest re-growth," said Ramakrishna Nemani, the study's lead author from the University of Montana, Missoula, Mont.

From 1980 to 2000, changes to the global environment have included two of the warmest decades in the instrumental record; three intense El Niño events in 1982–83, 1987–88 and 1997–98; changes in tropical cloudiness and monsoon dynamics; and a 9.3 percent increase in atmospheric carbon dioxide (CO_2), which in turn affects man-made influences on climate. All these changes impact plant growth.



NASA's Sea-viewing Wide Field-of-view Sensor (SeaWiFS) aboard the OrbView-2 satellite has been collecting data on plant productivity and the carbon cycle since 1997. This colorful globe is a three-year map of continuous data showing fluctuating areas of successful photosynthesis on land and in the oceans.

Credit: NASA/ORBIMAGE

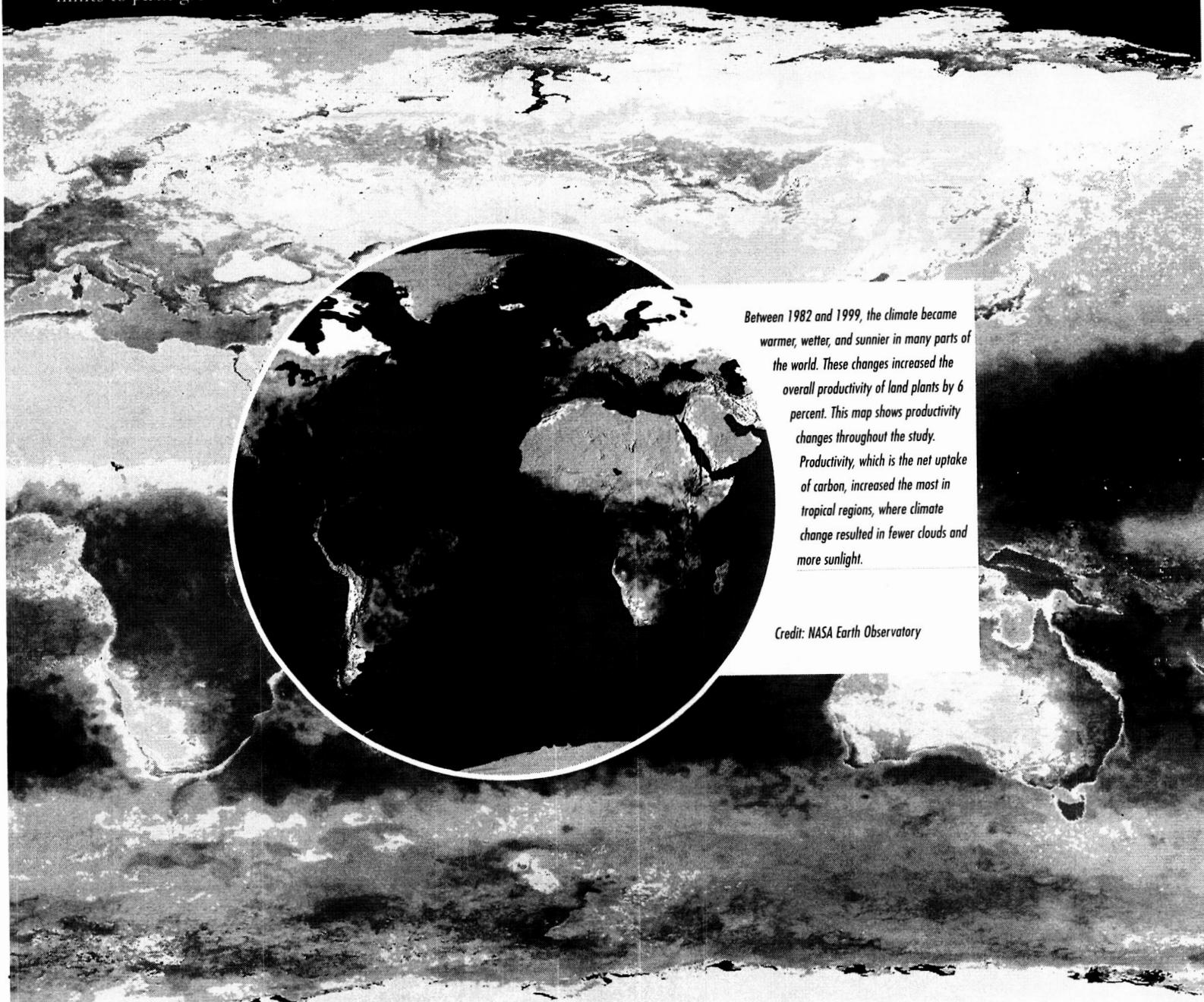
GLOBAL GARDEN

Nemani and colleagues constructed a global map of the Net Primary Production (NPP) of plants from climate and satellite data of vegetation greenness and solar radiation absorption. NPP is the difference between the CO₂ absorbed by plants during photosynthesis and CO₂ lost by plants during respiration. NPP is the foundation for food, fiber and fuel derived from plants, without which life on Earth could not exist. Humans appropriate approximately 50 percent of global NPP.

Climatic changes, over approximately the past 20 years, tended to be in the direction of easing climatic limits to plant growth. In general, in areas where

temperatures restricted plant growth, it became warmer; where sunlight was needed, clouds dissipated; and where it was too dry, it rained more. In the Amazon, plant growth was limited by sun blocking cloud cover, but the skies have become less cloudy. In India, where a billion people depend on rain, the monsoon was more dependable in the 1990s than in the 1980s.

NASA's Earth Science Enterprise is committed to studying the primary causes of the Earth system variability, including both natural and human-induced causes.



Between 1982 and 1999, the climate became warmer, wetter, and sunnier in many parts of the world. These changes increased the overall productivity of land plants by 6 percent. This map shows productivity changes throughout the study. Productivity, which is the net uptake of carbon, increased the most in tropical regions, where climate change resulted in fewer clouds and more sunlight.

Credit: NASA Earth Observatory

The background image shows three years of continuous SeaWiFS data (1997-2000) on a flat map of the Earth. The smooth migration of green areas over time is a reflection of seasonal changes in temperature and moisture.

GROWS GREENER

NASA's Newest UAV Makes Successful Flight

A milestone in the development of high-altitude, long-endurance, remotely operated aircraft occurred Monday, June 9 with the successful flight of NASA's Altair. Altair is the first unmanned aerial vehicle (UAV) to feature triple-redundant flight systems and avionics for increased reliability.

The slender-wing aircraft lifted off the runway at the General Atomics Aeronautical Systems Inc. (GA-ASI) flight test facility at El Mirage, Calif. The purpose of the historic first flight was to evaluate the UAV's basic airworthiness and flight controls. After the successful test flight, Altair glided to a landing on the remote desert runway. The entire flight was conducted at low altitude within a relatively short range of the El Mirage flight test facility.

"This is what we've been waiting for," said Glenn Hamilton, Altair Project Manager at NASA's Dryden Flight Research Center (DFRC), Edwards, Calif. "Now we can move forward with getting UAVs into the national airspace and conducting research," he said.

Built to performance specifications established by NASA's Earth Science Enterprise, Altair is an extended-wing version of the MQ-9 Predator B military UAV being developed under a partnership with GA-ASI. Altair is one of several UAVs designed for civil applications that have been developed or matured under the Environmental Research Aircraft and Sensor Technology (ERAST) program at DFRC.

After initial airworthiness test flights, Altair will serve as the avionics test aircraft for the production version of the MQ-9 before being transferred to NASA. At DFRC, Altair will first be used to evaluate various new control communications and collision-avoidance technologies that are critical to enabling UAVs to fly safely in national airspace.

Eventually NASA will use Altair for a variety of environmental science missions, such as volcanic observation, forest fire monitoring and atmospheric sampling. The UAV may be ideal for missions that are often too dangerous, difficult or lengthy for manned aircraft. UAVs are uniquely positioned to perform long missions that have repetitive routines.

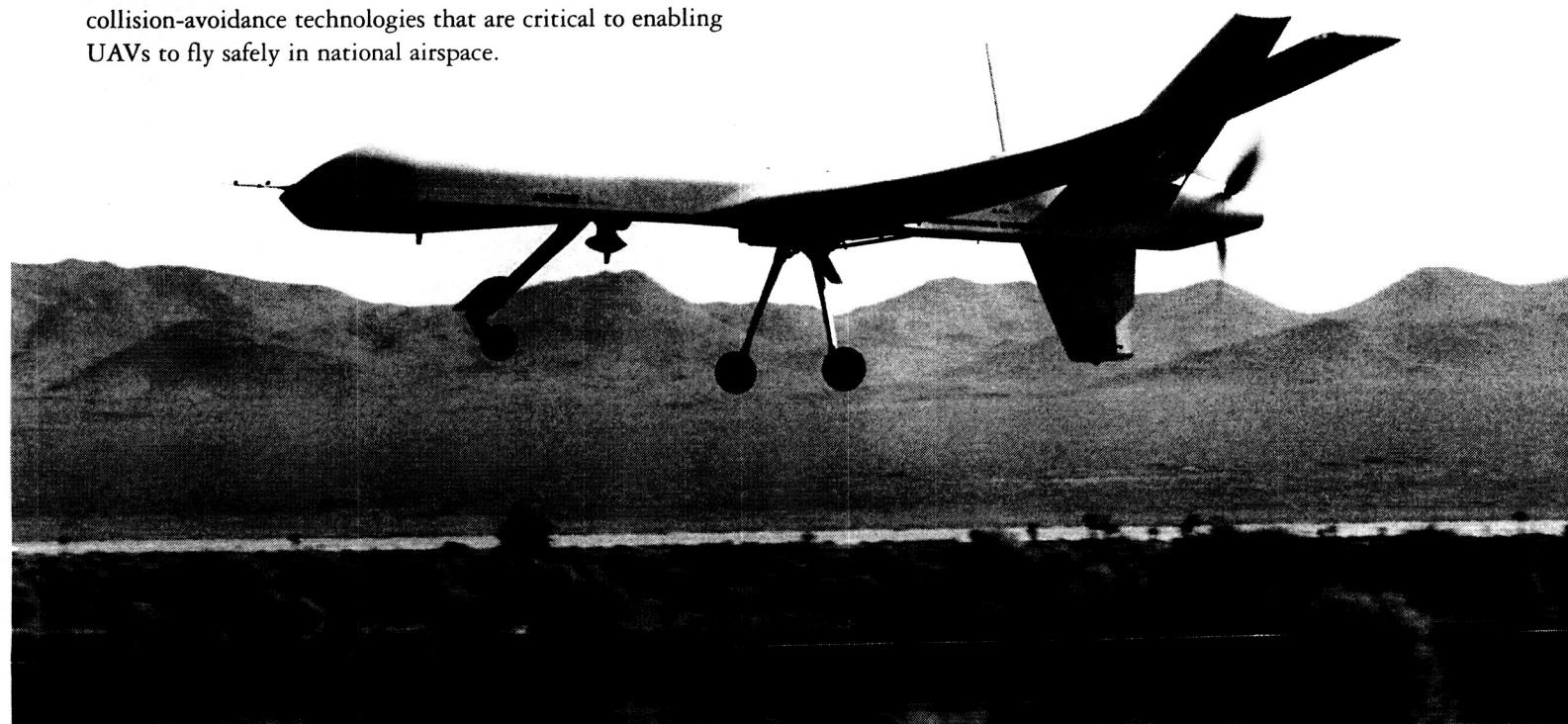
Altair is expected to be the first UAV to meet Federal Aviation Administration requirements to operate from conventional airports, with piloted aircraft, in the national airspace. In addition to triple-redundant avionics, Altair is configured with a fault-tolerant, dual-architecture flight control system. The UAV will be equipped with an automated collision-avoidance system and an air traffic control voice relay. The relay allows air-traffic controllers to talk to ground-based Altair pilots through the aircraft.

Command and control of the Altair, as well as research data gathered by the UAV, will be transmitted through an "over the horizon" satellite link. The link will also allow scientists to receive research information as soon as Altair obtains it.

Altair has been designed to fly continuously for up to 32 hours. It can reach an altitude of approximately 52,000 feet and has a maximum range of about 4,200 miles. Altair can carry up to 750 pounds of sensors, radar, communications and imaging equipment in its forward fuselage. The Altair is 34 feet long, with a wingspan of 86 feet, 22 feet longer than Predator B.

Photos are available at:

http://www.dfrc.nasa.gov/Gallery/Photo/Altair_PredatorB/index.html



Summer Interns Join the NASA Team

(l to r) Brandi Hawkins, Teressa Scott, Jerryne Mitchell, Sophia Qian, Katrina Thompson, Lauren Kalastein, Jana Taylor, Errol Allen, Joseph Adkins, Charles Brooks, Marcus Bourne, and Larri Whitsett. These interns, with the exception of Qian and Kalastein, are in the NASA-NAFEO (National Association for Equal Opportunity in Higher Education) internship program. Qian and Kalastein are in the ACCESS (Achieving Competence in Computing, Engineering and Space Science) program.



Photo credit: NASA/Renee Boucharde

Brandi Hawkins — Hometown: Washington, D.C. Junior, West Virginia University. Major: German and international studies. Code IS.

Teressa Scott — Hometown: Enterprise, Al. Senior, Florida A&M University. Major: English education. "I thoroughly enjoyed my experience and all it included last year here at NASA, and I look forward to gaining more knowledge and experience this year." Code CS.

Jerryne Mitchell — Hometown: Guthrie, Okla. Senior, Langston University. Major: accounting. "I wanted a rewarding and challenging experience that would help me achieve my career goals of becoming a CPA and owning my own accounting firm." Code ADI-1.

Sophia Qian — Hometown: Mundelein, Ill. Senior, Gallaudet University. Major: accounting. "My sister is my role model. She works at NASA Goddard Space Flight Center in Greenbelt, Md." Code W.

Katrina Thompson — Hometown: Kenner, La. Third-year doctoral student, State University of New York at Stony Brook. Major: history. "NASA offers a plethora of opportunities that will enhance all of my future endeavors." Code IQ.

Lauren Kalastein — Hometown: Bellmore, N.Y. Sophomore, George Washington University. Major: mathematics. "I think my internship at NASA will be an unforgettable experience. I want to work at NASA to explore my options with mathematics." Code QE.

Jana Taylor — Hometown: Reston, Va. Third-year law student, Rutgers University. "I would like to gain a valuable and unique work experience that will support and further my career goals." Code N.

Errol Allen II — Hometown: Houston, Texas. Senior, Florida A&M University. Major: business administration. "I believe it is a wonderful opportunity. I hope to gain valuable experience to benefit my career goals." Code IH.

Joseph Adkins — Hometown: Pine Bluff, Ark. Junior, Tuskegee University. Major: chemical engineering. Came to NASA HQ: "to gain good experience in my field that will give me an advantage that will propel me in the business world." Code M.

Charles Brooks — Hometown: Atlanta, Ga. Senior, Alabama State University. Major: history. "Last year I interned in Code IQ and had an excellent experience. Though I will not be in Code IQ this year, I still look forward to a great experience in Code CE." Code CE.

Marcus Bourne — Hometown: Oak Hill, Va. Graduate student. M.Sc. international management, University of the West Indies, Barbados; B.A., Latin American studies/foreign affairs, University of Virginia. Code IS.

Larri Whitsett — Hometown: Atlanta, Ga. Sophomore, University of Georgia. Major: English/pre-law. "I hope this opportunity will allow me to explore my options and will expose me to new people and career options." Code B.



Photo credit: NASA/Bill Ingalls

Monumental Tribute

"When people look upon these mountains, they see the challenge of the American frontier—bold in vision, courageous in spirit and endless in horizon. The crew of Columbia, like the Challenger before her, had these qualities at their core. These mountains are a natural testament to their memory, their spirit of exploration and will endure forever."

With those words, NASA Administrator Sean O'Keefe helped dedicate a new tribute to the STS-107 crew last month. He joined Interior Secretary Gale Norton at the U.S. Department of the Interior in Washington on June 10 to announce the naming of a mountain in memory of Shuttle Columbia and its crew, who were lost during re-entry February 1. "Columbia Point" rests in the Sangre de Cristo Mountains in southwest Colorado.

Secretary Norton called Columbia's crew, Rick Husband, Willie McCool, Mike Anderson, Kalpana Chawla, Dave Brown, Laurel Clark and Ilan Ramon, modern-day heroes. In naming Columbia Point, the Interior Department also recognized the scientific exploration, technical excellence and the dream of space flight exemplified by Columbia's 16-day mission.

Columbia Point's summit is 13,980 feet high. It sits on the east side of Kit Carson Mountain. About a half-mile northwest of Columbia Point is "Challenger Point," which is named in memory of the seven astronauts who lost their lives in the 1986 shuttle accident.

Among the honored guests at last month's ceremony at the Interior Department were Dave Brown's parents, who live in Arlington, Va., and his brother. A larger ceremony for relatives of the STS-107 crew is being planned at Columbia Point in August.

NewsFLASH! NASA Maps Bolts of Lightning

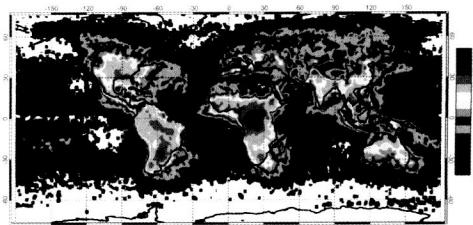
NASA scientists at the National Space Science and Technology Center in Huntsville, Ala., are using computer models and new technology to improve both lightning and severe storm probabilities and prediction. The resulting information represents the first time NASA's Optical Transient Detector and Lightning Imaging Sensor — satellite-based sensors that use high-speed cameras to detect brief lightning flashes — have been cross-calibrated to form a composite representation of global lightning patterns.

The North Alabama Lightning Mapping Array, developed by NASA scientists, shows lightning flash rate trends that will help regional weather forecasting offices to better characterize thunderstorm initiation and distinguish weakening storms from those gaining strength.

Another new lightning index that combines water vapor measurements of clouds with data from Global Positioning Systems has improved lead-time for first lightning strikes from thunderstorms.

For offshore areas, researchers are combining Geostationary Earth Orbit satellite data with other satellite and surface lightning measurements to help identify turbulent areas for aviators to avoid.

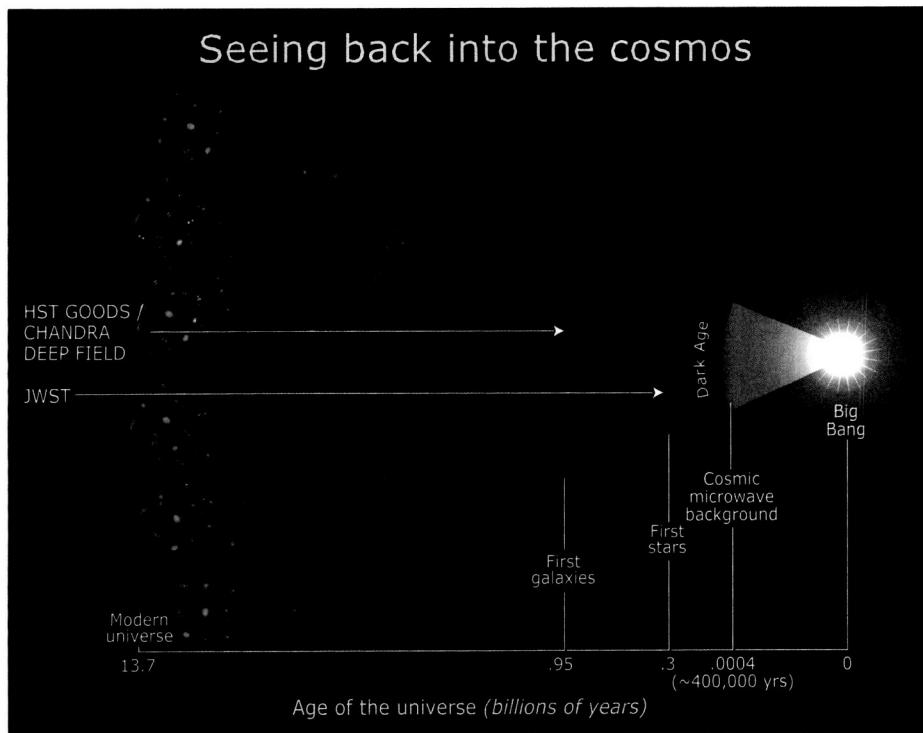
For more information about advances in lightning study, visit NASA's Earth Science Enterprise at: www.earth.nasa.gov/



A year of global lightning, compiled using satellite data. (NASA/NSSTC)

Secret Lives of Galaxies Unveiled in Deep Survey

Seeing back into the cosmos



Observatories continue to reach farther back in time to study the evolution of stars and galaxies. This illustration shows that the Chandra X-ray Observatory and the Hubble Space Telescope's Advanced Camera for Surveys looked back billions of years to see the first galaxies. Their combined effort was part of the Great Observatories Origins Deep Survey (GOODS). Hubble's successor, the James Webb Space Telescope (JWST), will gaze even farther back in time to the birth of the first stars.

Two of NASA's Great Observatories, bolstered by the largest ground-based telescopes around the world, are beginning to harvest new clues to the origin and evolution of the universe's largest building block, the galaxies. It's a bit like finding a family scrapbook containing snapshots that capture the lives of family members from infancy through adolescence to adulthood.

"This is the first time that the cosmic tale of how galaxies build themselves has been traced reliably to such early times in the universe's life," says Mauro Giavalisco, head of the Hubble Space Telescope portion of the survey, and research astronomer at the Space Telescope Science Institute (STScI) in Baltimore, Md.

So far, the Hubble Space Telescope has joined forces with the Chandra X-ray Observatory to survey a relatively broad swath of sky encompassing tens of thousands of galaxies stretching far back into time. (This unprecedented survey will soon be joined by the Space Infrared Telescope Facility (SIRTF), which is to be launched in August 2003).

Called the Great Observatories Origins Deep Survey (GOODS), astronomers are studying galaxy formation and

evolution over a wide range of distances and ages. The project is tracing the assembly history of galaxies, the evolution of their stellar populations and the gusher of energy from star formation and active nuclei powered by immense black holes.

In preliminary results soon to be published, Hubble astronomers report that the sizes of galaxies clearly increase continuously from the time the universe was about 1 billion years old to an age of 6 billion years. (This is approximately at half the current age of the universe, 13.7 billion years.) GOODS astronomers also find that the star birth rate rose mildly (by about a factor three) between the time the universe was about one billion years old and 1.5 billion years old, and remained high until about seven billion years ago, when it quickly dropped to one-tenth the earlier "baby boomer" rate. This is further evidence that major galaxy building trailed off when the universe was about half its current age.

The Chandra observations amounted to a "high-energy core sample" of the early universe. One of the fascinating findings in this deepest X-ray image ever taken is the discovery of mysterious black holes, which have no optical counterparts.

"We found seven mysterious sources that are completely invisible in the optical with Hubble," said Niel Brandt of Penn State University, who presented the X-ray results. "Either they are the most distant black holes ever detected, or they are less distant black holes that are the most dust enshrouded known, a surprising result as well."

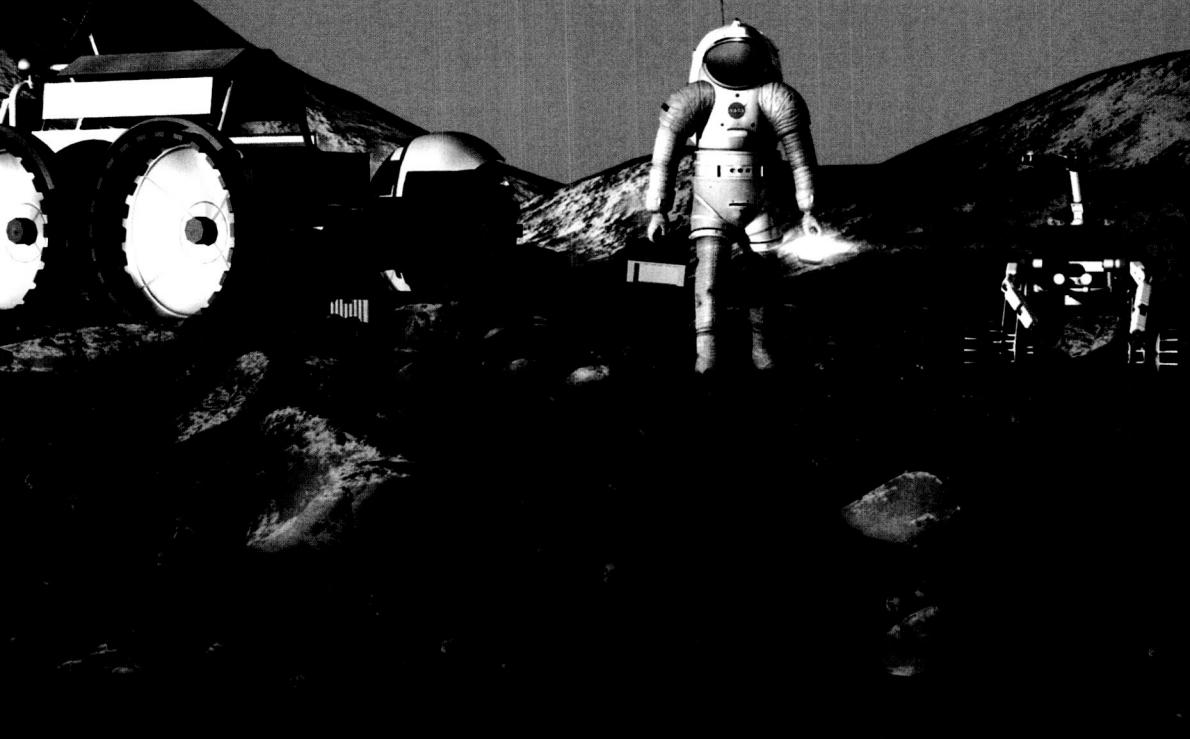
When comparing the Hubble and Chandra fields, astronomers also found that active black holes in distant, relatively small galaxies were rarer than expected. This may be due to the effects of early generations of massive stars that exploded as supernovae, evacuating galactic gas and thus reducing the supply of gas needed to feed a supermassive black hole.

Electronic images and additional information are available at: hubblesite.org/news/2003/18

NEW PROGRAM SENDS NATION'S TEACHERS "BACK TO SCHOOL"



NASA VISION
JULY 2003



On June 30, NASA launched a major new education initiative, the NASA Explorer Schools Program, before educators, policy makers and educational technology industry representatives at the National Educational Computing Conference (NECC 2003) in Seattle at the Washington State Convention & Trade Center. The multimedia event kicked off an innovative program that will send the nation's science and mathematics teachers "back to school" at NASA Centers in the summers to acquire new teaching resources and technology tools using NASA's unique content, experts and other resources — to make learning science, mathematics and technology more appealing to students.

As part of the annual conference hosted by the International Society for Technology in Education (ISTE), NASA Associate Administrator for Education Dr. Adena Williams Loston, joined by Astronaut Don Pettit and other special guests, formally announced the first 50 selected NASA Explorer Schools before an audience of nearly 1,000 science and technology educators.

"At NASA, we feel compelled to act, to implement proactive and innovative approaches such as the NASA Explorer Schools Program, to help stem the decline in the number of young people pursuing the study of science, technology, engineering and math disciplines," remarks new NASA Associate Administrator for Education Dr. Adena Williams Loston.

The new initiative, sponsored by the NASA Education Enterprise in collaboration with the National Science Teachers Association (NSTA), will establish a three-year partnership between NASA and 50 Explorer Schools teams, consisting of teachers and education administrators from diverse communities across the country. During the commitment period, NASA will invite teams to NASA Centers in an effort to spark innovative science and mathematics instruction directed specifically at students in grades five through eight.

For more information about the NASA Explorer Schools Program, visit: explorerschools.nasa.gov



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