March is Women's History Month

National Aeronautics and Space Administration
Goddard Space Flight Center

Goddard News

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INSIDE

2
New feature: Director's Update

4
Pluto's surface revealed

6
Goddard engineer astronaut candidate

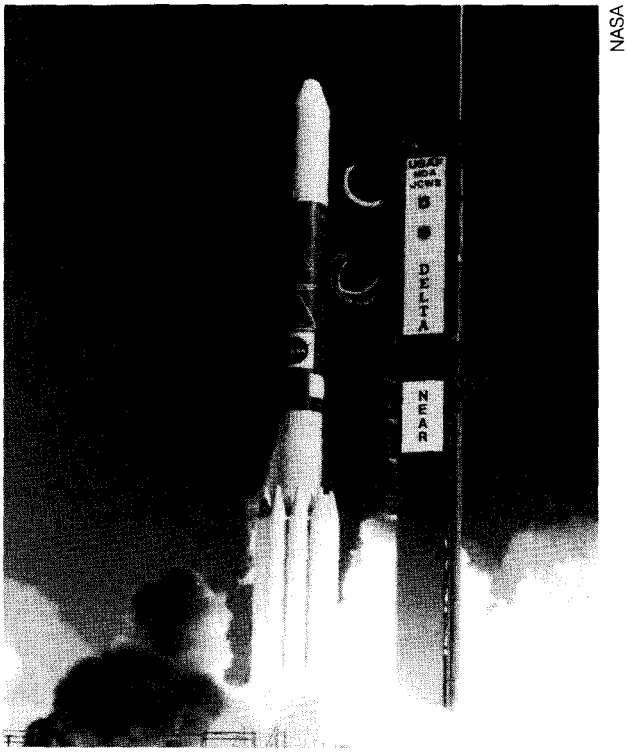
8
JASON Project VII

Near Earth Asteroid Rendezvous spacecraft flies with Goddard instruments

The Near Earth Asteroid Rendezvous (NEAR) spacecraft has embarked on a journey that will culminate in a close encounter with an asteroid. After a one-day delay, a Goddard-managed Delta II expendable launch vehicle lifted off at 3:43 p.m. EST, Feb.17 from Pad B at Launch Complex 17 on Cape Canaveral Air Station in Florida carrying the NEAR spacecraft.

The NEAR spacecraft's design emphasizes simplicity, reliability and lower cost. Its science payload includes two Goddard instruments: an X-ray/gamma ray spectrometer and a NEAR magnetometer. Other instruments include: a near-infrared spectrograph, laser rangefinder, and multispectral imager.

The launch of NEAR inaugurates NASA's innovative Discovery program of small-scale planetary missions with rapid, lower-cost development cycles and focused science objectives. NEAR will rendezvous in 1999 with the asteroid 433 Eros to begin the first long-term, close-up look at an asteroid's surface composition and physical properties. The NEAR mission is managed by The John Hopkins University Applied Physics Laboratory (JHU/APL) for NASA's Office of Space Science at NASA Headquarters.



NASA

The NEAR spacecraft on its way moments after its launch from the Cape Canaveral Air Station.

Polar in an elliptical orbit

by Jim Sahli

NASA's newest space physics laboratory is performing well on orbit. Polar was launched successfully from Vandenberg AFB in California at 6:24 a.m. EST Feb. 24, on a Delta II rocket and is in an elliptical polar orbit.

"As of day 12, we have raised perigee using onboard propulsion and powered on all but two of the Polar instruments. Mission operations continue to hum right along on schedule," said Dr. Bob Hoffman, the Polar Project Scientist at Goddard.

Polar is the latest spacecraft in NASA's Global Geospace Science mission series, which is part of the International Solar-Terrestrial Physics (ISTP) program. Polar and a sister spacecraft, Wind, are slated to perform simultaneous, coordinated measurements of key regions of Earth's space environment, including observations of entry and transport of solar plasma over Earth's magnetic poles, imaging of the northern aurora (Northern lights) and investigations of solar wind properties. Wind was launched in November 1994.

The Polar spacecraft carries 11 instruments. Currently it is in an elliptical orbit with an apogee of 32,000 statute miles and a perigee of 3,200 statute miles on a polar path inclined 86 degrees from the equator.

The satellite is a spin-stabilized cylinder-shaped spacecraft 7.9 feet in diameter and 6.9 feet high excluding

Continued on page 5

Director's Update

by Joe Rothenberg

Editor's note: *What follows is a column written by Center Director Joe Rothenberg. It replaces the Director's Dialogue column in the Goddard News. Employees with Director's Dialogue questions may continue to submit them to the Office of Public Affairs, Code 130. Questions submitted should include mail code address or e-mail address so that employees can receive a response.*

Beginning with this issue of the Goddard News, I will use this space to update you on what's happening around the Center. I hope that the information it contains will help to keep you informed about the exciting things going on at GSFC.

The successful launches of the SOHO, Polar and RXTE spacecraft over the past several months have provided the space science community with new tools to study both the sun Earth connection and the X-ray sources emanating from the universe.

The Mission to Planet Earth program continues to progress well. The instruments for the TRMM spacecraft are currently being integrated proceeding toward a fall 1997 launch. The EOS AM Platform is on schedule for a 1998 launch and the first Earth System Science Probe Announcement of Opportunity is scheduled to be released this spring. On the new initiative front, Center scientists and engineers working with the community, are actively pursuing scientific and technology questions for the Agency which will lead to future Goddard-sponsored missions. As one example, a Goddard led team is currently studying the next generation Space Telescope.

Along with our mission activities, strategic planning activities that will shape the future of the Center are well underway. These activities are critical to carry out our mission within the current and future budget environment as well as develop a constituency who will truly view Goddard as a national resource. The strategic planning activities are encompassed in three major efforts: near term "Strategic Roadmap" actions to refocus of the Goddard workforce into a hands-on technology leadership role; a Center Strategic Plan Development activity led by Dr. Dorothy Zukor to establish the plan to ensure GSFC maintains and enhances its leadership as the NASA Center of Excellence for Scientific Research; and the development and commitment of the Center to a set of programmatic goals designed to enable significant improvements in the cost effectiveness of our missions.

These three activities represent ambitious efforts and will provide exciting challenges for Goddard. They will involve most of the GSFC workforce over the next several years and more importantly ensure that the Goddard Space Flight Center will continue to be the nation's leader in technology and scientific research from space. I ask each of you to become involved as the opportunity arises.

COMMUNICATION HINTS ON THE WAY

A new column designed to help Goddard employees improve writing and communications skills begins in the April issue of the Goddard News. The column will provide tips on how to give effective speeches and presentations, improving letter and memo writing and writing for various types of publications. Don't miss the debut of this column in the next issue of the Goddard News.

X-ray Timing Explorer renamed by NASA

NASA has renamed the X-ray Timing Explorer, placed into orbit in December 1995, in honor of a pioneer in the field of X-ray astronomy, Bruno B. Rossi. The new official title of the 6,700-pound observatory is the Bruno B. Rossi X-ray Timing Explorer (RXTE).

The RXTE is currently in a circular 360-statute-mile (580-kilometer) orbit with an inclination of 23 degrees. Among the objects to be studied by RXTE are stellar black holes, neutron stars and quasars.

Professor Rossi and his colleagues discovered the first non-solar source of X-rays in a dramatic rocket flight in 1962. This source, Scorpius X-1, was the first of many collapsed stars that also are a key topic of study for the RXTE.

Rossi, who died in 1993 after a long and distinguished career, served as professor of Physics and Professor Emeritus at the Massachusetts Institute of Technology. He can be described as a pioneer in two separate fields of observational space astrophysics: X-ray astronomy and space plasma physics. He was the co-recipient of the prestigious Wolf Prize in Physics in 1987. The Bruno Rossi Prize, awarded annually by the American Astronomical Society to a top astrophysicist for achievements in the field, is named in his honor.

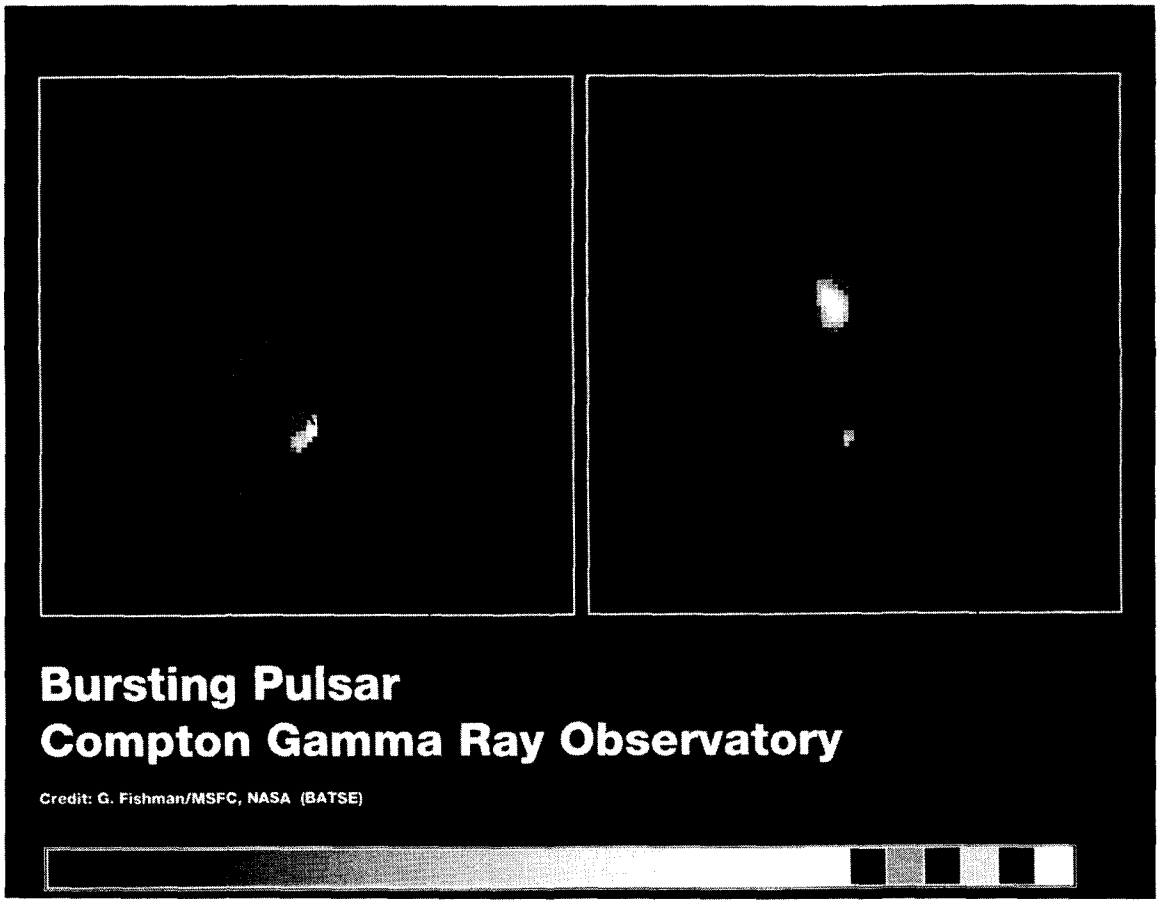
The spacecraft, which is about the size of a telephone booth, is carrying three science instruments which work together to increase scientific understanding of cosmic X-rays sources.

RXTE is the first mission for which 100 percent of the observing time will be available to the broad scientific community. Specific observations will be proposed by scientists from the United States and abroad. Observations are planned by scientists at the XTE Science Operations Center at Goddard.

The RXTE was developed by and is managed and operated by Goddard for NASA's Office of Space Science, Washington, D.C.

New type of astronomical object discovered in our galaxy

by Donna Drelick



NASA astronomers have discovered a new type of object towards the center of our Milky Way galaxy exhibiting a combination of behaviors never before seen in the 35-year history of gamma-ray astronomy.

During the first day it was observed, the source produced over 140 powerful bursts of gamma-rays; since then, it has settled down to a daily rate of about 20 bursts. It is currently the brightest source of hard X-ray/gamma-rays in the sky.

The discovery was announced recently in a paper published in the scientific journal "Nature" by scientists from the Marshall Space Flight Center; the University of Alabama in Huntsville; the Massachusetts Institute of Technology in Cambridge, Mass.; and the University of Amsterdam in the Netherlands.

The unusual object in the southern sky was discovered in early December 1995 by researchers using an instrument known as the Burst and Transient Source Experiment, aboard the Goddard-managed Compton Gamma Ray Observatory spacecraft. Since Dec. 2, the new burster has produced more than 1,000 hard X-ray bursts.

"We're particularly excited about the discovery of a new X-ray source," said NASA Marshall astrophysicist Dr. Gerald Fishman. "The object's strange behavior is one of the major discoveries in X-ray astronomy in the past decade."

In mid-December, NASA scientists discovered an additional source of steady radiation that seemed to reside at the same position in the sky with the burster. This new object further surprised scientists when it was observed to continuously emit pulses at a rate of about twice per second. It was now classified as a pulsar, and scientists soon learned the burster and the pulsar were one and the same source.

"The properties of this X-ray source are unlike those of any we know," explained Dr. Chryssa Kouveliotou of Marshall. "The burst repetition rate makes this phenomenon very different from gamma ray bursts that we have observed several thousand times from throughout the universe. Also, the longer duration and persistent bursting makes the object very different from so-called Soft Gamma Ray Repeaters, which have been observed to burst in short, isolated episodes separated by several years."

This bursting pulsar was later found by Dr. Mark Finger of the Universities Space Research Association at Marshall to be a member of a binary system, performing one full revolution around its low-mass companion every 12 days. "The most likely explanation at this time is that the bursts of X-ray energy may result when the lighter of the pair of stars loses its material by gravitational or magnetic forces to the neutron star," said Kouveliotou.

A neutron star is an exotic star with a mass greater than the Sun and a diameter of only about 10 miles. "The discovery of the new X-ray source may lead to a better understanding of how neutron stars form and evolve," Kouveliotou said.

The source was discovered shortly before the recent launch of the Goddard-managed Rossi X-ray Timing Explorer (RXTE) spacecraft, (recently renamed see story on page 2) which carries the largest collecting area of X-ray detectors ever flown in space. "Our highest scientific priority, after evaluating the operation of the satellite and X-ray instruments, was observing this transient source" said Frank Marshall, Director of RXTE's Science Operations Center at Goddard.

"With better measurements, we should be able to pin down the heoretical model," says Dr. Jean Swank, RXTE Project Scientist at Goddard. As soon as RXTE could observe the source, its detectors were pointed to

See ASTRONOMICAL on page 5

Hubble reveals Pluto's surface

by Tammy Jones

For the first time since Pluto's discovery 66 years ago, astronomers have at last directly seen details on the surface of the solar system's farthest known planet from pictures sent back by the European Space Agency's Faint Object Camera aboard NASA's Hubble Space Telescope.

Hubble's snapshots of nearly the entire surface of Pluto, taken as the planet rotated through a 6.4-day period, show that Pluto is a complex object, with more large-scale contrast than any planet, except Earth.

The images also reveal almost a dozen distinctive albedo features, or provinces, none of which have ever been seen before. They include a "ragged" northern polar cap bisected by a dark strip, a bright spot seen rotating with the planet, a cluster of dark spots, and a bright linear marking that is intriguing the scientific team analyzing the images. The images confirm the presence of icy-bright polar cap features, which had been inferred from indirect evidence for surface markings in the 1980s.

This historic new look at Pluto helps pave the way for a proposed Pluto flyby mission early in the next century. Pluto is the only solar system planet not yet visited by a spacecraft.

"Hubble is providing the first, tantalizing glimpse of what Pluto will be like when we get there," said Dr. Alan Stern of Southwest Research Institute's Boulder, Colo., research office. Stern led the team who used Hubble to obtain the most detailed view yet of Pluto. The Pluto imaging team also includes Dr. Marc Buie of Lowell Observatory, Flagstaff, Ariz., and Dr. Laurence Trafton of the University of Texas, Austin. This team of planetary scientists used the Faint Object Camera aboard the Hubble to obtain more than a dozen high-quality visible and ultraviolet images of Pluto in mid-1994. Those images have now been carefully reduced and analyzed.

The Hubble images reveal much more surface variety on Pluto than on other icy objects in the outer solar system, including Pluto's often-cited twin, Neptune's large moon Triton.

Pluto is two-thirds the size of Earth's Moon, and 1,200 times farther away. Pluto's apparent size in the sky is so small (0.1 arcseconds, which equals 1/36,000th of a degree), that 18,000 Plutos would need to be lined up to match the diameter of the full Moon. This puts Pluto's surface below the resolution limit of the largest ground-based telescopes; as a result it has been impossible to directly see any significant detail on Pluto before these Hubble observations.

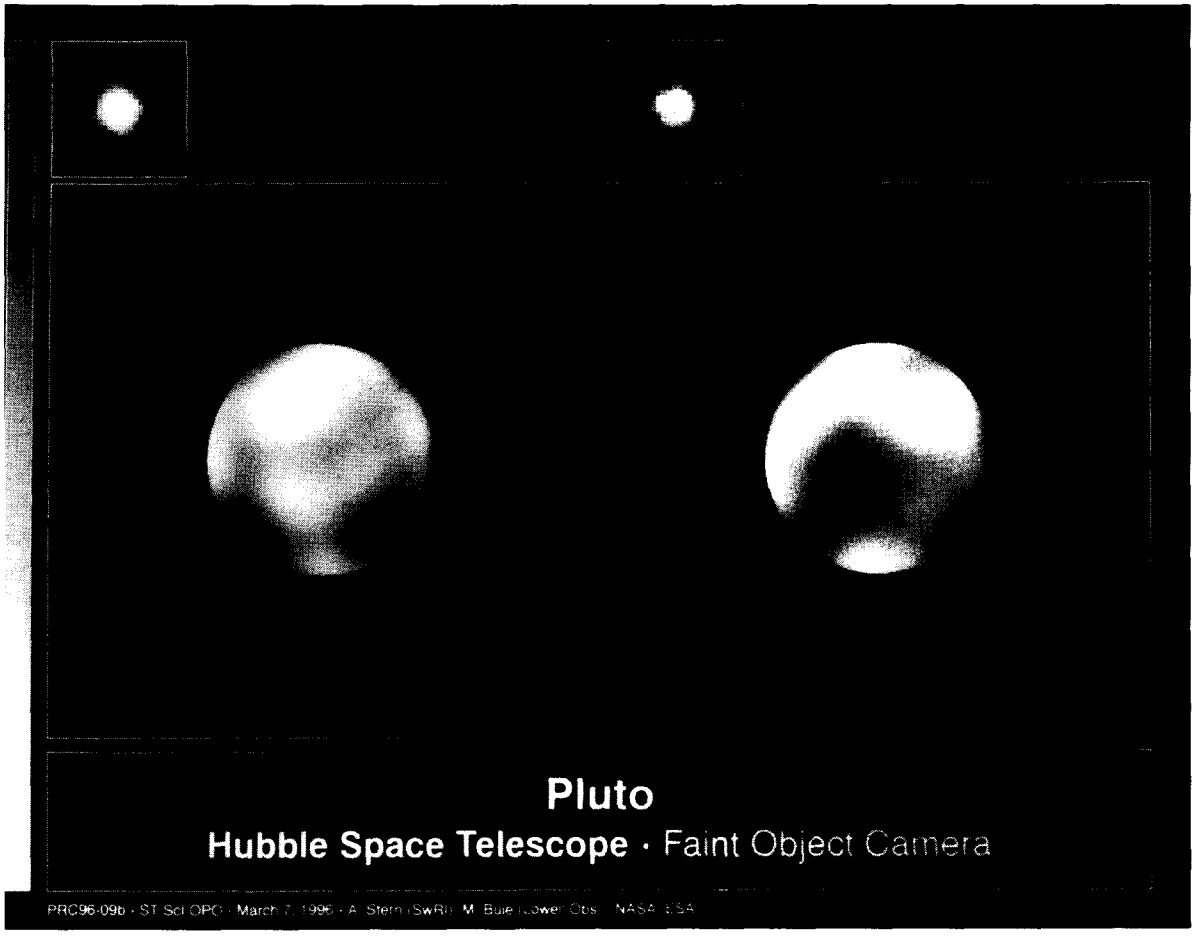
Viewing such a remote and small body has been so difficult that Pluto's moon Charon was not detected until 1978, despite the fact that Pluto itself was discovered by Clyde Tombaugh in 1930.

Shortly after its launch in 1990, the Hubble Space Telescope first peered at Pluto and clearly distinguished the planet and its satellite (which is only 1/3000th of a degree away) as two separate objects. However, a detailed look at Pluto's surface had to wait until Hubble's optics were improved during the 1993 servicing mission.

The Advanced Camera, planned to be installed on Hubble in 1999, will yield slightly better images of Pluto. This will be the best view of the distant planet until space probes eventually make the long trek across the solar system.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc., for NASA, under contract with Goddard. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.

NASA/ESA



Polar in an elliptical orbit

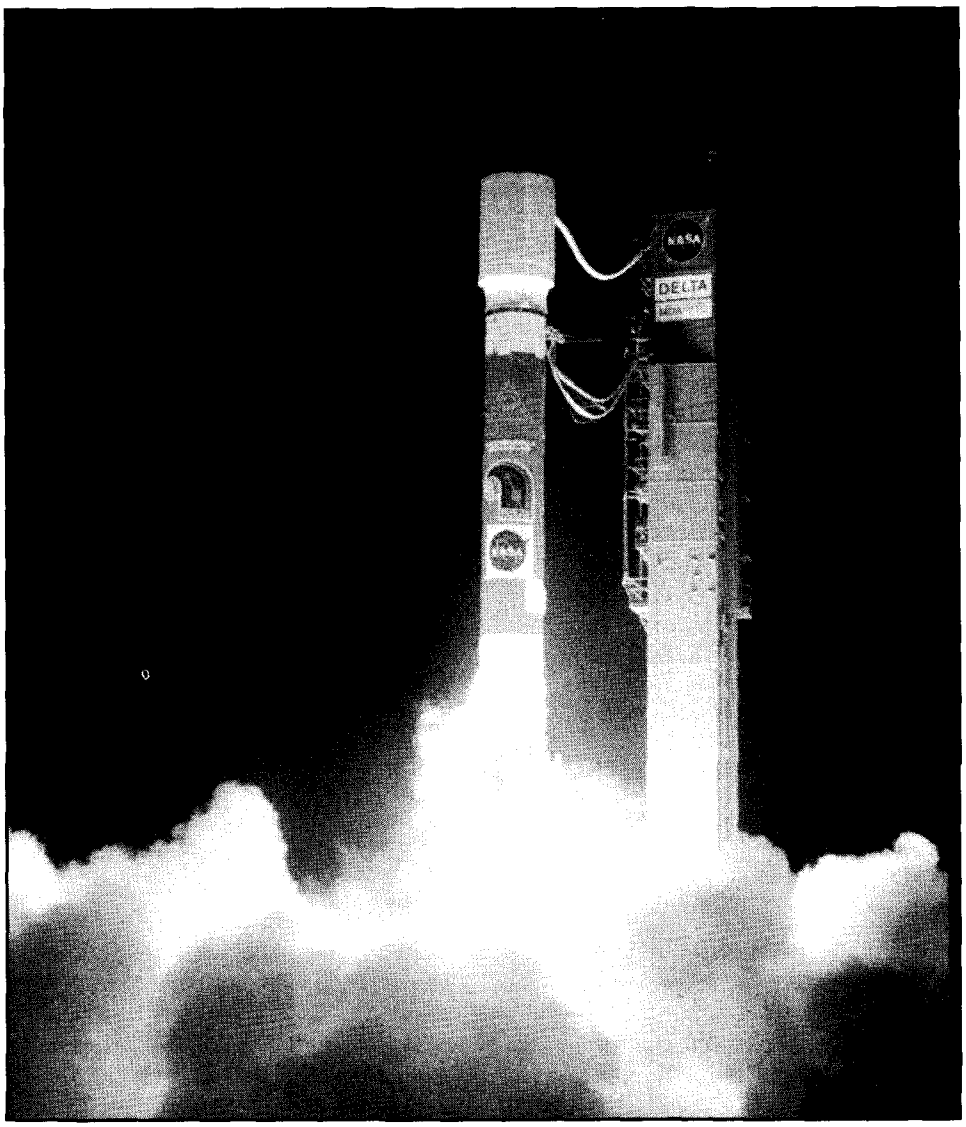
Continued from page 1

the despun platform. Dry weight is 2,200 pounds, with an additional 660 pounds of hydrazine propellant for orbit and attitude control. Its design life is three years.

The instruments on the Polar spacecraft were supplied by university and industry teams as well as NASA laboratories. Data from the instruments will be used to study a vast range of phenomena from electromagnetic radiation to charged particles from very low to relativistic energies. Especially important on Polar are the three high resolution imagers looking down on the Earth's polar region. The instruments will image at wavelengths from the visible to ultraviolet and into the X-ray region.

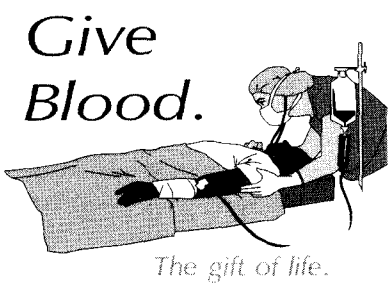
Goddard manages the Polar project for the Office of Space Sciences at NASA Headquarters.

Information about the Polar mission and the ISTP are available on the Internet at the following locations: Polar:http://www.istp.gsfc.nasa.gov/ISTP/ggs_project.html;ISTP:http://www.istp.gsfc.nasa.gov/



NASA

A Delta II rocket managed by Goddard's Orbital Launch Services Project (Code 470) lifts off from Space Launch Complex-2 at Vandenberg AFB.



New astronomical object discovered

ASTRONOMICAL, from page 3

obtain detailed information about the X-ray spectrum and its variations.

The two large instruments on the spacecraft, provided by teams led by Swank and Dr. Richard Rothschild of the University of California at San Diego, quickly found the source to be very bright across the X-ray band from 2 to 60 keV, with strong persistent emission as well as numerous bursts.

RXTE made repeated scans across the source to determine the position of the source accurately enough to allow astronomers to search for radio or visible light from it. Within the past ten days, a radio source and a very faint visible star have been identified in the direction of the X-ray source. Scientists are working furiously to see if the radio and visible light are coming from this object.

The bursting pulsar is a transient X-ray star that is expected to die out fairly soon, within a few weeks to, at most, a few months. Therefore, scientists are working feverishly to try to unravel its mysteries while it still shines.

The Compton Gamma Ray Observatory, launched in 1991, is managed by Goddard. The Burst and Transient Source Experiment is managed by Marshall Space Flight Center. The Rossi X-Ray Timing Explorer, launched on Dec. 30, 1995, is also managed by Goddard Orbital Launch Services (Code 470) team.

Goddard engineer may become astronaut

by Ann Jenkins

NASA

To prepare for the Hubble Space Telescope Second Servicing Mission, Paul Richards works underwater during tests that simulate the astronauts' tasks in space.

Many children dream of becoming astronauts, but Paul Richards, of the Hubble Space Telescope Project, never gave up that dream. A Goddard engineer who regularly works with astronauts, Richards, 31, recently completed a battery of medical and psychological tests and interviews at the Johnson Space Center to see if he has got the "right stuff" to become an astronaut.

"I remember watching the Apollo launches in kindergarten ...the teacher sitting us down in front of the TV," says Richards. "Ever since then I wanted to be an astronaut."

Richards just finished the next-to-last step in achieving his dream: a week-long series of extensive tests and a personal interview with NASA's astronaut selection committee. He was one of 123 chosen from a field of about 2,500 applicants. NASA will chose about 20 to become astronauts. Their names will be released in mid-April.

Since joining the Goddard team, Richards has worked on many exciting projects, the most recent being the Hubble Space Telescope Flight Systems and Servicing Project. Richards developed tools used by the astronauts to service Hubble in 1993. That mission improved Hubble's vision and helped change modern astronomy.

"The first (Hubble servicing) mission involved redesigning some power tools and coming up with some other tools from scratch," explains Richards.

On Hubble's Second Servicing Mission, scheduled for 1997, astronauts will place two new instruments on Hubble and do scheduled maintenance. For this mission, Richards explains "I'm the team lead on the next generation power tool, which is the Pistol Grip Tool. That's what I focus most of my attention and energy on."

Richards also serves as a "suited test subject," which means he gets to play astronaut during underwater tests that simulate space conditions. "One of the best ways to simulate it (the astronauts' work in space) is to run neutral buoyancy simulations. So we actually get in a space suit that is tied to umbilicals and go underwater in a tank 40 feet high, 80 feet across.

"We have a mockup of the Hubble in it (the tank) and a mockup of the Shuttle. With the assistance of scuba divers and a whole team, we work through the missions. ...I become sort of a liaison between the design engineers and the astronauts."

One of Richards' favorite tools is the Pistol Grip Tool, which he developed for the Hubble Second Servicing Mission. The tool was recently selected to aid in the building of Space Station. The Pistol Grip Tool has many features found in high-end, industrial power tools, but it is much smaller and self-contained. Though developed for NASA, Richards foresees its use in medicine, particularly in orthopedics.

Richards' work has earned him numerous NASA awards, including the astronauts' own Silver Snoopy. Given for enhancing flight safety and mission success, the coveted Silver Snoopy award was presented to Richards by astronaut Jeff Hoffman of the first Hubble servicing mission.

"The Silver Snoopy is the most relevant award I have because it's given directly by the crew, who is the end user," says Richards. "The other accomplishment I'm proud of is that the tools performed well during the mission, and seeing Hubble accomplish its mission and its objectives after the servicing mission. That was more satisfying than any individual award — to be a part, to do good engineering, and then to see it be able to bring down great science."

Another one of his proudest moments was having his tools demonstrated on the top-rated TV show *Home Improvement*—by the astronauts of the Hubble servicing mission! "The crew from the Hubble Servicing Mission was invited to be on the show *Home Improvement*, on the 'Tool Time' segment of it," says Richards. "I got to sit in the audience and see the taping of it. And before the show, I got to have dinner with Tim Allen and Debbie Dunning, who plays Heidi on the show. Then, after the show, I also got to go on-stage and get my picture taken with the (Hubble First Servicing Mission) crew and Tim and Al."

When asked if he would like to service the Hubble Space Telescope himself on the scheduled 1999 servicing mission, Richards responds, "I'd love to! That would be an excellent mission to come back on. And to work again with the people here at Goddard would be great, and to work with Hubble, which I am so familiar with after spending the last five years of my life on Hubble."

Beyond his goal of becoming a mission specialist astronaut, Richards says "I'd also eventually like to get into teaching and to eventually finish my studies and get my doctorate. I'd like to teach at the college level, teaching hands-on engineering—the kind of work we do at Goddard."

Smithsonian features Goddard observatory

Photo by Marc DeBord

The Compton Gamma Ray Observatory, a mini-exhibition on the scientific goals and achievements of the Goddard-managed Compton Gamma Ray Observatory spacecraft, opened at the National Air and Space Museum in Washington, D.C. last month. Launched from the Space Shuttle Atlantis in 1991, the Compton Observatory is the second of NASA's Great Observatories, a family of four orbiting telescopes designed to study the universe in both visible and non-visible forms of light. The first, the Hubble Space Telescope, was launched in 1990. The mini-exhibition is located in the Museum's Milestone of Flight gallery and will be open to the public through October 1996.

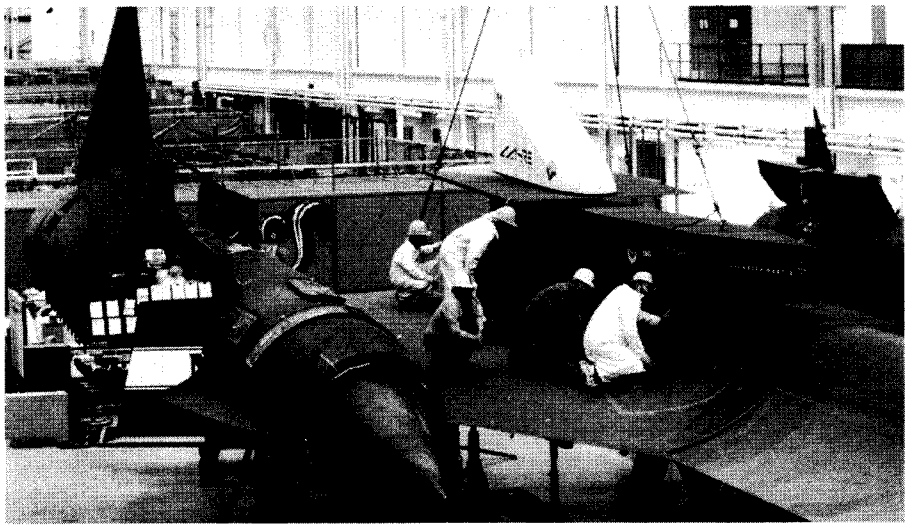
Retirees

Congratulations to the following employees who recently retired!

Name	Code	Years
Michael Rice	532.1	38
Llewellyn Nicholson	410	35
Gerald Taylor	754.2	33
Roger Jenkin	110	30
Reed McDowell	228	30
William Schoene	515.2	30
William Withgott	514.2	28
Kathleen Williams	114	27
Marjorie Johns	722.3	26
George Tompkins	224.2	22

Development of next generation Shuttle underway

Photo by Denny Lombard



Team members on the Linear Aerospike SR-71 Experiment (LASRE) perform fit checks on a 10 percent scale, half-span model of Lockheed Martin's Single-Stage-To-Orbit (SSTO) Reusable Launch Vehicle (RLV) as it is about to be mated to an SR-71 Blackbird in Palmdale, Calif. The test engine and its mount containing hydrogen fuel, water, helium and control computers weighs 13,800 pounds. The mount is 41 feet in length.

The SSTO RLV is being developed to replace the NASA Space Shuttle fleet in the next century. An advanced technology demonstrator vehicle, the X-33, will be built and flight tested in 1999.

The industry/government LASRE team, led by Lockheed Martin Skunk Works, includes Lockheed Martin Astronautics, Rocketdyne, Dryden Flight Research Center, Marshall Space Flight Center, and USAF Phillips Laboratory, Propulsion Directorate.

Local students to make observations using Hubble Space Telescope

by Tammy Jones

Students in grades K-12, working alongside some of America's foremost astronomers, will have a chance this spring to help do real science observations using NASA's Hubble Space Telescope. The resulting observations will be featured in a live, interactive telecast on NASA TV and public television this month and in April.

The observing time was offered to students by astronomers from a lively discussion and debate via the Internet. Students were challenged to go on-line to do research and decide which planet in the solar system would be best to study. Neptune and Pluto were selected as targets by students who will be serving as Hubble Space Telescope "Co-Investigators".

Over the next two months, mission planners will transform the students' selection into detailed plans for the observations. Students will be able to follow the progress of their upcoming observations via the Internet. The students then will be featured on "Live from the Hubble Space Telescope: Making Your Observations" which aired March 14, and again on "Live from the Hubble Space Telescope: Announcing Your Results" airing at 1 p.m. EST, April 23.

"Live from the Hubble Space Telescope" is part of the ongoing Passport To Knowledge series. The series provides low- or no-cost access to "real science, real scientists, real locations, real-time" by using integrated multimedia components — print, on-line and live video.

Passport To Knowledge is supported by NASA, the Space Telescope Science Institute, the National Science Foundation and public television. For more information, access the project's home page on the World Wide Web at: http://quest.arc. nasa.gov/live from/hst.html or send e-mail to: listmanager @quest.arc.nasa.gov and in the message body write: subscribe updates-hst.

An information hotline is available on 1-800-626-LIVE (626-5483) or (908) 273-4108.

JASON Project on tap for April

The annual Jason Project broadcasts are scheduled to begin in April. They have been designed to motivate students' interest in science and geography for grades 4 through 9 and to increase their awareness of career opportunities in the sciences. Through telepresence, live telecasts via satellite, students have the opportunity to join teams of scientists as they carry out a wide range of environmental research projects in Florida.

Goddard participates as a Primary Interactive Network Site (PINS) for the JASON Project Voyage VII: Adapting to a Changing Sea. All of the JASON broadcasts will be shown in the GSFC Visitor Center Auditorium which has a total seating capacity of 100 people. The Educational Programs Team is taking reservations from Goddard employees and their families for:

Wednesday, April 17, at 2:30 p.m.
Friday, April 19, at 4 p.m.
Saturday, April 20, at 1 p.m.
Wednesday, April 24, at 2:30 p.m.
Thursday, April 25, at 4 p.m.

The deadline to phone in reservations is March 29, and can be made by calling either Diane Cockrell or Michelle Jackson at 6-7205.

After securing reservations plan on arriving at least fifteen minutes prior to the broadcast time. Each one hour JASON broadcast session will be followed by a ten-minute question and answer period.

Goddard News NASA

National Aeronautics and Space Administration — Goddard Space Flight Center

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Deadline to submit material is the first of each month. For additional information contact Fred Brown (301) 286-8955.

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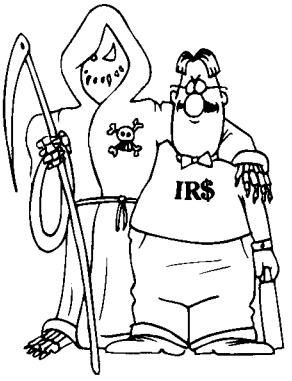

COMING IN APRIL!