National Aeronautics and Space Administration
Goddard Space Flight Center

# Goddard News

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Keeping a watchful eye

# 25th anniversary of first Moon landing observed

by Jim Elliott

At 4:17:40 P.M. EDT on July 20, 1969, two men landed on the Moon.

As a tense world waited breathlessly, Apollo 11 left its orbit, descended toward the 4.5-billion-year-old Moon's pock-marked surface and — dangerously short of fuel — set down gently on the unfamiliar lava terrain. With touchdown, astronaut Neil Armstrong proudly reported:

"Houston. Tranquillity Base here. The Eagle has landed."

Now, 25 years later, the world well remembers that feat — a day when almost everyone and everything stopped to look and to listen to an activity that previously only had been a dream. Memories of that moment, perhaps faded somewhat by the years in some people's minds, remain as vivid today as they did then for the scores of Goddard Space Flight Center employees who participated directly in the flight. They still look upon Apollo 11 as "the event of the century."

The event climaxed 10 years of effort by the U.S. space program, successfully answering a challenge made by a young, far-sighted President John F. Kennedy. Just four months into his presidency — on May 25, 1961 — Kennedy went before a joint session of Congress to make a bold and astonishing suggestion that the United States set as its goal to send men to the Moon and return them safely to Earth "before this decade is out."

The event marked a political and technological victory for this Nation over its cold war rival, the Soviet Union, as well as a turning point in human exploration of the universe.

The dramatic touchdown following liftoff atop a giant Saturn rocket from the Kennedy Space Center, Fla., on July 16 and a 240,000-mile (386,000-kilometer) journey underscored the immensity of the ambitious NASA project. It was the first time a human would set foot on a world other than the Earth.

The nearly flawless flight of astronauts Armstrong, Buzz Aldrin and Michael Collins was one of the most highly-publicized events in history, with NASA recording and making public by radio and TV a minute-by-minute account of the historic flight.

During the mission, Goddard personnel played a key role, their efforts centering on vital tracking and communications links of the Manned Space Flight (MSFN) and NASCOM (NASA Communications) networks.

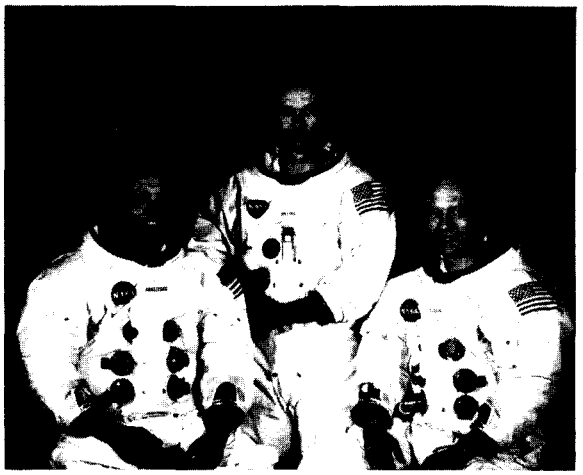
Goddard teams worked around the clock in computer and control areas of Building 14, at remote sites around the world and aboard tracking ships on the high seas. The MSFN used 17 ground stations, four tracking ships and eight instrumented aircraft during that mission.

Goddard was the primary switching center for NASCOM, which routed communications to all points in the network. Prime sites were stations in Madrid, Spain; Canberra, Australia, and Goldstone, Calif. They were spaced 120 degrees apart. Each had 85-foot (26-meter) antennas capable of tracking spacecraft from an altitude of 10,000 miles (16,000 kilometers) to lunar distances.

Data and communications were relayed from the spacecraft through the huge antennas and transmitted via NASCOM — a two-million-mile hookup of landlines, undersea cables, radio circuits and communication satellites, all controlled from Goddard.

When the lunar module separated from the command module, the MSFN had to keep track of both spacecraft at once, providing two-way communication and telemetry between them and Earth. To accomplish that, each site used its prime 85-foot (25-meter) antenna to

*Continued on page 6*



NASA

# Apollo 11 crew

The crew of Apollo 11 are seen here prior to their historic flight. From left are: Neil A. Armstrong, commander; Michael Collins, command module pilot; and Edwin E. Aldrin Jr., lunar module pilot.

# NASA Strategic Management Column

## Reinvention success

by Margaret Finarelli

***The NASA Strategic Plan recently was distributed to all NASA employees and provided to our external customers. This plan represents a major success story for NASA. This point is made clear in Mr. Goldin's message to the Plan's readers in which he states: "This document represents a significant step toward our reinvention of NASA. It underlines our commitment to strategic management, to achieving more innovative and efficient implementation of our programs, to focusing on our customers' needs, and to institutionalizing equal opportunity and workforce diversity. I am committed to working with the men and women of NASA to meet our goals and realize our vision."***

***The following is a summary of the NASA Strategic Plan and strategic management process that was acknowledged by Vice President Al Gore as one of the Agency's significant "Reinvention Success Stories" during his June 15, 1994 visit to NASA Headquarters.***

NASA is adjusting to a fundamental paradigm shift as U.S. space efforts evolve from programs driven largely by Cold War competition to post-Cold War programs spurred by the need to contribute to national research and development goals. While we reinvent NASA, we aim to set the standard within the U.S. Government for excellence in strategic management.

The first step in strategic management is strategic planning, and the concept underlying NASA's Strategic Plan is customer focus. We recognize that our requirements cannot be self-generated. Rather, we must carefully identify our customers and meet their needs. To this end, we have separated NASA's mission into five externally focused elements that we call Strategic Enterprises: Mission to Planet Earth, Aeronautics, Human Exploration and Development of Space, Scientific Research, and Space Technology. Each enterprise has its own strategic objectives, and each has a unique set of external customers. Each enterprise will develop mechanisms for understanding the needs of its external customers, satisfy those needs and obtain feedback in order to improve its performance. Our performance in carrying out our programs, i.e., our success as an agency, must be judged by our customers, not by ourselves.

The NASA Strategic Plan presents our top-level strategy. It clarifies our mission and the fact that we simultaneously must address broader national needs. It articulates what we do and for whom; it differentiates between ends and means; it states where we are going and how we will get there. When we get there will be dependent upon priorities and funding decisions established by the Administration and the Congress.

NASA's Strategic Plan reflects culture change not only in its content, but also in the methodology used to develop it. Over 7,000 NASA employees were involved in the year-long process to articulate our vision, our mission, and our values. Using its statement as a starting point, NASA's entire Senior Management Team proceeded to develop a meaningful Strategic Plan. Under the leadership of the Administrator, the Senior Management Team will continue to be responsible for NASA's strategic planning and for the strategic management decisions necessary to turn the plan into reality.

The NASA Strategic Plan represents the culmination of many months' work at NASA. We believe that this effort, although arduous at times, has paid off — our product is a strong consensus document that provides a clear context for key management decisions regarding policy, strategy and action. It establishes a framework for working with our customers to shape our activities and for developing a balanced set of budgetary priorities across the agency. The plan will keep us focused on our long-term goals.

# GOES-8 doing well

The Goddard-managed GOES-8 satellite is continuing to function normally following its launch from the Kennedy Space Center, Fla., on April 13. The advanced weather satellite arrived at its on-station location of 90 degrees west longitude on May 6 and has been the subject of continuous testing and evaluation since that time. Initial satellite operations activity was concentrated on Activation and Characterization (ACT) testing and was followed by the System Performance and Operations Test (SPOT) activity which is currently in progress. The SPOT test activity is designed to permit a graceful transition to an operational use of the Imager and Sounder instruments. Test results achieved to date show excellent radiometric performance for the instruments.

A major GOES-8 performance milestone was passed during the week of June 23 when stars were sighted for the first time by the Imager visible channel detectors. The Imager is now successfully acquiring stars every half-hour in support of the start-up activity of the Image Navigation and Registration (INR) system. The Operations Ground Equipment (OGE) continues to calculate the star position correctly as well as time elements that permit the Imager to be pointed precisely to the star locations. The ability of the Orbit and Attitude Tracking System (OATS) to receive and process satellite range data, landmark information and stars has been demonstrated. These data will allow the spacecraft to Earth locate images to an accuracy of 4 kilometers, which is a requirement of end product data.

Training of NOAA Operations personnel was started on June 20 and is currently in progress at the GOES Payload Operations Control Center (GPOCC) in Suitland, Md. A series of classroom and hands-on training sessions is being conducted by the NASA Mission Operations Support Team (MOST) to prepare the NOAA operations personnel to assume responsibility for the health and safety of the GOES-8 satellite on or about August 17, 1994.

## Goddard Multi-Cultural Advisory Team

The Multi-Cultural Advisory Team (MCAT) was established by the then Center Deputy Director, Peter Burr, in November 1993 as an advisory panel to Goddard's Equal Opportunity Council. Their mission is to provide leadership in promoting the benefits of a multi-cultural work environment and help ensure that each employee feels valued, participates fully and can develop to their maximum potential to achieve the Center's mission.

The team from left is: Top row; Rick Keegan, Code 240; Ryan Turner, Code 822.4; Dan Krieger, Code 120; Bernie Dixon, Code 152; Steve Smith, Code 540; Adolfo F. Vinas, Code 692; and Bob Dedalis, Code 302.A. Bottom row: Josephine San, Code 712.1; Sandra Irish, Code 721.1; Sheri Thorton, Code 441; Cricket Stevenson, Code 111.2 and Man-Li Wu, Code 910.4.

# TOMS-EP launch delayed

The launch of the Total Ozone Mapping Spectrometer-Earth Probe scheduled for July 15 has been delayed. The spacecraft was to be launched from a Pegasus-XL launch vehicle from Vandenburg Airforce Base (VAFB), Lompoc, Calif.; however, problems with the launch vehicle were discovered during an Airforce launch attempt in late June.

The TOMS-EP launch will be rescheduled after a joint NASA/Airforce investigation is completed and the Pegasus-XL is certified as flight-worthy for NASA launches. Pending the completion of the investigation the TOMS-EP spacecraft is being stored in its clean tent in the Pegasus Vehicle Assembly Building at VAFB.

# What's Up? July 1994

**International Ultraviolet Explorer (IUE)**
*Days in orbit: 6,032*

One of the more interesting stars observed by IUE during June was FK Comae. This star is somewhat cooler than our own Sun, but rotates very rapidly. This is unusual as FK Comae is also a giant star. Most Sun-like stars become giants near the end of their lifetime; the central regions of the star become smaller and denser and the outer regions become larger and less dense. This expansion of the outer layers usually results in a Star that spins very slowly, but something different has happened to FK Comae. It has been suggested that FK Comae is the result of stars that were in close orbit around each other that recently merged to form a single, rapidly rotating star.

This rapid rotation greatly enhances the magnetic activity that is common in Sun-like stars. Even in our own Sun this activity is poorly understood. It is hoped that by observing the FK Comae simultaneously in X-rays (with ASCA), ultraviolet (with IUE) and visible light, more can be learned about how this magnetic activity behaves in the extreme conditions found in the extreme conditions found in this star. This might teach us more about the milder magnetic activity produced by our own Sun.

**Hubble Space Telescope (HST)**
*Days in orbit: 1,436*

The HST has returned to full science operations following a temporary halt in observations when the spacecraft was in a safe hold, first on command from the ground and later when it commanded itself into a more advanced safe operational status.

The observatory was placed in inertial safe hold on July 5 by Goddard controller after a high-gain antenna failed to establish communications with the Tracking and Data Relay Satellite System's (TDRSS's) west satellite as expected. Investigation showed that the antenna failed to slew, and subsequent planned spacecraft slews failed to execute. After having commanded the spacecraft into inertial hold as a precautionary measure, engineers later determined that the problem was in a faulty memory unit in the DF-224 computer on the spacecraft and started recovery operations July 7. Officials were confident that the observatory would be able to fulfill its entire planned observations of the collisions of fragments of Comet Shoemaker/Levy with Jupiter. The fragments were to collide with the planet over a six-day period beginning July 16.

**Compton Gamma-Ray Observatory (CGRO)**
*Days in orbit: 1,152*

The Burst and Transient Source Experiment (BATSE) on CGRO has detected its 1,000th gamma-ray burst. Gamma-ray bursts are huge explosions that have been detected only in the gamma-ray region of the spectrum. Some last only a fraction of a second, but others are as long as a few minutes. The origins of these bursts continues to be an enigma, but scientists believe they originate in the far reaches of the Universe.

# Goddard employees remember Apollo 11

**Story and photos by Jim Elliott**

**Dick Tagler**

**Ron Moltere**

**Bob DeFazio**

**Pete Pataro**

**William R. "Russ" Jones**

**Henry Wagner**

**George Barbehenn**

**Bob Stanley**

When Neil Armstrong and Buzz Aldrin were making the descent for their historic first landing on the Moon on July 20, 1969, a number of Goddard employees were directly involved, particularly the folks in Code 500, Mission Operations and Data Systems Directorate, and played significant roles in the success of this mission.

They were responsible for tracking and communications for the entire mission and for bringing television coverage of the dramatic event to viewers around the world.

The fact that they carried out their duties without a major hitch, many believe, is testimony to the dedication, teamwork and training that went into the preparation and conduct of the mission.

Today, 25 years later, those employees directly involved in the mission look upon that experience as one of the most exciting and rewarding of their lives. Even Goddard employees not associated directly with the mission reflect on their Apollo 11 experience as something they always will remember.

One of the Code 500 employees perhaps closest to the "action" at the time was Ed Lawless, now head, Mission Planning Section, Code 542. Lawless was on the console monitoring voice communications during the Moon landing.

"Things were pretty tense, of course," he remembered. "I was monitoring several channels and was aware of the low fuel situation (the lunar lander only had seconds of fuel left), so I knew things were going to be touchy. But when I heard Armstrong say 'The Eagle has landed,' I thought 'Wow, it actually worked!' I was speechless."

Another Goddard employee close to the action that night was Ed Danko, then network operations manager and now a Loral AeroSystems supervisor supporting Code 530. "The experience was the height of my career," he explained.

Another for Network Operations Manager who also works for Loral AeroSystems is Ed Ambrose. Ambrose still maintains such excitement about Apollo 11 that he has been the sparkplug behind a recent Center 25th anniversary celebration. More than 400 hundred people were expected to attend, some as far away as Hawaii.

Dick Tagler, Code 500, now associate director in the Mission Operations and Data Systems Directorate, was an engineer working on a console in Building 14 and making sure communications with all the ground stations and the two spacecraft (command module and lunar lander) were maintained. "It was really a fun time," he remembers. "Everyone was working long hours, and we all were tired. I was so tied up with things that I really didn't realize the importance of what was taking place until I got home and saw it on television. Then, I said, 'Wow, look at that!'"

Two Lockheed contract employees currently associated with the Hubble Space Telescope (HST) program at Goddard remember the Apollo 11 mission well. Pete Pataro, Code 440.8, now operations support lead in the Space Telescope Operations Control Center (STOCC), was network support team maintenance and operations flight controller at Goddard, and George Barbehenn, Code 440.8, now a mission operations manager with HST, was the unified S-band supervisor at the ground station in Madrid, Spain.

"After waiting several days for them to get there (Moon)," he said, "we were full of anticipation. I remember most reading the biofeedbacks that were monitoring pulse, heartbeat and other things. We didn't realize they only had seconds of fuel left when they touched down, but I understand that caused quite a hectic situation at NASA headquarters."

Barbehenn worked in the Mercury, Gemini and Apollo missions, and both he and Pataro have been involved with the launch and servicing missions of HST. "Apollo was probably more intense than the Hubble servicing mission even though that was quite spectacular, also. I think there was greater uncertainty with Apollo, and we realized lives were more at stake. With Apollo, too, we knew it had to work the first time."

Another Goddard employee, Bob Stanley, Code 515, now head of the Simulations and Compatibility Branch, also was far away from Goddard, but very much involved in the Apollo 11 mission. He was station director aboard the Apollo reentry ship Huntsville off Kwajalein Island in the Pacific. The Huntsville provided critical splashdown location data to the recovery ship, USS Hornet.

"The sky was pitch black, clear and warm, when the Apollo 11 ionization track began at one horizon, passed overhead and continued to the other horizon — a sight I will never forget" he remembered. "I can remember the feeling after learning of safe astronaut recovery ... and knowing I had been given the opportunity to participate directly in a mission of such magnitude."

Gay Carls, now requirements officer in the Fight Mission Support Office, Code 501, was working for the Bendix Documentation Support Group in Building 12 at the time. Her job was to document all the communication requirements that Goddard supported for manned space flight. "Basically," she said, "I'm doing the same thing now that I did 25 years ago. Only now, everything is computerized. My biggest memory is that the mission was exciting. We were working seven days a week. It was a new frontier, and we felt a part of it."

One can imagine the enthusiasm of Donna Walls during the mission. Barely two weeks out of college, she was just learning about software and was responsible for reporting any communication dif-

Ed Danko

Chuck Woodyard

Ed Lawless

Roberta Valonis

Donna Walls

Gay Carls

Irv Salzberg

Ed Ambrose

ficulties to the ground stations involved in the mission. Now a flight dynamics engineer in Code 553, she remembered that she was most impressed with the landing. "I still have all the mementos from that time and the official awards that say I was a part of the Apollo 11 team."

Working in the same branch at the time was Bob DeFazio. Also a flight dynamics engineer at GSFC, DeFazio remembered that the branch was primarily responsible for providing maneuver support to the Johnson Space Center, Houston, Tex. "One time," he recalled, "the computer went down, and we did five lunar module maneuvers using only a hand calculator."

Irving Salzberg, head of NASCOM Systems Engineering Branch, Code 541, was working orbital trajectory determinations during the mission. "When they landed," he remembered, "a big cheer went up, and there was a lost of hand-clapping. We all were quite exhilarated. Really, we felt like we were the Lewis and Clarks of space exploration."

Charles E. "Chuck" Woodyard, associate chief of the Flight Dynamics Division, Code 550, was responsible for getting acquisition data to the tracking stations and the tracking data for orbit determination. "I was a gopher," he laughed. "I do recall that when the astronauts touched down everyone had crowded into the computer/control room. The celebration was like a graduation at West Point!"

William R. "Russ" Jones, now telecommunications manager in the Communications Management Section, Code 542, was a contract employee with Philco/Ford at the time. "We were in total awe," he recalled. "We realized we were part of a unique event. It was indescribable the feeling we had, and I remember thinking back to the challenge by President Kennedy 10 years earlier and realizing that, by golly, we had done it."

Although these people were directly involved in the mission, many, many other Goddard employees were working indirectly in support of the historic mission. Roberta Valonis, for example, was a secretary to Tec Roberts, a division chief in Code 550 at the time. Now head of the Manned Flight Awareness program, Code 503, Valonia remembered staying up all night to watch the event and the follow-up activities after the mission, such as White House dinners that the major participants attended and the Emmy Award that was accepted by Goddard for the television production and programming.

Ron Moltere, head of the Photographic Services Section, Code 253.2, recalled that although he played a relatively minor part in the mission, the flight was so emotionally all-encompassing for all employees that no matter where you worked or what you did, you somehow felt important and that you had participate in something of great historical importance.

One of the most intriguing, challenging and successful aspects of that mission, of course, was the television. Henry C. Wagner, telecommunications specialist in the Telecommunications Branch, Code 543, played a major role in establishing the TV facilities that enabled NASA to bring pictures of almost everything that was taking place on the Moon into living rooms around the world — in itself, a first of major magnitude. Wagner was working for RCA at the time and was tasked to build, test, install and operate a television control center in Sydney, Australia, to support TV received at the Parkes site and at Canberra, both in Australia; monitor both signals and select the best for transmission to the Johnson Space Center and from there to the rest of the world.

# What did he actually say?

**by Jim Elliott**

"That's one small step for man...or was it "...one small step for a man?"

Controversy over what Neil Armstrong actually said when he first set foot on the Moon 25 years ago is still a matter of controversy.

There seems to be no question that he had planned to say "a man," but did he?

According to the book, "Chariots For Apollo," the writer, Courtney G. Brooks, relates that Armstrong was in Bethpage, L.I., some weeks after the flight to receive a silver plaque bearing 11 words, "That's one small step for man, one giant leap for mankind."

"Hey, they got it wrong," Armstrong is quoted as having said. "That's not what I said. I said, '... one small step for a man ...' Someone left out a word."

The host then played a recording of his message, according to the book. "No matter how many times he (the host) played the record, and no matter at what speed," the book concludes, "there was no 'a' before the word 'man'."

"But there must be an 'a,'" Armstrong is quoted as having said. "I rehearsed it that way. I meant it to be that way, and I'm sure I said it that way."

The gracious host, according to the book, assured the astronaut that if that is what he meant "we'll make a new plaque."

Armstrong is quoted as having said, "Damn, I really did it. I blew the first words on the Moon, didn't I?"

A lot of folks, of course, suggested and still maintain that the problem was a communications glitch, pointing a finger at Goddard's NASCOM.

However, Ed Lawless, head, Mission Planning Section in Code 500, says, "No!"

Lawless was monitoring the voice communications from the Moon in Building 14 that night.

"I didn't hear an 'a' then, and I haven't heard it on any recording of his words since," he said. "I just don't think he said 'a man'."

# Keeping a watchful eye

by Karen W. Davis

Gilberto Colón (Gil) joined the Meteorological Satellite (Metsat) project, Code 480, as instrument systems manager in May 1994. Since joining the project, Colón has been busy learning Metsat instruments and spacecraft operations, as well as getting to know the people in the organization. He was born in San Juan, Puerto Rico, and lives in Olney, Md., with his wife Rosa and their four-year-old son.

Colón has a BS Degree in chemical engineering from the University of Puerto Rico, Mayaguez. After graduating from college, he worked for the Defense Contract Administration Service in Cleveland, Ohio, as a quality assurance engineer.

Colón joined Goddard in December 1980 as a fluid systems engineer in Code 713.3, where he worked on the design, fabrication and test of the Energetic Gamma Ray Experiment Telescope (EGRET) gas replenishment system. During his career at Goddard, Colón has worked on a series of challenging projects. From 1986 to 1988, he worked as the systems engineer for the Super Helium On Orbit Transfer experiment (SHOOT) experiment. Colón later moved to Code 740, where he served as the mission manager for the Solar, Anomalous and Magnetospheric Particle Explorer (SAMPEX) mission. Before joining Metsat, Colón was the instrument systems manager for the Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics (TIMED) project.

The Metsat office is responsible for the development and deployment of meteorological satellite systems and advance environmental instrumentation. In his current position, Colón plans, directs and coordinates the technical management and engineering functions for Metsat instrument activities. He also provides administrative and technical supervision to the technical officers of the Metsat complement.

"It is my job to make sure that the operation runs as smoothly as possible. I monitor the contracts to ensure that all requirements and procedures are followed. I also monitor the contractors, productivity and technical direction in case there are any changes. When problems arise, I make sure that the proper procedures are adhered to and reviewed for solutions," Colón said.

Although his initial interest was in engineering, Colón aspired to be in management. He was able to realize that goal when he became a part of Code 400. According to Colón, there are pressures and problems that arise with any job and tough decisions must be made. Despite those factors, Colón says his job is rewarding. "The instruments are extremely complex, and the problems that may occur are not only technical. Solutions must fit into the overall scheme of a successful operation; therefore, the decisions I make affect things like cost, manpower, schedules. However, I work with very good people with technical expertise and they make my job easier," Colón said.

Colón says that he enjoys working at Goddard, because there is a lot of flexibility to pursue interests and lots of opportunity to learn from others. Goddard's Metsat office works with the National Oceanic and Atmospheric Administration (NOAA) and its weather satellite system that has provided valuable data for over 30 years. Colón says the success of NOAA can be traced in part to the operational nature of the Metsat satellites and their instruments.

Photo by Ron Moltere

**Gilberto Colón**

Colón says that there is never any question about his role and purpose at Goddard, "I love being involved in something that directly affects the everyday citizens who depend on the data for the weather forecasts. I believe in the mission of Goddard and the Metsat project. What I am doing lays the foundation for a long-term investment. My job is fulfilling because it relates to the masses, and we all play a role. It is important to have the instruments in orbit on time for many reasons. They are part of a natural resource; to study the weather. For this reason, I find my job very satisfying," said Colón.

## Moon landing

*Continued from page 1.*

track one spacecraft and a backup antenna to track the other.

At 10:56 P.M. (EDT) on the day of the landing, Armstrong stepped onto the surface of the Moon, saying "That's one small step for a man. One giant leap for mankind." He was followed by Aldrin at 11:15 P.M. The two astronauts planted an American flag and left a plaque with the message, "Here, men from planet Earth first set foot upon the Moon, July 1969, A.D. We came in peace for all mankind."

During their one moonwalk, Armstrong spent 2 hours and 32 minutes on the lunar surface; Aldrin, 2 hours, 15 minutes. Liftoff from the Moon occurred at 1:54 P.M. EDT on July 21, and — after docking with the command module — the triumphant trio of astronauts headed for home, their spacecraft splashing down near their recovery ship USS Hornet at 12:49 P.M. EDT July 24 in the Pacific Ocean.

In all, there were 11 missions in the $24 billion program. The last mission was Apollo 17 in December 1972 with astronauts Ronald Evans, Eugene Cernan and Harrison Schmitt. Cernan is credited with being the last man to walk on the Moon.

# Detection technique for search and rescue tested

A new phenomenon in laser physics was demonstrated recently at Goddard's Geophysical and Astronomical Observatory. Observing the test were Ron Wallace, Code 480; (left), and Dr. Jan Kalshoven, Code 925; (right). The new laser technology demonstrated could be applied to Search and Rescue (SAR) operations.

According to Rudy Larsen, Code 480, this technology shows great potential for application to SAR. A special lasing material has been invented that could be applied to skin of an airplane or life raft. When struck by laser light, the material radiates laser light at a shifted wavelength. In SAR application, a search plane would be equipped with a scanning laser and receiving optics. The downed aircraft or life raft with the lasing material applied could be detected by narrowly filtering the received light to reject all but the shifted wavelength. The material was invented by Dr. Nabil Lawandy, formerly of Goddard.

Photo by Peter Baltzell

# Apollo stamps on sale

In recognition of the 25th anniversary of the Apollo Moon Landing, the U.S. Postal Service issued two new Moon Landing postage stamps on July 20. Ceremonies were held at most NASA Centers unveiling the stamps and the stamps were made available for purchase to Goddard employees during a special ceremony in Building 28.

U.S. Postal Service

One of the stamps is a 29-cent commemorative and the other is a $9.95 Express Mail stamp. The artwork was created by Paul and Chris Calle, a father and son team. Both are experienced stamp designers. The 1994 Moon Landing stamps are the first stamp the Calles have painted together.

Both new stamps show the same view of an astronaut on the Moon's surface. The $9.95 stamp gives a larger view of the scene, showing a second astronaut as well as the Apollo 11 landing module.

The Express Mail stamp is being sold individually and in panes of 20 stamps. The 29-cent commemorative stamp is available only as a complete 12-stamp memento of this historic anniversary. The 12 stamps on each sheet are set against a background featuring a view of Earth from the Moon. One of the sheets has Neil Armstrong's famous words as he stepped onto the Moon's surface; "that's one small step for a man, one giant leap for mankind."

# Mather receives honorary degree

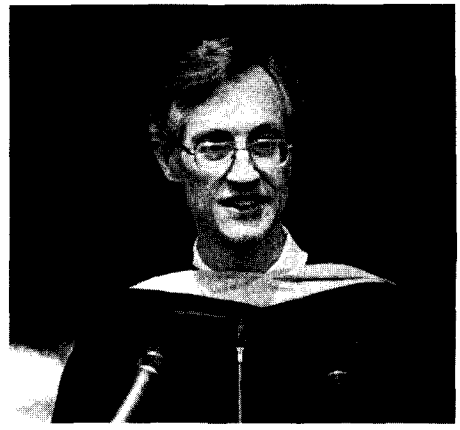


Photo by Steven Goldblatt

**John Mather**

At the 122nd commencement ceremony for Swarthmore College, Swarthmore, Pa., Goddard scientist John Mather, Code 685, was presented with an honorary degree by college president Alfred Bloom.

Mather is a 1968 graduate of Swarthmore and joined Goddard shortly after finishing his graduate work at the University of California at Berkeley.

In 1974, Mather originated the concept of the Cosmic Background Explorer (COBE), a satellite designed to study in many different ways the microwave radiation, pervasive in space, thought to be left over from a hot phase of the early universe.

# Retirees

Congratulations to the following employees who recently retired!

| Name | Code | Years |
|---|---|---|
| Harry Cyphers | 442 | 36 |
| David Detwiler Jr. | 841 | 36 |
| John Stripling | 832.2 | 35 |
| Roger Smith | 822.1 | 33 |
| Robert Jones | 833.1 | 32 |
| William Cooper | 230 | 31 |
| Arthur Anderson | 205.2 | 30 |
| Wayne Hart | 834.1 | 30 |
| Donald Hoskinson | 833.1 | 29 |
| Lawrence Carey Jr. | 244.2 | 26 |
| Arlene Burns | 235.2 | 25 |
| Elizabeth Feck | 263 | 17 |

# Cheaper and less traumatic breast biopsies

by Jim Elliott

A new, non-surgical and much less traumatic breast biopsy technique, based on technology developed for the Goddard-managed Hubble Space Telescope (HST), is now saving women time, pain, radiation exposure and money, according to officials at Goddard.

Radiologists predict that this new biopsy technique — known as stereotactic automated large-core biopsy — will cut national health care costs by approximately $1 billion-annually.

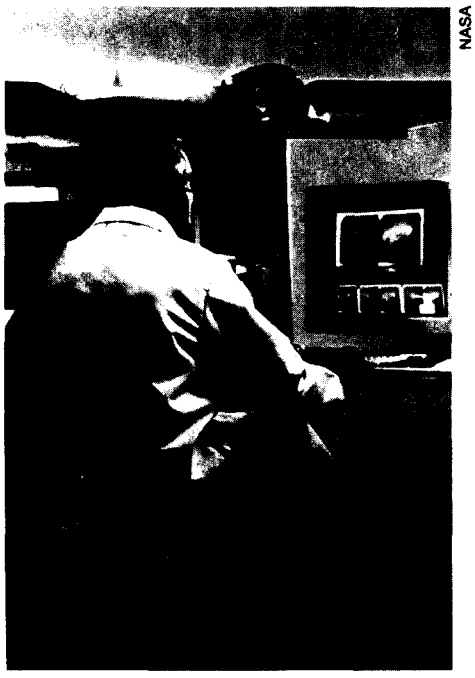
The new technique involves a NASA-driven improvement to the digital imaging technology known as a Charged Coupled Device (CCD), a high tech silicon chip which replaces film in digital imaging. The CCD allows digital cameras to "see" with X-ray vision. This thinned and highly sensitive CCD, which was not commercially available prior to NASA's need, is now leading the field of digital breast imaging technology, according to medical specialists.

The technology breakthrough came when scientists at Goddard sought a thinned and more refined CCD than was available prior for use on the Space Telescope Imaging Spectrograph (STIS), an instrument scheduled to be installed on Hubble during the planned 1997 servicing mission.

NASA contracted with Scientific Imaging Technologies, Inc. (SITe), of Beaverton, Ore., to develop the improved CCD. The HST program provided application and funding to drive the CCD design, improve sensitivity and reduce the manufacturing costs.

Working closely with HST's instrument developers, SITe produced a CCD that met NASA's strict spaceflight requirements. The company then applied that knowledge to manufacturing CCDs for the digital spot mammography market, creating an imaging device that sees suspicious breast tissue more clearly than is possible with conventional X-ray film screen technology.

Studies show that the new, automated core biopsy procedure is just as effective as traditional biopsy surgery, doctors say. While traditional surgery costs about $3,500, an automated core biopsy runs about $850, they reported. Determining whether or not a suspicious mass is cancerous now can be done in a radiologist's office rather than in an operating room, they explained.



NASA

The system pictured here is the LORAD Stereo Guide Breast Biopsy System, which incorporates the thinned CCD and offers women a quick, nonsurgical method of determining whether a breast lump is benign or malignant. (LORAD is located in Danbury, Conn.)

# Teacher resources available

Although summer is just getting underway, it's not too early to start thinking about the upcoming school year. Now is the time for Goddard employees to visit the Teacher Resource Laboratory (TRL) to see what is available for their children's teachers. NASA educational materials are available in several mediums: videos, slides, publications, teacher's guides with activities, lithographs, wall charts and computer programs. These materials are designed to enhance or to be integrated into the curriculum.

This fall a computer will be available for teachers to use to explore the Internet. They also will be able to access NASA's Spacelink as well as information and images from Goddard.

Employees are invited to the TRL to see first hand what is available for teachers. A TRL brochure also is available. Located upstairs in the Goddard Visitor Center, the TRL welcomes visits from employees Tuesday-Saturday from 10:00 a.m. to 4:00 p.m.

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The GODDARD NEWS Staff is:
**Managing Editor:** Fred Brown
**Contributing Editors:** Karen Davis, Jim Elliott, Michael Finneran, Tammy Jones, W. Allen Kenitzer