

Happy 15th Birthday IUE

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Goddard Releases Big Science At 1993 AAS Meeting

Results from the German/United States/United Kingdom Roentgen (ROSAT) satellite, the Goddard-managed Cosmic Background Explorer (COBE) and the Hubble Space Telescope (HST) were released this month at the annual American Astronomical Society meeting in Phoenix, Ariz. Several Goddard scientists presented their project's latest results. Related stories begin on pages 1, 2, 3 and 8.

ROSAT Finds Mysterious Concentration of Dark Matter

by Jim Elliott

Astronomers discovered a huge concentration of mysterious "dark matter" using the international Roentgen (ROSAT) x-ray observatory. The discovery appears to confirm previous suggestions of where most of the dark matter in the Universe may be concentrated, namely in and around small groups of galaxies, according to astronomers.

The new findings add much weight to the theory that most of the mass of the Universe consists of dark matter, the precise nature of which remains unknown to scientists, astronomers contend.

The discovery was made with x-ray pictures of three galaxies known as the "NGC 2300 group," located about 150 million light-years from Earth in the direction of the northern constellation Cepheus.

The images were taken with the Position Sensitive Proportional Counter instruments on ROSAT during April 25-27, 1992, according to Dr. Richard F. Mushotzky, Code 666. They show that the small group of galaxies is immersed in a huge cloud of hot gas, about 1.3 million light-years in diameter, he explained. Astronomers estimate that the cloud has a mass equal to 500 billion times that of the Sun and is at a temperature of approximately 18 million degrees Fahrenheit (10 million degrees Kelvin).

"A cloud like this would have dissipated into space long ago, leaving nothing for us to detect, unless it was held together by the gravity of an immense mass," Mushotzky said. "The mass required to restrain the

cloud is about 25 times greater than the mass of the three galaxies that are present."

This work represents the first case in which the amount of dark matter in a small group of galaxies has been determined accurately, the science team reported.

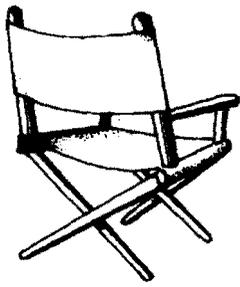
"For confirmation, we need repeated x-ray observations from space of the NGC 2300 group and other representative small groups of galaxies," Mushotzky explained. "Meanwhile, if we are right, the theorists need to start thinking about why there is much dark matter where there is little ordinary matter (i.e. in small groups of galaxies), and there is much less dark matter where there is a

lot of ordinary matter (in rich clusters of galaxies)," he said.

ROSAT is a joint project of Germany, the United States and the United Kingdom. Goddard manages the U.S. contribution to the project. ROSAT was launched on a Delta II rocket from the Cape Canaveral Air Force Station, Fla., on June 1, 1990.



This is a picture of three galaxies (larger white objects), known as the NGC 2300 group, immersed in a huge gaseous cloud (gray area surrounding the objects). The image was taken by the Roentgen Satellite (ROSAT), a joint project of Germany, the United States and the United Kingdom.



Directors' Dialogue

Q. I have a question regarding the Goddard information number. It was my understanding that this number could be called for information on the Center's status during periods of bad weather. I have attempted to get information this way several times including December 21 when ice problems caused delays at several government agencies. The recording is usually a day or two old. When I have gotten a relevant recording, it was after I had already arrived at the office. Can anything be done to get relevant weather-related information on the recording early enough to be of use? Before 7:00 a.m. would be best.

A. The primary reason for Goddard's code-a-phone, or recorded message on 286-NEWS, is to announce special events, mission status and other activities occurring at Goddard. On occasions when hazardous weather conditions cause either a delay of reporting times or excused duty the recorded message and phonemail is used. Normally a Goddard-related message is filed daily, Monday through Friday, usually by 9:00 a.m. to take advantage of any early morning newsworthy information.

Understandably, weather and its

impact on commuting to work is important to employees. Judgments made on whether to declare a delay in work arrival or excused from duty status because of hazardous weather is made locally. The bulletin is recorded on 286-NEWS and is given to local radio and television stations before 6:00 a.m. whenever possible. In the absence of a special recording, employees should assume they report at their normal work time.

**Janet K. Ruff, Chief
Office of Public Affairs
Code 130**

Questions for Directors' Dialogue may be sent in to Directors' Dialogue, Code 130, without identification. Questions are sent to the appropriate directorate office as written but may be edited for space and clarity before being printed.

Happy 15th Birthday IUE

Goddard originally designed the International Ultraviolet Explorer (IUE) to "live" for three years, and optimistically hoped for five. Fifteen years later, the IUE continues producing first class science.

The IUE was designed and built in-house by Goddard. The United Kingdom provided its cameras and the European Space Agency provided its solar arrays. The achievement of this design goal is a real tribute to the design, fabrication, test and team that put this spacecraft together.

The IUE was launched with six gyroscopes (half of them spares) but

four of them subsequently failed leaving the spacecraft dependent on only two gyros. Thanks to a highly unconventional plan devised and implemented by Goddard engineers, the IUE now operates on two gyros.

The IUE was launched by a Delta rocket on January 26, 1978, from Cape Canaveral, Fla. The following are just a few contributions by IUE to the astronomical science community:

- IUE has supported astrophysical research on almost every astrophysical object in the Universe, such as comets, asteroids, x-ray binary stars, novae, supernovae,

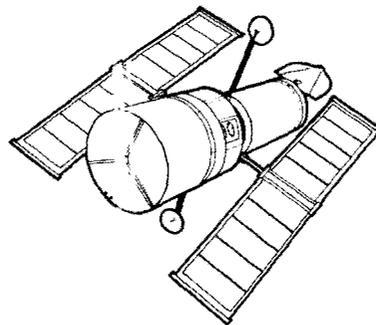
quasars and active galactic nuclei, to name a few.

- IUE observations have been used for more than 2500 articles in refereed publications.
- IUE data has been used by more than 2,000 different astronomers worldwide.
- More than 100 post-graduate students have used IUE data to obtain their doctorate degrees.
- IUE is the only astrophysical satellite in a geosynchronous orbit.
- More than 85,000 spectra has been obtained by IUE.

Hubble Discovery Released At AAS

Astronomers announced the discovery of a double nucleus in the active galaxy Markian 315. The discovery was made from images taken by the Goddard-managed Hubble Space Telescope (HST) and released this month at the annual American Astronomical Society meeting in Phoenix, Ariz.

The findings may solve a decade-old mystery about the nature of a jet-like feature in the Markian 315, a so-called Seyfert galaxy, and appear to confirm one mechanism for produc-



ing an active galactic nucleus. Seyfert galaxies are spiral galaxies with very bright nuclei that may be powered by massive black holes that

are accreting matter.

"The Hubble images provide support for the theory that the jet-like feature may be a "tail" of gas that was stretched out by tidal forces between the two galaxies as they interacted," Dr. John MacKenty, of the Space Telescope Science Institute explained.

This observation best explains the extraordinary 240,000 light-year long jet-like feature of Markian 315. "The jet feature is most likely a remnant of a merger between

(Continued on page 8)

Big Bang Theory Passes Toughest Test

by Randee Exler

The Big Bang theory passed its toughest test yet with the latest results reported from Goddard's Cosmic Background Explorer (COBE) team at the American Astronomical Society meeting in Phoenix, Ariz., this month.

Precise measurements made by COBE's Far Infrared Absolute Spectrophotometer (FIRAS) of the afterglow from the Big Bang — the primeval explosion that began the Universe — show that 99.97% of the radiant energy of the Universe was released within the first year after the Big Bang itself.

"The Big Bang theory comes out a winner," said COBE Project Scientist and FIRAS Principal Investigator Dr. John C. Mather. "This is the ultimate in tracing one's cosmic roots," Mather said.

All theories that attempt to explain the origin of large scale structure seen in the Universe today must now conform to the constraints imposed by these latest measurements.

This includes theories that postulate large amounts of energy released by such things as black holes, exploding supermassive stars, or the decay of unstable elementary particles. In other words, there were not a lot of "little bangs," as suggested by some theories.

The Big Bang theory predicts that the spectrum of the relic radiation should be that of a perfect "black body" unless there were major energy releases more than a year after the explosion. (A black body is a hypothetical cosmic body that absorbs all radiation falling on it, but reflects non what-so-ever.) These latest FIRAS results reveal that later energy releases did not occur.

The COBE scientists now can say that the temperature of the afterglow radiation is 2.726 degrees above absolute zero (273 degrees below zero on the Celsius scale) with an uncertainty of only .01 degrees.

Hundreds of millions of measurements were combined to obtain these

unprecedentedly precise results.

"Making certain that all of the measurements were combined correctly required exquisitely careful work and lengthy analysis by a large team of COBE scientists," Mather reported.

"We are seeing the cold glow still remaining from the initially very hot Big Bang. These results now limit the size of any "after shocks" following the Big Bang. The closer we examine the Big Bang the simpler the picture gets," said Mather.

"It took us 18 years of careful effort to reach this point, but we now can say that the Big Bang Theory has been tested against observations to a fine degree of precision," explained Mather.

Papers on these results and their implications have been submitted to the *Astrophysical Journal* for publication.

COBE, launched November 9, 1989, on a Goddard-managed Delta rocket.

What's UP?

January 1993

COMPTON — *Days in orbit:* 636
Interesting fact: The first publicly available Oriented Scintillation Spectrometer Experiment (OSSE) data are now being placed in the GRO public archive. These data comprise the OSSE observations during viewing period 1. As in most missions these early data sets may contain some bugs and will likely be superseded by enhanced products in the next year.

UARS — *Days in orbit:* 475
Interesting fact: From November 29 to January 9, many of the UARS instruments observed high latitudes in the Northern Hemisphere, allowing scientists to better understand the combination of chemistry and meteorology that so strongly influence the amount and distribution of life-supporting stratospheric ozone in the part of the world in which most of us live.

HST — *Days in orbit:* 921
Interesting fact: Two discoveries that impact current theories of cosmology were made: (1) A team from the Carnegie Institute, used Hubble's Wide Field Camera to

observe Abell 851, a cluster of some 73 galaxies about four billion light-years away and was able to distinguish, for the first time, the shape of the galaxies within the cluster. The images indicate that star-forming galaxies were far more prevalent in the clusters of the younger universe than in modern clusters of nearby galaxies, having important implications for theories of how galaxies have evolved since the birth of the universe 15 billion years ago; and (2) Dr. Robert C. O'Dell, of Rice University, and colleagues used the Wide Field Camera to discover extended disks of dust around 15 newly-formed stars in the Orion Nebula starbirth region 1,500 light-years away. These young disks signify an entirely new class of objects in the universe and represent a missing link in our understanding of how planets like those in our Solar System form.

EUVE — *Days in orbit:* 208
Interesting fact: Astronomers at the University of California, Berkeley, report that a new bright source in the EUVE long wavelength filters

has been associated with a catalogued white dwarf. This increases the total number of white dwarfs detected in the long wavelength filters to seven. It has been thought that observations in the long wavelength region of the extreme ultraviolet would be nearly impossible because of the strong absorption of light by hydrogen and helium atoms between the stars.

NOAA — *Days in Orbit:* 2,942
Interesting fact: NOAA-9 celebrated its eighth birthday on December 12. Goddard's Meteorological Satellites project developed the spacecraft, which served as the afternoon operational weather satellite for the National Oceanic and Atmospheric Administration (NOAA) until 1988 when NOAA-11 replaced it. The battery charge for the spacecraft exceeded its expectancy and extended the NOAA-9's useable lifetime. Today, NOAA-9 still provides valuable science and imagery data and data for the COSPAS/SARSAT program, an international search and rescue program which has saved more than 2400 lives since it began in 1982.

STS-54 Carries Goddard Payloads

The Space Shuttle Endeavour is scheduled to launch this month from Kennedy Space Center (KSC), Fla., carrying two Goddard-managed payloads. During the STS-54 mission, a sixth Tracking and Data Relay Satellite will be deployed from the orbiter's cargo bay, and the Diffuse X-Ray Spectrometer will make astrophysical observations of the origin and nature of the matter that fills the space between stars. This seven-day mission will conclude at KSC when the orbiter lands on January 19.

Sixth TDRS Added to Constellation

by Jim Elliott

The Tracking and Data Relay Satellite (TDRS) is the sixth in a series of communications spacecraft for the Tracking and Data Relay Satellite System (TDRSS). TDRS-F

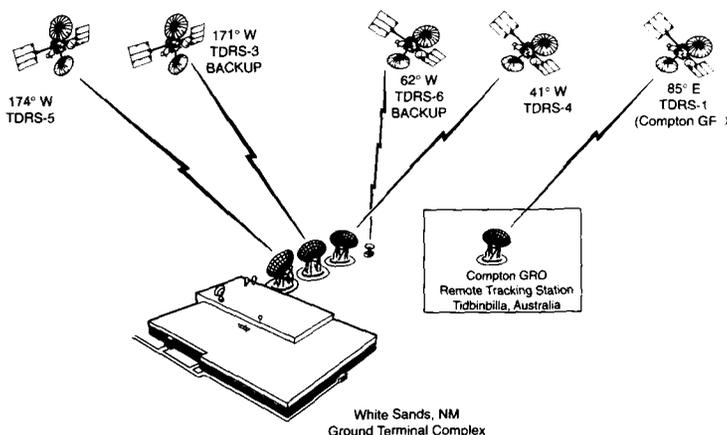
accomplished, NASA officials explained. TDRS-F will be located at 62 degrees West Longitude and will serve as a backup to replace TDRS-4 or TDRS-5 in the event of catastrophic failure. TDRS-1 will be stationed at 85 degrees East Longitude, over the Indian Ocean southeast of Sri Lanka, to provide additional support to the Compton Gamma Ray Observatory GRO; TDRS-3 will be moved to 171 degrees West; TDRS-4 will remain at 41 degrees West, and TDRS-5 will remain at 174 degrees West.

Officials estimate that more than \$70 billion in space missions through the end of this decade will have been TDRSS-dependent.

TDRS-F will be deployed approximately six hours after launch. The injection burn to geostationary orbit will be initiated at 77 degrees East Longitude (Indian Ocean, south of India), placing the satellite in orbit at 178 degrees West Longitude (over the Pacific near the Gilbert Islands). Once TDRS-F is in place and checked out, TDRS-1 will be assigned to the GRO mission and will be moved to its Indian Ocean location.

Project manager for the Tracking and Data Relay Satellite project at Goddard is Charles Vanek, Code 405. Thomas E. Williams is Deputy Project Manager, and Anthony Comberiate is TDRS Manager, both from Code 405; Daniel A. Spintman is Chief, Networks Division; Wesley J. Bodin is Associate Chief for Ground Network; Phillip Liebrecht is Assistant Chief for TDRSS, and Gary Morse is Network Director, all from Code 530.

In addition to the shuttle, TDRSS customers include GRO, Upper Atmosphere Research Satellite, Hubble Space Telescope, Cosmic Background Explorer, Extreme Ultraviolet Explorer, TOPEX-Poseidon, both Landsat spacecraft and other non-NASA missions. Among future TDRSS-dependent missions are Space Station Freedom and the Earth Observing System.



This image shows the Tracking and Data Relay Satellite System formation following the deployment of TDRS-F from the Space Shuttle Endeavour during the recent STS-54 mission.

will be deployed from the Space Shuttle Endeavour during the STS-54 mission.

Four TDRS spacecraft are operational, but only two (TDRS-4 and TDRS-5) are fully functional. In the event of a malfunction of one of the fully-functional satellites, it would take nearly a year before an emergency replacement launch could be

DXS Flies On Endeavour

by Dolores Beasley

The Diffuse X-ray Spectrometer (DXS) experiment on Space Shuttle Endeavour's STS-54 mission, is aimed at addressing a fundamental question of present-day astrophysics: what is the origin and nature of matter which fills the space between stars?

The DXS will study the hottest parts of the interstellar medium, gases at temperatures at approximately one million degrees Kelvin, by detecting the x-rays that are produced there. By measuring the gas temperature and composition, the DXS will provide important clues to

the origin, evolution and physical state of this gas in the Milky Way Galaxy

The Diffuse X-ray Spectrometer experiment, developed by the University of Wisconsin in Madison, consists of two identical instruments, one mounted to each side of the shuttle cargo bay. A DXS instrument consists of a detector, its associated gas supply, and electronics. Each instrument is mounted to a 200-pound (91 kg) plate, which is attached to side of the shuttle bay.

These plates are part of the

Goddard's Shuttle Payload of Opportunity Carrier (SPOC) standard hardware, which is part of the Hitchhiker carrier system. The Hitchhiker system provides real-time communications between the payload and customers in the Hitchhiker control center at Goddard. The carrier system is designed to be modular and expandable in accordance with payload requirements. Hitchhikers were created to provide a quick reaction and low cost capability for flying small

(Continued on page 5)

Goddard Supports Antarctic Project

by Randee Exler

Goddard transmitted historic, first-time, live-video images this month from Ross Island in the Antarctic through a portable Tracking and Data Relay Satellite System (TDRSS) station located at the base of Mt. Erebus an active volcano. The transmissions were carried live on NASA Select Television allowing controllers at Goddard and the American public an opportunity to witness in real-time the operations of a scientific mission from this remote location.

The goal of the mission, called the Mt. Erebus project, was to send an eight-legged walking robot named Dante over the rim of the volcano and down to the lava lake below to collect scientific data. The purpose of the expedition was to test robotic technologies under extremely harsh conditions as a precursor to planetary exploration, and to gather information about Mt. Erebus and its emissions that previously were impossible to obtain.

Dante was built and designed by the Robotics Institute of Carnegie Mellon University (CMU) in Pittsburgh, Pa., under a NASA grant. The National Science Foundation provided operational and logistical support for this mission.

Steve Thompson, a software engineer with Bendix Field Engineering Corporation, Code 430.2, travelled to Antarctica for the expedition. He set up the portable TDRSS station at the base of the volcano so the transmissions could occur. The TDRSS link allowed teams located in Building 25 at Goddard and in the Antarctic to communicate with each other through computer terminals during the satellite passes. The Tracking and Data Relay Satellite (TDRS)-West was used for this mission.

Through TDRSS, the CMU team at Goddard controlled Dante remotely from Greenbelt. This successful portion of the mission is called "telepresence" and has applications for future NASA exploration missions using robots.

In addition to Goddard's TDRSS contribution to this mission, Dante carried a Goddard-supplied gamma ray spectrometer to measure levels of

airborne metals inside the volcano. The instrument is very similar to one already flying on the Mars Observer spacecraft launched Sept. 25, 1992.

Goddard also supplied the spidery rover with proximity sensors embedded in its feet, which helped the rover "choose" the best places to step in order to stay upright and stable. These sensors also sent imaging data back to Goddard via the TDRSS.

On January 2, the Erebus project team located on the ice at the foot of the volcano called off any further exploration with Dante because of a physical break in the fiber optical cable which connects the robot with the computers providing its machine intelligence.

The team reported the results of a day's troubleshooting during a one-hour-long video conference via TDRS-West which included their colleagues at Goddard.

At the time the team called off any further mission operations, Dante remained suspended approximately 21 feet (6.4 meters) below the rim of the crater having been successfully "launched" approximately at 2:00 a.m. on New Years Day, January 1.

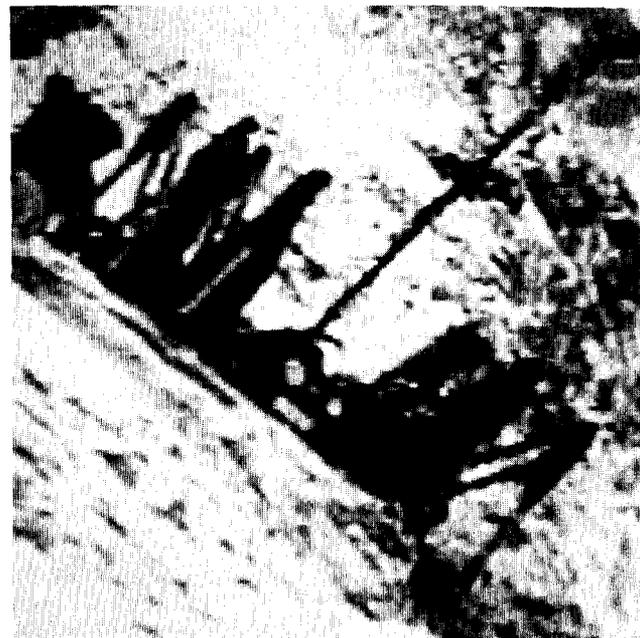
Dante had moved the 21 feet (6.4 meters) on its own during initial testing of the robot control mechanisms and had been halted in its further progress by what, at the time, seemed to be computer network problem.

The team reported that one of the considerations in their decision to call the demonstration project off at this point was the time period remaining until they must leave the side of the volcano. By January 15 the team had to be back at McMurdo Station in Antarctica because of impending ice-up of the Ross Sea and a worsening of general weather conditions.

This time constraint existed all along but became of higher importance when the break in the fiber optical cable occurred. The team could not guarantee delivery of cable to Antarctica in time to make a repair, perform the rest of the descent down into the volcano, and still get the robot back up to the top and pack everything up in time to depart on January 15.

"There is obvious disappointment

over what is a component failure, but we're proud of what we've accomplished," said Dave Lavery, Telerobotics Program Manager, NASA Headquarters, Washington, D.C.



Pictured is the Dante robot poised on the inner-rim of Mt. Erebus, an active Antarctic Volcano. The picture, transmitted through Goddard's Tracking and Data Relay Satellite-West, occurred moments before Dante took its first steps.

DXS Flies

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payloads in the shuttle payload bay.

DXS will be operated from Goddard's Payload Operations Control Center (POCC). University of Wisconsin personnel at Goddard will control and monitor the DXS, and Goddard personnel will monitor and control the operations of the Hitchhiker carrier support hardware. Students from DuVal High School in Greenbelt, working in the POCC, monitor thermal conditions for the experiment.

Goddard's Flight Dynamics Facility and the Spacelab Data Processing Facility will assist the DXS POCC operations and data processing activities.

After the shuttle lands, the DXS instruments will be removed and then transported to the University of Wisconsin for post-flight testing and calibration.

Lynne Slater: Working Toward Diversity

Program Analyst — the official title of Lynne Slater, Code 120, hardly describes the scope of her position at Goddard. As part of the Equal Opportunity Programs Office, Slater processes all discrimination complaints at Goddard and runs the Federal Women's Program on Center. Slater is the first program manager at Goddard to handle both complaints and the Federal Women's Program.

Her position focuses on advancing ethnic minority, disabled and female employees; assuring diversity of talents and skills at all levels of employment and creating comfortable work environment for all.

Slater views both the Federal Women's Program and the discrimination complaints process as two paths towards these general objectives.

"At present there are few ethnic minorities and women at the division-level or above at Goddard. One contributing factor is that managers tend to select people with backgrounds similar to their own, because they trust and communicate most easily with them. For example, the average white male may look to promote other white males because they are more likely to share the same values and behaviors."

The idea behind the Federal Women's Program and other special emphasis programs is to help Goddard become more flexible and help employees learn the ways of the culture," says Slater, an Upper Marlboro, Md, resident. Slater also points out that these subtle biases against diverse groups are unconscious and that Goddard is no different than other Federal agencies.

Slater suggests the culture's expectations can be changed by raising people's consciousness about differences and diversity and by teaching those in selecting positions that there is more than one acceptable way to "do business." "Female, disabled, and ethnic minority employees can offer new approaches and ideas to management," Slater said.

So what is being done to raise the acceptance and comfort levels for Goddard's diverse population? One is the basic sexual harassment class in which most Directorates at Goddard participate. Through this program supervisors receive a day-long training on the law, how to promote an appropriate climate in their work units, and how to deal with sexual harassment incidents should they occur. Non-supervisory employees attend a half-day seminar where they discuss organizational norms, analyze daily male-female interactions and develop strategies for dealing with sexual harassment.

In 1990, Slater started the sexual harassment seminar to help prevent such acts from occurring. It since has become institutionalized, new employees and managers participate in similar training sessions during the first year in their new jobs.

Recently, Slater and the Employee and Organizational Development Branch, Code 114, jointly organized a class on Writing for Publication. This course was developed after an informal group of technical women brought to Slater's attention a need to learn the ins and outs of writing to publish, including Goddard's technical release process, writing abstracts and "selling" their work. This course is now offered to all employees on an annual basis.

Last year Slater, initiated the "Brown Bag Luncheon Series," casual meetings dedicated to the discussion of women's issues. One of the more popular luncheons is "The Type 'E' Woman," where women learn how to reduce stress produced by managing career and a home. There are more luncheons planned for the spring. In addition, she also assists ad hoc groups of women, such as Women in Astronomy and the African-American Women at Goddard who meet regularly to discuss special interests.

While on the phone, pacing her bright office and sipping from a purple water bottle, Slater listened intently to an employee with a discrimination complaint. She says that during her tenure in the Equal Opportunity Programs Office, there has been an increase in the amount of complaints. Slater contends that "it is healthier to have an increase in the number of complaints than letting problems ferment." Usually a complaint arises because someone has

been alienated from or abused by the system in some way. Slater and Goddard's 12 Equal Employment Opportunity (EEO) counselors who work with her seek to resolve the issues raised and help Goddard and its employees work together to pursue common goals.

One of Slater's many contributions to the complaint process is implementing a new option for complaints processing called the "Alternative Dispute Resolution Process (ADRP)." This option is Goddard's response to new Equal Employment Opportunity Committee regulations in effect since October 1992. These new regulations encourage resolutions to be made at the Center-level. ADPR must be mutually agreed upon by the complainant and an EEO officer as the best route to process the complaint. This option is different because a third party — a management representative from a non-involved Directorate, who has been trained in mediation — is selected to assist in the case. Slater comments that so far "ADPR has proved to be an interesting, intense and effective way to resolve a dispute."

To benefit the advancement of diverse employees at Goddard, Slater also analyzes the Civilian Labor Force (CLF) data put out by the Census Bureau. She compares these statistics to the Goddard workforce to determine work fields lacking diversity. These data look at the ethnic minority and gender availability in the national workforce by occupational category. A second breakdown of employees in managerial positions also is reviewed. These numbers give insight to the advancement trends of diverse employees. Slater works towards raising Goddard's representation levels to reflect the national or D.C. Metropolitan-area (depending on the job category) averages.

All of these aspects of Slater's position and of the Equal Opportunity Office as a whole, help create an environment that is fair and comfortable for Goddard's diverse population and to promote the advancement of these employees to higher-level jobs. Slater enjoys making someone's experience at Goddard better. "I never know what I will face on a given day. I enjoy the interaction with a wide variety of people

(Continued on page 7)



photo by J. Semeraro

Lynne Slater, of the Equal Opportunity Programs Office, Code 120, in her office in building 8, works to make life at Goddard more enjoyable.

King and Leckrone Receive Prestigious Appointments



Dr. Michael King

Center Director John Klineberg recently appointed Dr. Michael King Senior Project Scientist for the Earth Observing System (EOS) and David Leckrone as Senior Scientist with the Hubble Space Telescope (HST).

As senior project scientist, King has primary responsibility for providing scientific insight and guidance to the EOS project management at Goddard and represents EOS to the Earth science community.

Leckrone's new responsibilities as senior scientist include providing scientific leadership to the HST project and to its many participating organizations and serving as the project's principal scientific interface with the HST program office at NASA Headquarters, the Space Telescope Science Institute and the European Space Agency. He will also direct the work of other HST project scientists at Goddard in the areas of flight operations and in-orbit servicing.



Dr. David Leckrone

Previously, King served as deputy team leader for the Moderate Resolution Imaging Spectrograph (MODIS) science team and is a member of the Clouds and the Earth's Radiant Energy System (CERES) science team. Both MODIS and CERES are key instruments planned for the EOS satellite payloads. In addition, King is an Adjunct Professor of Atmospheric Science, Department of Oceanography, Dalhousie University, Halifax, Nova Scotia.

Prior to his new appointment, Leckrone was deputy project scientist for HST and senior astrophysicist with Goddard's Laboratory for Astronomy and Solar Physics. He also is an internationally-recognized authority on ultraviolet spectroscopy of hot stars.

Lynne Slater

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and sometimes I'm able to really make a difference in someone's career."

Programs like the Federal Women's Program exist for other diverse groups at Goddard including special emphasis programs for Hispanics, disabled employees, Asian-Americans and African-Americans currently run by the Black History Club. For more information on these programs, call the Equal Opportunity Office at (301) 286-7348.

Slater has been in her current position at Goddard since 1987.



On December 2, 1992, the Bloodmobile was held in Building 26, Room 205 and 133 prospective donors volunteered to donate blood. The following is a list of Goddard employees who were cited by the American Red Cross with gallon pins at the Bloodmobile.

# of Gallons	Name	Code
2	M. P. Noordzy	
1	Jeff Gramling	405
8	Ron O'Leary	722.4
4	Charles Fleetwood	717.1
1	Mark McGinnis	721.1
5	Ranal Koster	974
2	J. Sauerwein	
1	Jay Parker	752.2

The next Bloodmobile is scheduled for February 3, 1993 in the Building 8 Auditorium. Watch Dateline Goddard for more details.



Pictured above are the Manned Flight Awareness Honorees for the December 1992 STS-53 mission which carried two Goddard-managed Hitchhiker payloads. Seated are Paul Wescoat, General Electric Government Services; John Balla, Code 733; Christina George, Computer Sciences Corporation (CSC); Barbara Machtey, CSC; Joseph Hashmall, CSC; John King; Bendix Field Engineering Corporation (BFEC). In the second row are Edward Ruitberg, Code 441; Claude Harris, GTE; Paul Hill, Code 542; Daniel Jens, BFEC; John Young, Swale and Associates, Inc.; Jimmie Elswick, Boeing Computer Support Services, Inc.; In the third row are Richard Schonbachler, Code 534; Clarence Harder, BFEC; and not pictured are Carl Riley, Code 562; Dennis Asato, Code 713; Deborah Moran, BFEC.

She joined Goddard in 1980 as the Head of the Manpower Analysis Office, formerly Code 220, and then became Goddard's first female Directorate Resource Manager in the Institutional Support Office, Code 201. Prior to joining Goddard for the first time, Slater worked at NASA Headquarters and before that was an English teacher. She was born in Cambridge, Mass., and is active in Goddard's Music and Drama club, a deacon and choir member of her local church and an amateur photographer.

DIRBE Image Reveals Streaming Dust Grains

by Randee Exler

Four new images formed from data gathered by NASA's Cosmic Background Explorer (COBE) were released this month at the American Astronomical Society meeting in Phoenix, Arizona. The images, created from Diffuse Infrared Background Experiment (DIRBE) data, show the Universe in the full range of infrared wavelengths from 1 to 240 micrometers.

Pictured is an image that combines data from DIRBE obtained at infrared wavelengths of 4.9, 12 and 25 micrometers. The plane of the Milky Way Galaxy lies horizontally across the middle of the image with the Galactic Center at the center.

Emission from interplanetary dust in our solar system is very prominent, as shown by the "S-shaped" curve which follows the ecliptic plane. The thin lines forming bands within the curve show the structure of streaming dust grains — the result of colliding

asteroids. To make the contributions from the Solar System as uniform as possible, the images are made from observations when the

an ancient fossil known as the cosmic infrared background (CIB) radiation — the remnant from the formation of the earliest objects in



Infrared sky as seen by Goddard's Cosmic Background Explorer.

Sun angle was 90 degrees from the viewing direction.

DIRBE is the first space instrument designed to make a comprehensive sky survey in the search for

the Universe created 5 to 15 billion years ago. Extensive modeling, now underway, is required to isolate the CIB from the infrared foregrounds from the Solar System and Galaxy.

COBE, launched November 9, 1989, was built in-house by Goddard and was launched on a Goddard-managed Delta rocket.

Goddard News National Aeronautics and Space Administration Goddard Space Flight Center

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HUBBLE

(Continued from page 2)

Markian 315 and a smaller galaxy," says MacKenty.

The HST image also might explain why Markian 315 has an active core. "It presumably harbors a black hole which has been re-fueled by the galactic collision," MacKenty noted.

Galaxy mergers may be one mechanism for driving gas deep into the heart of a galaxy, astronomers believe. This raw material fuels massive black holes, theorized to be the "central engines" in Seyfert galaxies and other galaxies.

Deadline for submitted material is the fifteenth of each month. For additional information contact Katie Brannigan (301) 286-8956, TDD (301) 286-8955.

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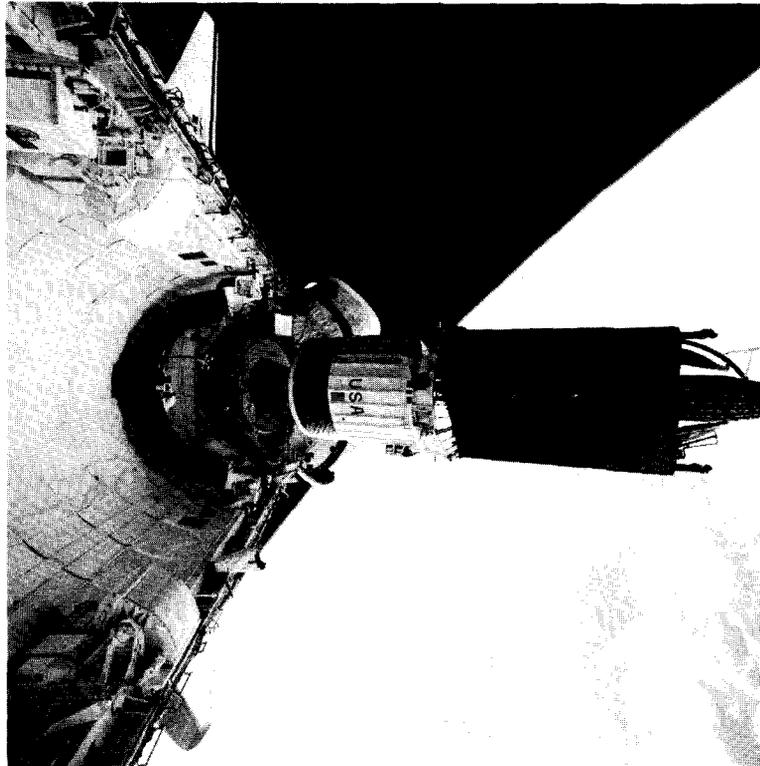
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Charles Vanek: 27 Goddard Years And Going Strong



Pictured is Goddard's Tracking and Data Relay Satellite (TDRS)-F about to be released from its cradle/tile table device in the Space Shuttle Endeavor's cargo bay. TDRS-F was successfully deployed in January joining Goddard's constellation of communication satellites.

1993 Promises to be Productive Year for Goddard Science and Engineering

by Randee Exler

Beginning with the deployment of Goddard's Tracking and Data Relay Satellite (TDRS)-F in January and ending with the first servicing mission for NASA's Hubble Space Telescope in December, Goddard will play an active role in another ambitious year for NASA.

January

In January, the Space Shuttle Endeavor mission, STS-54, successfully deployed the sixth TDRS satellite adding to Goddard's constellation of space-based communication satellites. The Diffuse X-ray Spectrometer (DXS), a joint NASA/University of Wisconsin experiment also flew on this mission and was controlled from Goddard's Hitchhiker Payload Operations Control Center (POCC).

Astrophysicists analyzing preliminary data from DXS obtained the first direct evidence that mysterious x-rays from deep space emanate from clouds of invisible gas. The clouds of ionized, extremely hot gas, many scientists believe, were produced by cataclysmic supernova explosions.

February

On February 10, NASA launched a Pegasus launch vehicle carrying an environmental satellite called Brazil SCD-1. Goddard's Wallops Flight Facility

controlled the mission. Services provided by Wallops included range safety, and tracking and telemetry. Approximately 100 Wallops personnel were involved in this mission.

In mid-February, Astro-D, a joint NASA/Japanese x-ray observatory is scheduled to launch from Japan carrying four sets of conical mirrors developed out of Goddard-technology. Goddard manages the U.S. portion of this mission (story on page 4).

March

STS-55, the first Spacelab mission scheduled to fly this year will be supported by Goddard's Spacelab Data Processing Facility (SLDPF) in March. This facility provides the scientific community with data gathered during Spacelab and other attached payload missions.

A small secondary payload, the Reaction Kinetics in Glass Melts (RKGM) will fly aboard this mission. Goddard's Shuttle Small Payloads Project (SSPP) is responsible for the integration and safety of this payload.

At the time of this printing, the Space Shuttle Discovery also is scheduled to launch in March on STS-56, another Spacelab mission supported by Goddard's SLDPF. This is the second Atmospheric Laboratory for Applications and Science mission that

Continued on page 5



Directors' Dialogue

Q: Can you tell me who decided that the Building 21 parking lot needed new curbs this year and what it has cost to install them? It seems to me that this is the biggest waste of money in a long time, even if it is peanuts in relation to the full GSFC budget. I am sure everybody can think of more important ways to spend the money, from renovating existing buildings to new construction to replace the temporary trailers and relieve the chronic on site space problem. Redoing parking lot curbs does not send the right message in this time of increasing fiscal constraints.

A: The Engineering & Contract Support Office, Code 290.1, of the Plant Operations and Maintenance Division, Code 290, provides for the repair and maintenance of roads and curbs around GSFC.

A portion of the concrete repair was done through the work request system. A majority of the work has been planned for several years. The cost for replacing the roadway and parking lot curbs and sidewalks north of Building 21 was approximately \$10 thousand. The curbs and the sidewalks could no longer perform their intended functions, i.e., to control drainage and deter vehicles from leaving the roadway (and parking lot). Water drainage problems occur at the Building 21 access road along the north and west sides of the building during the heavy rains. Years of patching potholes, repairing utility trenches, and normal road wear have created uneven elevations resulting in standing water during heavy rains. Numerous complaints after recent heavy seasonal rains have emphasized the need to solve this problem.

Furthermore, broken curb and low, uneven curbs cannot provide the barrier required to stop car wheels when parking. This presents a safety problem along the north parking area against the hill that separates the parking area from Building 97 at the lower elevation. Prior to repaving the road the spring, additional curb replacement is required from the roadway at the northwest entrance of Building 21 to the storm drain at the Goddard Road intersection. The completion of the work will provide a uniform curb and road system containing and directing stormwater to the appropriate drains for the convenience and safety of GSFC personnel and visitors.

**Sherry Foster, Director
Management Operations
Directorate
Code 200**

Questions for Directors' Dialogue may be sent in to Directors' Dialogue, Code 130, without identification. Questions are sent to the appropriate directorate office as written but may be edited for space and clarity before being printed.

New Team Promotes Goddard's Multicultural Community

An advisory team was established recently to create an environment that maximizes the potential contribution of every employee on center. The Multicultural Educational Program (MCEP) Advisory Group, will respond to Goddard's growing diverse workforce.

Multiculturalism differs from Equal Opportunity (EO) and Affirmative Action programs. While EO programs address discrimination, and affirmative action programs focus on representation by certain groups in positions throughout the organization, multiculturalism focuses on maximizing the potential of each individual contributing to the organization. It involves learning about and valuing differences among employees and realizing these differences as strengths.

"Affirmative Action programs will continue to be a part of the Center's ongoing effort to ensure

appropriate representation at all levels. Multiculturalism, however, cannot be a program only from the Equal Opportunity Office. It must be adopted by the managers of the organization since it is based on changing the work environment in which individuals develop," says Rick Keegan, Code 240, chairman of the MCEP Advisory Group.

The group initially developed its vision and goals for GSFC and the agency and presented them at an agency-wide meeting in May 1992. In brief, NASA should aim to create a work environment where diversity is understood and valued and where all levels of the workforce are culturally literate. We should staff the agency at all levels and in all occupations with the best talents of all cultural groups, and continuously eliminate barriers to working effectively as a culturally diverse workforce, according to Keegan.

The group is actively planning initiatives to further a multicultural

environment. "We are looking at various ways to assess where we are now versus where we want to be; to identify and eliminate barriers; to benchmark and learn from other organizations; and to provide and promote awareness training to maximize the potential contribution to GSFC of each individual in the workforce," says Keegan.

The MCEP Advisory Group consists of Wayne Boswell, Code 110; Lynn Clark, Code 284.5; Richard Costa, Code 500; Phil Holloway, Code 290; David Jacintho, Code 550; Angie Kelly, Code 501; Tony Liu, Code 971; Arletta Love, Code 110.2; Dillard Menchan, Code 120; Otilia Rodriguez, Code 712.1; and Ed Torres-Martinez, Code 728.2. It was chaired initially by Krista Paquin, Code 201; and now is chaired by Keegan.



Photo: D. McCallum

"COBE Road" was officially named in a ceremony on January 26 in the parking lot behind Building 28. Named after the Goddard-built and -managed Cosmic Background Explorer (COBE) this road completes the connection between Explorer, Tiros and Nimbus roads. Pictured at the ceremony from left to right are Dr. Harvey Moseley, Code 685; Dr. Michael Hauser, Code 680; Dr. Nancy Boggess, Code 685; Dr. Gerald Soffen, Code 160; Center Director Dr. John Klineberg; Deputy Director Peter Burr; COBE Project Scientist Dr. John Mather, Code 685; and Dr. Tom Kelsall, Code 685.

What's UP?

February 1993

SAMPEX — *Days in orbit: 212*

Interesting fact: Sampex has begun tests with the Transportable Orbital Tracking Station (TOTS) at the Wallops station. The TOTS, located at Poker Flat, Alaska, will be one of the prime ground stations for the Fast Auroral Snapshot Explorer (FAST) mission which will launch approximately one and one half years from now. The SAMPEX and FAST spacecraft, which are both Small Explorer missions, have almost identical telemetry system

HST — *Days in orbit: 952*

Interesting fact: Testing of the Solar Array engineering with the Vehicle Electrical Systems Test (VEST) has commenced. The third Servicing Mission Internal Simulation was successfully conducted on January 14, to train operations personnel, identify problems with commands and procedures, deal with contingencies and exercise interfaces. These exercises will run monthly from the Space Telescope Operations Control Center in preparation for the December 1993 HST First Servicing Mission.

UARS — *Days in orbit: 506*

Interesting fact: The UARS batteries continue to be of concern. Low voltage can be observed as the spacecraft comes out of the Earth's shadow and the batteries have not been charged for up to half an hour. This low "end of night" voltage, combined with other indicators,

implies a premature aging of the batteries. This experience is similar to that of several other spacecraft which are using batteries manufactured around the same time as the UARS batteries.

The High Resolution Doppler Interferometer (HRDI) instrument experienced an electronic malfunction which compromises its ability to measure winds. The problem is being examined and the instrument is expected to resume normal operation soon. The Improved Stratospheric and Mesospheric Sounder (ISAMS) instrument returned to life briefly and then stopped again, but the intermittent behavior gives some hope that it can be restored to useful operation. All other instruments are performing well and good data are being received and processed with very little delay. The spacecraft yaw maneuver was performed on February 9, and now the Microwave Limb Sounder (MLS) and Cryogenic Limb Array Etalon Spectrometer (CLAES) instruments are observing to high northern latitudes, allowing detailed study of possible Arctic ozone loss processes similar to those in the Antarctic ozone hole.

EUVE — *Days in orbit: 239*

Interesting fact: All EUVE payload and Explorer Platform subsystems continue to perform well, with no significant degradation experienced. Approximately, three to five targets

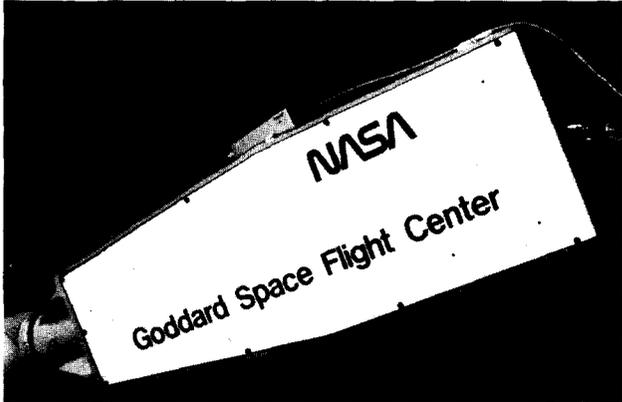
are planned for observation each week. Future targets include the moon, Jupiter, two comets, and many interesting stars. The EUVE mission celebrated the anniversary of its eighth month since launch with an announcement from the principal investigators at the University of California, Berkeley, that the total number of confirmed bright EUV sources is now 135, with an expected final count of several hundred in the Bright Source List. The number of extragalactic objects detected so far also is now up to seven. Spectroscopic observations under the EUVE Guest Observer Program were initiated on January 22 after the successful completion of the EUV All Sky Survey the previous day.

COMPTON — *Days in orbit: 667*

Interesting fact: Preparations for a reboost are underway. Joint Flight Operations Team/Flight Dynamics Facility simulations began in late January and will continue through March. The brightest gamma ray yet detected by the Burst and Transient Source Experiment was observed January 31. The so called "superbowl" burst also was imaged by the Imaging Compton Telescope and the Energetic Gamma Ray Experiment providing the fastest burst position ever obtained to the world science community.

Goddard Develops Robotic "Skin Sensor"

A team of robotic, electronic and software engineers at Goddard have developed what has been called a revolutionary proximity sensor.



Pictured is a robotic arm with proximity-avoidance sensors developed by Goddard. The four rectangular sensors are on the face of the arm and visible only by the faint outlines just above the Goddard nameplate. The actual sensors are embedded under the paint on the arm.

The new sensor relies on an electric field to detect objects within a range of just under one foot (30 centimeters). It can be built to be completely flat — less than one-tenth of an inch (.254 centimeters) thick — or conform to curved surfaces and is extremely rugged. This simplifies the application of the sensor to robot arms, spacecraft or payload surfaces.

"For humans, our eyes, ears and skin are our primary collision-avoidance sensors," explained the

head of Goddard's Robotics Branch Stan Ollendorf. When people build machines, such as robots, to move about and interact with their surrounding world, the robot also must have the sensors needed to avoid collisions with objects in its path.

The sensor is a unique device that can hold an electronic charge, called a capaciflector, to enable simple electronic elements to detect approaching objects with unprecedented range, sensitivity and resolution, according to Ollendorf. The sensor is accurate at very small distances — .030 inches at .5 inch (.076 centimeters at 1.27 centimeters) range.

By assembling an array of sensors, a "sensor skin" can be created to provide both robot arms and payloads with an unbroken, early-warning protective field so collisions will be avoided despite obstructed views or unanticipated events.

Because the resolution of the system grows more accurate at decreasing ranges, it can provide precise sensory-interactive guidance and alignment for tasks such as docking and berthing payloads. The robot operator is able to guide the overall direction of the task

knowing that obstacle avoidance is being supported automatically.

"The system can be thought of as electric hairs, like those on your arms, that permit the robot to feel its way around obstacles without touching," Ollendorf said.

The system works on a wide variety of materials and has been routinely demonstrated to perform collision avoidance at ranges in excess of one foot (30 centimeters). The materials and electronic components can "see" through flight paint and even through thermal blankets.

By making the telerobot "smart" about its short-range environment, the capaciflector sensor skin, coupled with the robot's control software, can relax the burden on the operator while improving the speed, safety and use of telerobotic operations.

A spin-off of this technology being developed under NASA's Technology Utilization program is the commercial development of small sensors that are embedded in artwork such as paintings and sculptures as anti-theft devices.

Goddard Technology Flies on Joint NASA/Japanese X-ray Mission

Goddard is managing the U.S. portion of a joint NASA/Japanese high-capability x-ray astronomy mission, called Astro-D, that is scheduled to launch mid-month from the Kagoshima Space Center in Japan.

Astro-D is equipped with four sets of mirrors provided by Goddard. The technology for these conical, thin-foil x-ray mirrors was developed by Dr. Peter Serlemitsos, Code 666, and his colleagues.

The mirrors use the same technology as those in the Goddard-designed and built Broad Band X-Ray Telescope (BBXRT), one of four telescopes aboard Space Shuttle Columbia's STS-35 mission in December 1990. Goddard also is

part of the team that developed the Astro-D software.

Astro-D has been specifically designed to help understand the physics of a variety of cosmic sources. Astro-D is expected to make important contributions to the advancement of astrophysics and cosmology.

Like BBXRT, Astro-D will look at dark matter distribution and clusters, supernova remnants and distant quasars. However, unlike BBXRT, Astro-D will be able to view sets and groups of objects. BBXRT was on a shuttle mission, which allowed for several days of observations. Scientists will have years of observations with Astro-D.

"We have done x-ray astronomy investigations with better imaging

characteristics, and have done others with better spectroscopic sensitivity," said Goddard's Director of Space Science Dr. Steve Holt, Astro-D project scientist. "But combining relatively modest imaging performance with powerful spectroscopic sensitivity gives us the ability to perform literally thousands of observations that we could not do before."

Data for U.S. observers will be distributed by the U.S. Astro-D Science Center at Goddard.

Astro-D is a cooperative astronomy mission with Japan's Institute of Space and Astronautical Science (ISAS) and NASA. At Goddard, the Astro-D project manager is Jerre Hartman, Code 404.

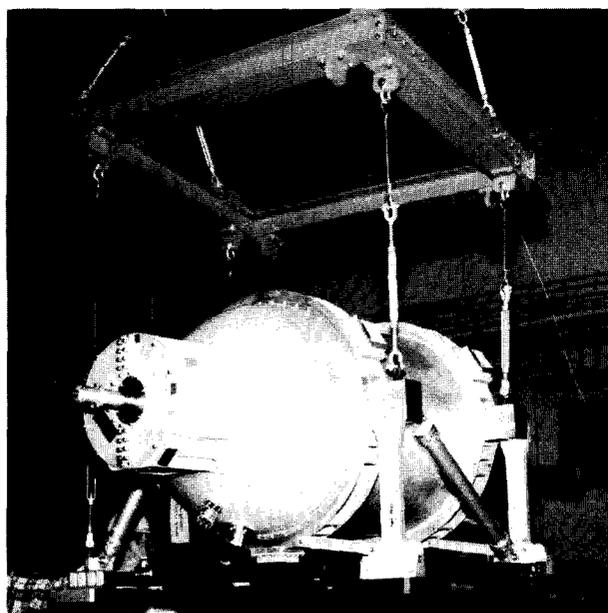
SHOOT Update

Goddard's Superfluid Helium On-Orbit Transfer (SHOOT) payload arrived at the Kennedy Space Center, Fla., on February 10. SHOOT is a Hitchhiker cross-bay secondary shuttle payload scheduled to launch on the Space Shuttle Endeavor on STS-57 in April.

The SHOOT experiment consists of two superfluid helium dewars connected by a transfer line and supported by six electronics boxes. The experiment will demonstrate the on-orbit handling and transfer of liquid cryogen (helium) from a supply to a receiving dewar. SHOOT was conceived, designed, fabricated and tested entirely within the Engineering Directorate beginning in 1985.

On orbit, the experiment will be operated from the GSFC Payload Operations Control Center by Code 713 Principal Investigator Dr. Michael DiPirro and Co-Investigators Dr. Peter Shirron and Dr. Jim Tuttle, Hughes STX. The acting experiment manager is Dr. Steve Volz, Code 713.4, and mission manager is Neil Barthelme, Code 740.3.

After checkout at Hanger AE at the Cape Canaveral Air Force Base, Fla., the SHOOT payload will be transferred to the Vertical Processing Facility at KSC for final testing and integration with the transport cannister, then will be transported to the launch pad. Integration with Endeavour will be in early April.



This picture of the Superfluid Helium On-Orbit Transfer (SHOOT) payload was taken at Goddard before SHOOT was shipped to the Kennedy Space Center, Fla., this month. SHOOT will fly on STS-57 in April.



Photo: J. Semerario

Justice Sandra Day O'Connor and four of her law clerks visited Goddard January 27. After a meeting with Center Director Dr. John Klineberg, Dr. Sally Heap, Code 681, and Larry Watson, Code 140, Justice O'Connor was given a tour of the Center with special emphasis on the Hubble Space Telescope. Pictured in front from left to right is Director of Engineering Tom Huber, Code 700; Justice O'Connor and Alda Simpson, Code 750.

1993

Continued from page 1

will fly with Goddard's Solar Shuttle Backscatter Ultraviolet (SSBUV) experiment. SSBUV helps scientists solve the problem of data accuracy caused by the calibration drift of Solar Backscatter Ultraviolet instruments that collect ozone data from several spacecraft.

Goddard's Spartan-201 will fly on STS-56 to study how the solar wind is generated by the Sun. Spartan is an orbiting spacecraft that is deployed by the shuttle and retrieved on the same mission.

A small secondary payload managed by Goddard's SSPP also will fly on this mission. The Solar Ultraviolet Experiment payload originates from the University of Colorado and will measure both extreme and far ultraviolet radiation in the upper atmosphere.

NASA is scheduled to launch the Commercial Experiment Transporter out of Wallops on a Conestoga 1620 launch vehicle no earlier than March 31. Wallops will provide full-range support including payload and vehicle assembly facilities, tracking and telemetry, range safety and range operations for the mission.

April

STS-57 will carry a Goddard-managed Get Away Special (GAS) Bridge in the payload bay of the Space Shuttle Endeavor including small scale experiments to help in the development and operation of Space Station Freedom. Experimenters will conduct investigations that include studying plant growth, and the effects of microgravity and radiation on bacteria.

A Goddard experiment called the Superfluid On-Orbit Transfer (SHOOT) will demonstrate a new

technology developed by Goddard's Engineering Directorate. The experiment will demonstrate transferring a liquid cryogen from one thermos-like container, called a dewar, to another. SHOOT will be operated out of the Hitchhiker POCC (story on this page).

June

The National Oceanic and Atmospheric Administration (NOAA)-I will launch in June from the Vandenberg Air Force Base. This polar orbiting environmental satellite will conduct global environmental observations and equipment for Goddard's Search and Rescue Satellite Project.

Goddard's Meteorological Satellite Project is responsible for this satellite from development through check-out at which time it will be turned over to NOAA.

Continued on page 8

Charles Vanek: 27 Goddard Years and Going Strong

by Jim Elliott

If titles were given for "Devoted Goddard Employee," Charles Vanek, the unflappable, 49-year-old Tracking and Data Relay Satellite System (TDRSS) project manager, certainly would seem to qualify as a leading candidate.

From the time he left the University of Maryland 27 years ago,

In high school, he participated in football, basketball and track.

The easy-going project manager has two sons — one a State trooper and the other a former State trooper who is now studying at Howard Community College to be a teacher. Vanek and his wife, who also has taken up books in pursuit of a nursing career, live in Ellicott City.

One of the blond-haired manager's fondest memories quite likely will be the recent launch of TDRS-F last January 13. The launch of the communications satellite was a complete success, and the spacecraft is now being checked out in preparation of taking its place in the constellation of five TDRS satellites hovering over the Equator 22,300 miles (35,888.44 kilometers) above Earth.

Although the launch was a success, there were a few anxious moments, Vanek explained.

"The most exciting moments probably came when one of the electronic systems on the Inertial Upper Stage (IUS) failed," he explained. "Then, the first indications from the other system indicated that we had an anomaly there, also."

As things turned out, the indication of an anomaly was false, and the IUS was working as programmed.

"After reviewing the tapes after the launch," he said, "we found that the deployment was almost flawless."

Of all the things that happened on the launch, however, Vanek said he found the greatest "relief" when he received verification that the single access antennas had unfurled properly. Those antennas are the same as the one on the Galileo spacecraft, and that spacecraft's antenna failed to deploy, seriously hampering the mission.

"Although we had tested and retested everything and were pretty confident we wouldn't have any trouble," he sighed, "I was extremely happy when we learned that they had deployed."

Of all his experiences at Goddard,

Vanek thinks his most memorable was his work on the Explorer 45 satellite in 1971 when he spent a month in Kenya. The satellite was launched on a Scout rocket from Italy's launch platform, located three miles offshore in the Indian Ocean.

"The culture and the way of life there was just so different," he said.

He remembered, too, that the NASA project people stayed in one of what were only four hotels in Malindi at the time.

"We had to share rooms because there weren't that many available," he said. "The room rates were \$6 a day, including meals, and per diem was \$13 a day."

For recreation, Vanek goes biking with his wife ("about 25 miles (40.23 kilometers) along the C&O Canal"), dabbles in photography (he has his own darkroom at his home) and works on old cars (antiques). Right now, he's looking for an old car to start refurbishing.

"As a matter of principle," he emphasized, "the only criterion I have is that the car be older than I am."

Under Vanek's direction, the TDRSS program has continued to move ahead. People who work with Vanek give him high marks for his leadership qualities.

"He's a real people person," one colleague explained. "He lets people know what he expects of them and lets them take it from there. He solicits input from his co-workers and always gives his staff an opportunity to express its thoughts."

"Technically, he's very sharp. And he's dedicated to doing things with the best interest of the government in mind."

Vanek is proud of the way the TDRSS program has been working. The program has been able to meet its commitment to the customers accepted in its scheduling system 99 percent of the time.

When one considers how many satellites are being serviced by the system, including the space shuttle, that's a record for which anyone could be proud.



Charles Vanek has worked for the Tracking and Data Relay Satellite (TDRS) System project since 1977. Pictured is Vanek in his office with a TDRS model on his desk.

he has worked at this NASA center. It is the only place he has worked in all that time. He started in Code 700 and has participated in a wide variety of programs and responsibilities. An electrical engineer, he has worked with the Delta, Explorer, cooperative programs with Holland and Germany, International Ultraviolet Explorer (IUE), Nimbus and TDRSS.

He came to TDRSS as a payload engineer in 1977, became payload manager in 1979, deputy project manager in 1983 and project manager in 1989.

His devotion to Goddard and climb through the ranks is even more outstanding when you consider that he didn't even come to the United States until he was seven years old. That's when he and his parents moved from Czechoslovakia, where his father had been associated with a machine manufacturing firm.

After arriving here, he attended Churchville Elementary and Bel Air High Schools in Harford County, Md.

Goddard Officials Receive NASA Procurement Awards

Two Goddard procurement officials were among those named as recipients of NASA's annual Procurement Awards. The honors are open to all NASA procurement professionals

Agency-wide, and the winners represent the best in the Agency in their specific positions. The Goddard winners are as follows:



McDONALD

Karen Anne McDonald, Code 284.4, was named "Contract Specialist of the Year." McDonald handles major contracts in the Earth Observing System project, a planned series of orbiting satellites. McDonald has worked at Goddard since 1985 and was recognized for her work on a major contract competition, which included protecting against the

unauthorized disclosure of sensitive information in the hands of many individuals.

Lisa D. Keenapple, Code 262, was named "Price Analyst of the Year." Keenapple analyzes companies' proposals for research contracts to determine whether reasonable prices are negotiated. Keenapple, through analysis of several proposals for a \$600 million research contract, disclosed and averted a "buy-in" attempt. A buy-in is an attempt to bid low to win the contract and claim substantial cost overruns later when the project is underway. Keenapple has worked at Goddard since 1978.



KEENAPPLE

Fire Alarm System Upgrades Underway

On on-going project is underway to replace older fire alarms systems still in service on Center. These older systems function at voltages which by present standards are considered high voltage and are being replaced with systems which function at lower voltages.

The new components are smaller. The smoke detectors are slim and made of a white plastic and manual pullstations are small red boxes. Unlike the old stations which reset themselves, the new stations require a key to reset. This provides an indication that a station has been activated.

The new fire alarms systems incorporate a strobe light to inform hearing impaired individuals of fire alarm activation, a new feature required by the Americans with Disability Act.

RETIREES

Congratulations to the following employees who recently retired!

Name	Code	Years
John Beckham	470	37
John Boggess	252	36
Herbert Blodget	922	32
Thomas Broderick	903.1	24
Harry Culver	734.1	32
John Flaherty	701	40
Cylde Freeman	564.2	34
David Fromme	415	33
Ruth Gherard	151.3	16
Richard Hockensmith	721	21
Donald Kirkpatrick	733.1	35
Richard Marks	723	39
James Quick	291.1	31
Henry Obler	271	28
Jack Peddicord	423	31
Francis Rebar	680.1	34
Ellen Seufert	130	37
Richard Sclafford	470	31
William Skillman	912	19
Lawrence Skiscim	534.1	36
Stella Speth	740.3	23
Eloise Tarter	535.1	34
Harold Vitagliano	683.3	42

COBE Team Honored



MATHER

Dr. John Mather, Code 685, project scientist for the Goddard-managed Cosmic Background Explorer (COBE), George Smoot of Lawrence Berkeley Laboratory and University of California and principal investigator for COBE's Differential Microwave Radiometers and the entire NASA/University team are among six Laureate category honorees named by AVIATION WEEK & SPACE TECHNOLOGY magazine for having made significant

contributions in the global field of aerospace in 1992. The COBE team used data to reveal temperature variations in the early Universe. These 15-billion year old relics support the "Big Bang Theory" which states that the Universe was created following a cataclysmic explosion. Mather and Smoot will receive trophies in honor of their recognition on April 21 in ceremonies in Washington, D.C.

Continued from page 5

Goddard's Orbital Launch Services (OLS) team will oversee launch operations for NASA.

July

A Goddard-managed small secondary payload, called the Limited Duration Candidate Material Exposure (LDCE)-2, will fly on STS-51 in July. Composed of two experiments, the purpose of this payload is to expose different materials to atomic oxygen. Out of this research, new materials may be developed for building structures such as Space Station Freedom. Case Western Reserve University, Cleveland, Ohio, is the customer.

As for all space shuttle missions, Goddard's Tracking and Data Relay Satellite System and Flight Dynamics Facility will support this mission with air-to-ground communications and orbital information.

August

The third mission to be supported by Goddard's SLDP facility will fly in August aboard the Space Shuttle Columbia. STS-58 is a Spacelab Life Sciences mission devoted entirely to understanding how the human body reacts and adapts itself to the space flight environment.

October

The commercial launch of Seastar which will collect data for the Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) is scheduled to launch in October into low-Earth orbit on a Pegasus vehicle. SeaWiFS will measure changes in ocean color that indicate where concentrations of phytoplankton and chlorophyll lie on the surface of the ocean. For global change research, measuring concentrations of phytoplankton are essential in understanding the role of oceans in the global carbon cycle.

Goddard's Wallops Flight Facility will conduct a sounding rocket campaign this month for atmospheric research. As many as nine sounding rockets are expected to launch from Brazil for this effort.

November

Goddard engineers are preparing several payloads for STS-60. Plans are underway for one small secondary payload, possibly two Hitchhiker experiments, and four or more GAS payloads to fly onboard the Space Shuttle Discovery.

During this mission, astronauts will execute and obtain data from six experiments onboard a small secondary payload managed by Goddard's SSPP called the University of Bremen (Germany) Satellite.

A STS-60 payload that will use Hitchhiker hardware, the Capillary Pumped Loop experiment, is a prototype of the two-phase thermal control system planned for use in the Earth Observing System platform. It is possible that an additional Hitchhiker payload also will fly on this mission.

STS-60 will carry GAS experiments. Although no firm selection of these payloads has been made at this time, a minimum of four GAS experiments are expected to fly.

December

Wind is scheduled to launch aboard a Delta rocket in December. Part of NASA's Global Geospace Science Program, this Goddard-managed spacecraft will determine solar wind input properties including plasma waves, energetic-particles, electric and magnetic fields for magnetosphere and ionospheric studies.

The final space shuttle mission of 1993 highlights the first servicing mission for NASA's HST. Three spacewalks are planned with provisions for two more to service the HST, launched in April 1990. Simulations are already underway for Goddard's HST servicing team and the mission astronauts. The solar arrays will be replaced and several instruments and gyros will be changed out.

Though manifested for a December launch, NOAA-J will be held in storage until requested by NOAA. Like NOAA-I, this environment satellite is under development by Goddard.



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1992 Antarctic Ozone Depletion as Severe as Previous Years

Continuing observations by the Nimbus-7 and Meteor-3 Total Ozone Mapping Spectrometer (TOMS) instruments have confirmed that the depletion of stratospheric ozone over Antarctica in 1992 was as severe as any previous year. In 1992, the "ozone hole" developed one to two weeks earlier than prior years. Goddard scientists also confirmed that on September 23, 1992, the Antarctic ozone hole was the largest on record. This data from the TOMS instrument onboard NASA's Nimbus-7 satellite is consistent with that of the TOMS onboard the Russian Meteor-3 satellite launched in August 1992.

Deadline for submitted material is the fifteenth of each month. For additional information contact Randee Exler (301) 286-7277, TDD (301) 286-8955.

The GODDARD NEWS Staff is:
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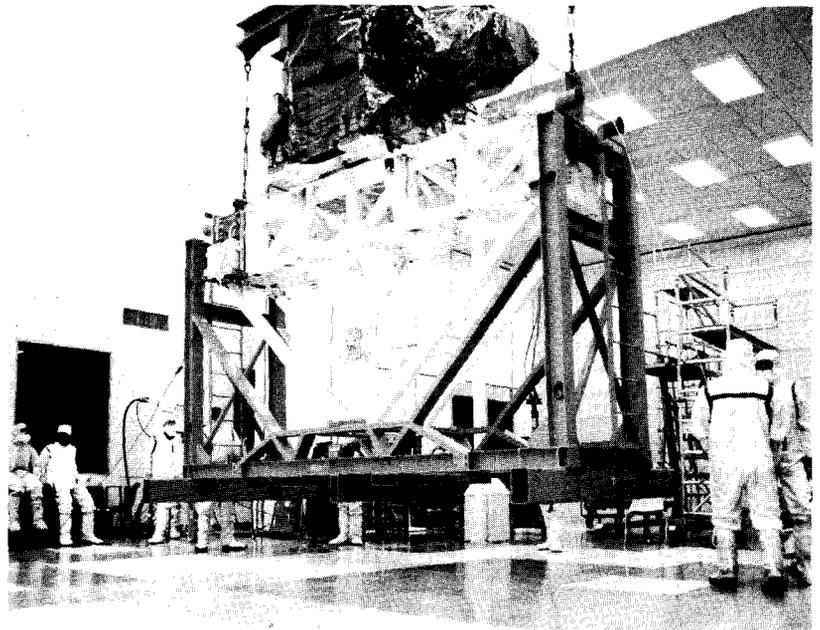
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The Spartan-201 payload, inside the Kennedy Space Center's payload processing facility in Florida, is mounted on the Spartan Flight Support Structure in preparation for launch in Discovery's cargo bay. Spartan is scheduled to fly again in 1994 and 1995.



Goddard Projects Aboard STS-56

by W. Allen Kenitzer

Two Goddard projects will be in the spotlight as they ascend above the Earth on the April scheduled launch of the Space Shuttle Discovery, STS-56. Goddard's Shuttle Solar Backscatter Ultraviolet experiment (SSBUV) and the Goddard-managed Spartan-201 spacecraft will be in the shuttle's cargo bay and of great interest to the scientific community.

The SSBUV spectrometer is fondly known as Goddard's "frequent flyer." STS-56 will be its fifth flight. SSBUV is mounted on the walls of the shuttle's cargo bay and is designed to measure ozone concentrations by comparing solar ultraviolet radiation with that scattered back from the Earth's atmosphere. SSBUV undergoes rigorous calibration before and after flight. Consequently, scientists can determine the reliability of ozone data gathered by scientists.

Meanwhile, Spartan is designed to provide short-duration, free-flight opportunities for a variety of scientific studies.

"This is the first Spartan flight since the loss of Spartan-Halley on the Space Shuttle Challenger," said Jack Pownell, mission manager, Spartan-201, Code 740.2. "On this occasion, our thoughts go back to the crew of Challenger."

Spartan-201 is an orbiting spacecraft that will be deployed by the space shuttle and retrieved on the same mission. After deployment, it is completely autonomous, providing its own battery power pointing system and

recorder for capturing data. While on orbit, Spartan-201 executes a pre-programmed science mission.

Spartan-201 will study the acceleration and velocity of the solar wind and measure aspects of the Sun's corona. Results should suggest solutions to the questions of coronal and solar wind physics with dramatic observations.

On the third day of the mission, a shuttle crew member will use the robot arm to lift Spartan from the payload bay and release it over the side of the shuttle. Once deployed from the shuttle, Spartan operates independently, turning and pointing at the Sun, while leaving the orbiter free for other activities. Additionally, Spartan is able to view the Sun clear of any contamination which might be generated by shuttle thruster firings.

For approximately 40 hours, Spartan-201's instruments will observe the Sun. About four hours prior to the scheduled retrieval, the shuttle will slowly close in on Spartan-201, eventually passing directly below. Shuttle Pilot Steve Oswald manually will fly the final few hundred feet (approximately 100 meters) to allow the satellite to be grasped by the robot arm. Once caught, Spartan-201 will be stowed back in the cargo bay to be returned to Earth.

The solar wind originates in the corona, the outermost atmosphere of the Sun. Spartan-201 will carry two separate telescopes to study the corona. One tele-

(Continued on page 4)



Directors' Dialogue

Q: Nine years of court proceedings have resulted in a ruling that employees who were on a special salary rate from 1982 to 1988 were improperly denied the annual General Schedule (GS) raises for those years. Back pay with interest will go to an estimated 50,000 employees, but, the Office of Personnel Management (OPM), the court, and the unions which sued the government have yet to agree on a payout formula. Has there been any progress or plans that will include GSFC employees in this action? What schedule is envisioned for payout?

A: The OPM establishes special

rates for hard to fill occupations such as accountants, engineers, computer scientists, and clericals in grades ranging from GS-2 through GS-12, depending on occupation. The occupations and grades covered are subject to change as the labor market changes. Two courts have ruled that employees who were on a special salary rate from 1982 to 1988 were improperly denied annual GS raises for those years.

Agreement has not yet been reached on a payout formula. This may take some time. In June 1992, OPM published a second proposed approach for comment. When agreement is reached, OPM will publish regulations on how to deter-

mine which employees are covered and how to calculate the amount due each employee. Goddard will notify and pay affected employees as soon as OPM issues final regulations.

OPM is the only source of official information on matters such as this. OPM has made no official statements about the case, and the Goddard Office of Human Resources must currently rely, as you do, on information in the public media. When the matter is resolved we will inform employees immediately.

Roger L. Jenkin
Director of Human Resources
Code 110

Questions for Directors' Dialogue may be sent in to Directors' Dialogue, Code 130, without identification. Questions are sent to the appropriate directorate office as written but may be edited for space and clarity before being printed.

Supernova May Have Created Mysterious Void That Surrounds Solar System

by Michael Finneran

A supernova that shone in the ancient sky like a second moon is the probable cause of a huge void known as the "Local Bubble" that envelops the solar system and many nearby stars, Goddard scientists reported in the Feb. 25 issue of the British journal, "Nature."

The bubble is an area about 300 light-years across that, compared to other parts of space, is relatively empty of gases except for super-hot hydrogen. The bubble's origin has been the subject of intense speculation for the last 20 years. Now, researchers say evidence suggests it was formed by the supernova, or explosion, of a star known as Geminga about 340,000 years ago.

"This is a supernova we didn't know about until last year. We put this new knowledge together with some other information about the Local Bubble, and we were able to say 'ah-hah, we think we know what happened here,'" said Dr. Neil Gehrels, of the Laboratory for High Energy Physics, Code 661. He wrote the paper with colleague Dr. Wan Chen, of Universities Space Research Association.

A supernova is an internal explosion that blows away a star's outer layers, leaving a dense, collapsed, rapidly spinning core that emits ener-

gy in pulses. These blinking stars are known as pulsars. The Local Bubble would have been formed by the force of the supernova blasting most of the gases out of the surrounding interstellar medium, according to Gehrels and Chen.

"This must have been the brightest supernova ever seen by Homo sapiens," said Gehrels. "Everybody would have immediately noticed it. It would have been quite a spectacular and frightening event, though not one that would have threatened the planet's existence."

Supernovae are one type of phenomena that create bubbles, Gehrels said, and others exist in space, including a cluster of several around the Local Bubble. Similar bubbles probably even were formed around our solar system by supernovas just as close as Geminga millions of years ago. But those would have collapsed and dissipated by now, he said, leaving little or no trace of their existence.

Astrophysicists have long speculated that the current Local Bubble was created by a supernova. But for that to have happened, the star would had to have been relatively nearby, said Gehrels. And until recently, the evidence for that was scant.

From Geminga's pulsations, sci-

entists calculated that the star is no more than 340,000 years old. Gehrels and Chen speculate that the Geminga supernova was about 180 light years away — close enough to have created the bubble. Geminga has since moved to about 400 light-years away.

Further evidence recently presented by a team of Italian astronomers helped Gehrels and Chen place Geminga more precisely. Calculations based on its speed suggested the star was born in a position to have created the bubble. The team also reported that the swiftness with which Geminga crosses the sky indicates it is not far away.

"So we now believe the position for this nearby supernova was right near the current middle of the Local Bubble," Gehrels said.

Gehrels said the supernova that created the bubble would have been a unique experience for anyone on Earth who witnessed it.

Observers would have seen the sudden appearance of a star emitting as much light as the moon, visible even in daylight. With a full moon in the sky, the nights would have been twice as bright as usual. Geminga would have lingered like a beacon for several months before fading. Currently, it cannot be seen with the naked eye.



Pictured left to right are the Niña, Pinta and Santa Maria. All are exact full-scale replicas of Christopher Columbus' ships that sailed to America in 1492. These ships, seen here on the Banana River near Kennedy Space Center, Fla., made the voyage from Spain last year. The trip was sponsored by the Spain Foundation on the 500th Anniversary of Columbus' journey to the new world. Silhouetted in the background is the Space Shuttle Endeavour one day prior to its maiden voyage, STS-49, on May 7, 1992.

What's UP?

March 1993

ASTRO-D — *Days in orbit: 19*

Interesting fact: Astro-D launched into a near-nominal orbit on Friday, February 19, 1993, at 9:00 p.m. EST from the Kagoshima Space Center, Japan. The satellite was renamed Asuka, which means "flying bird" in Japanese. On March 2, the x-ray telescope system set-up was completed. The optical bench, which was folded inside the satellite for launch, successfully extended and latched firm into position. The Sun shade opened at the same time. The telescope is in its final in-orbit configuration and has a focal length of 11.5 feet (3.5 meters).

COMPTON — *Days in orbit: 695*

Interesting Fact: The Imaging Compton Telescope instrument team has produced the first maps of the Milky Way in the light of intermediate-energy gamma rays. This region of the electromagnetic spectrum has been poorly studied and was never the subject of an all-sky map. The map and the description of its features have yet to be published.

EXTREME ULTRAVIOLET EXPLORER — *Days in orbit: 267*

Interesting fact: All spacecraft subsystems continue to function normally. Special attention continues to be paid to the batteries state-of-health performance parameters since modifying their charging process in early February.

HST—*Days in Orbit: 949*

Interesting fact: A software program designed to allow safe operation of the HST if any further gyro problems occur prior to the December servicing mission passed an on-orbit test.

SAMPEX — *Days in orbit: 240*

Interesting Fact: SAMPEX continues to acquire most science and engineering without any major problems or operational errors. There were minor problems with the Wallops passes during a week in February. Wallops is the only station that is certified for acquiring the 900 kilobit science data dumps. The project has requested Merritt Island as a backup site and the network has begun tests.

TDRS-6 — *Days in orbit: 46*

Interesting fact: NASA has com-

pleted a checkout phase which verified that TDRS-6 is operating nominally. It joins four other TDRS spacecraft in geosynchronous orbit approximately 22,000 miles (35405.64 km) above the Earth. TDRS-6 has seven antennas and two solar arrays that tip-to-tip are taller than a five-story building. The satellite can handle more than 300 million bits of information per second per channel — the equivalent of all the data in a 20-volume encyclopedia.

UARS — *Days in orbit: 534*

Interesting fact: The Solar/Stellar Irradiance Comparison Experiment team reported in a submitted paper to the Geophysical Research Letters that both ground-based and space measurements of solar radiation at radio, visible, and ultraviolet wavelengths show a large decline in the first six months of 1992. Although such decreases have been observed in earlier solar cycles, the change in 1992 is unique because the level of solar radiation has remained low for at least six rotations.

GSFC Engineers Visit Schools

Ninety-seven GSFC and 21 Wallops' engineers visited area middle and high schools February 14-20, in support of National Engineers Week. The schools visited included those in Washington, D.C.; Baltimore City; Anne Arundel County; Howard County; Prince George's County schools and 19 schools in five counties surrounding Wallops.

Through their combined efforts

the engineers communicated with thousands of students. The school visits included lectures, group discussions and demonstrations involving students and teachers. The National Capital Section of the American Institute of Aeronautics and Astronauts also sponsored two days of activities at the DuVal High School in Greenbelt, February 17 and 18.



Pictured is Leigh Gatto, Code 573.2, explaining to students at Wilde Lake Middle School in Columbia what courses they need to take to prepare themselves for careers in engineering. Gatto said "The students seemed to enjoy the class, especially the video tape of Space Basics." He added, "I enjoyed the entire experience and plan to participate next year."

Safety Training Held Here

More than 130 people attended a recent training session for Facility Operations Managers (FOMs) and Fire Wardens. The class provided participants with information on responsibilities related to safety and emergency preparedness.

Topics discussed included:

- NASA and GSFC documents pertaining to FOMs
- Service organizations at GSFC that can be of use to the FOMs and Wardens
- Non-emergency duties of FOMs and Wardens
- An introduction into alarm systems (primarily fire alarms)
- An introduction into hazardous materials and the regulations governing them
- Emergency planning, including initial procedures, emergency response personnel procedures, and emergency plans.

The Safety and Health Branch plans to provide this type of training session annually. For answers to questions concerning emergency planning and response contact the Safety and Health Branch at 286-6295.

Spartan-201

Continued from page 1

scope, the White Light Coronagraph (WLC), will measure the density distribution of electrons making up the corona. The Ultraviolet Coronal Spectrometer (UVCS) telescope will investigate the temperatures and distributions of protons and hydrogen atoms through the same layers of the corona.

The corona is difficult to study in view of its extremely dim light. Investigations cannot be done from Earth because the sky is overwhelmingly bright. The white light corona only can be viewed from Earth during times of solar eclipse because of absorption of the atmosphere. The ultraviolet radiation is never available to ground-based astronomers.

A comparison of the white light and ultraviolet data sets will, for the first time, allow scientists to

measure the electron and proton temperatures and densities in the solar corona. These data sets also will allow scientists to test specific theories on how the corona is heated to its million degree temperature.

These scientific observations will be recorded onboard Spartan-201 and analyzed by scientists and engineers after recovery on the ground. The Spartan carrier and instrument will fly again on STS-63 in May 1994 and STS-76 in June 1995. These flights coincide with the Ulysses spacecraft passage over the poles of the Sun.

The UVCS telescope was built by scientists from the Smithsonian Astrophysical Observatory, Harvard University, Cambridge, Mass. The WLC telescope was developed by the High Altitude Observatory of the National Center for Atmospheric Research in Boulder, Colo.

The Spartan carrier structure itself was built at Goddard where engineers also checked out the experiments, integrated the payloads and performed system checks.

The Spartan program is managed by Goddard for the Office of Space Science and Applications, Washington, D.C. The Spartan project manager is Frank Collins, Code 740.1, Goddard's Special Payloads Division. The principal investigator is Dick Fisher, Code 682, Goddard's Laboratory for Astronomy and Solar Physics.

Federal Employees Group Life Insurance Open Season Begins

The Federal Employees' Group Life Insurance (FEGLI) open season has begun. During this open season, which ends on April 30, 1993, eligible employees have the opportunity to enroll or change their enrollment options. There are no restrictions or limits on those who are eligible to enroll and no physical examination is required. In order to be eligible for optional insurance you must also choose basic coverage.

New enrollments and changes will become effective on the first day of the pay period beginning on or after May 30, 1993, if you were in a pay and duty status — at work and not on leave or nonpay status

— for at least 32 hours in the pay period immediately preceding May 30, 1993. Otherwise, the election becomes effective on the first day of the pay period following one in which you fulfill the 32 hour requirement.

The Standard Form 2817 "Life Insurance Election" is available in the Center's Employee Services Area which is located in Building 1, Room 160. Wallops employees may pick up forms at the Wallops Personnel Office in Building F160.

For more information concerning open season, contact Clita Graham at 286-8930. Wallops Flight Facility employees should contact Tommye Sue Thornton at (804) 824-1141.

Director for Space Telescope Science Institute Named

The Association of Universities for Research in Astronomy, Inc., (AURA) announced that Dr. Robert E. Williams has been appointed director of the Space Telescope Science Institute (STScI) in Baltimore effective August 1, 1993. STScI carries out the international science program of NASA's Hubble Space Telescope (HST). As director of STScI, Williams will lead a staff of nearly 400 astronomers, computer scientists and technical staff who will carry out the science operations of the HST. Williams also will be responsible for conducting HST's observation program and ensuring that the telescope is a scientifically productive resource for the international astronomy community.

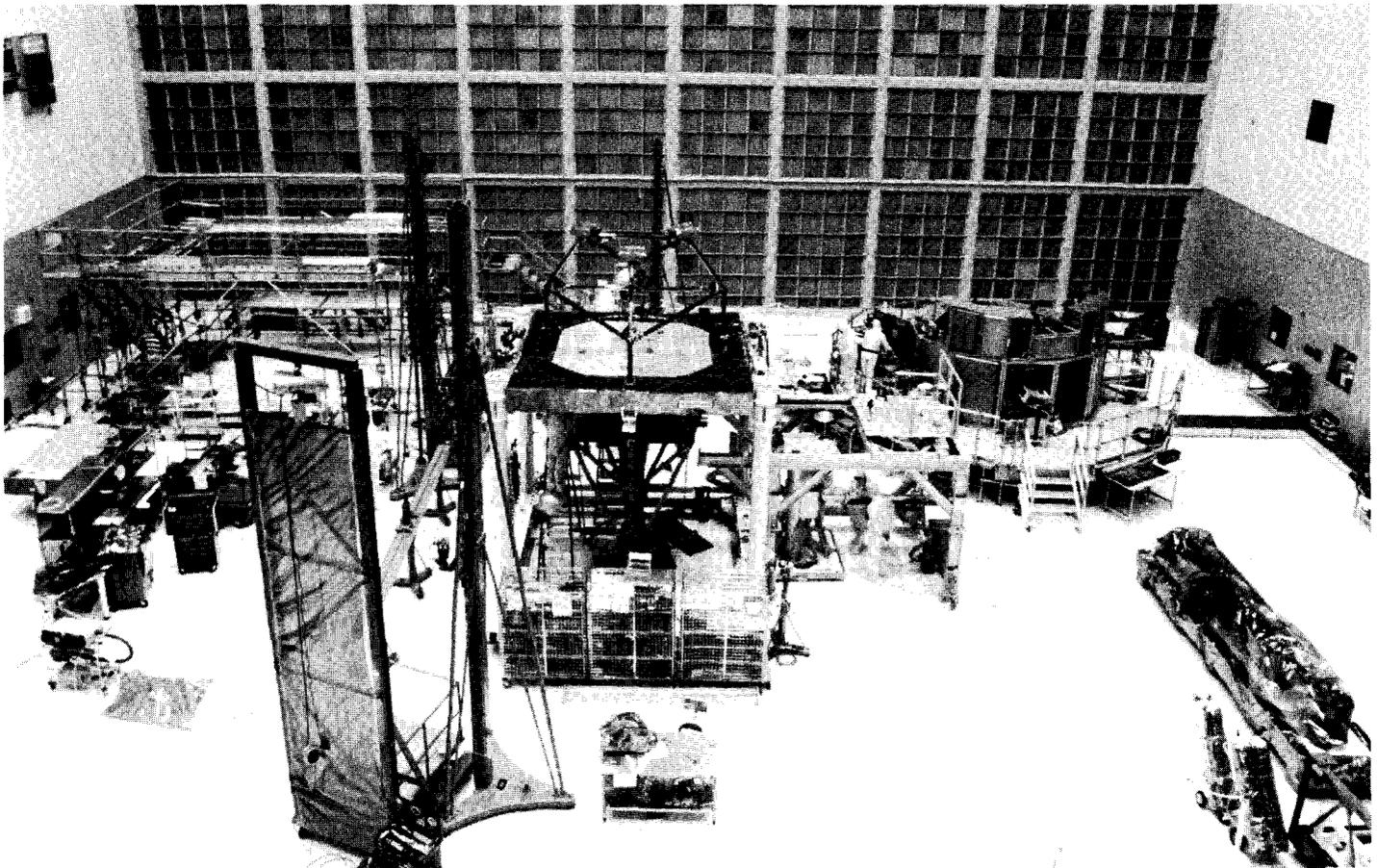


Photo: Randy Frisch

This photo of Goddard's Building 29 cleanroom shows activities surrounding the testing of equipment that will fly on the Hubble Space Telescope Servicing Mission (STS-61) in December. Replacement and new instruments that will be flown on the mission will come to Goddard for resting before the flight on the Space Shuttle Endeavour. Here, technicians (top right) work with the Vehicle Electrical Test System (VEST). Also shown are the Scientific Instrument Support Structure (SISF), center, and the qualification model of the solar array, lower right.

Goddard Engineer Keeps Trains on Track

At work, Dr. Jim Strong is an engineer and computer scientist who designs graphics for Goddard scientists. At home, he's another kind of engineer — one with an entire railroad at his disposal.



Dr. Jim Strong shows off an engine and a caboose, which are among more than 50 model trains that run through his back yard on the Woodland Railway.

And it's all in his own back yard.

Strong, of the Scientific Applications and Visualization Branch, has spent the better part of his spare time in the last dozen years building a wonderland of winding, 1:22.5-scale railway behind his home in Upper Marlboro, Md. Ten battery powered, radio-controlled engines and 50 railroad cars, each six to eight inches (15 to 20 centimeters) high, clack along 850 feet (255 meters) of track that snakes through four Lilliputian "towns."

All hand-crafted by Strong, the layout covers more than a quarter-acre (.1 hectare), stretching from his wooded back yard down to a side yard. Gulliver-like, Strong presides over his miniature world whenever he gets the chance, maintaining, improving and adding to it.

"In the summertime I work on it whenever I'm not doing anything else," said the 56-year-old Prince Georges County native.

Strong has been hooked on the hobby ever since viewing a display of the trains while visiting his brother in England in 1975.

"I saw them winding through the woods," Strong recalled, "and I said 'Boy, this is for me.'"

He had his brother buy and send him a set, but he didn't do anything with it until 1981, when he began turning his back yard into a locomotive landscape. He buys the railroad cars already assembled, but has built many of the buildings himself and assembles and lays all of the track. Son Kevin became involved as a teenager and even now, at 22, continues to fabricate engines for his father.

Strong constructs all of the buildings — there are about 15 of them — that dot his private kingdom, using plastic instead of wood to prevent deterioration.

"I try to make all of my buildings out of plastic," he said. "Some of them are kits.

If I want to build one myself, I'll buy sheets of scrap plastic and cut them out in the shape I want."

Strong's "towns" are named after the trees that populate them such as Hemlock Hill, Tall Oaks and Willow Flats. Each town has a railroad yard, and all are linked by track that tunnels through rocks and traverses bridges on its way across the woods.

Strong's real love, though, is in the landscaping.

"The trains and track are one thing," he said, "but I really enjoy the scenery parts of it the most. I enjoy putting in the bushes and rocks and moss. I try to make it look as realistic as I can, with real plants and things. I'll move rocks around and then stand back for a few minutes and look at them and think, 'Is that right?' Then I'll move them a little more. That's what's the most fun for me."

Over the years, Strong said, he's spent several thousand dollars on trains and track. Engines cost \$200

to \$800, depending on size and whether they have sound. Cars cost about \$30 each. Track costs about \$3 per foot. And Strong puts another \$200 each year into landscaping.

Strong, is a member of the Washington, Virginia and Maryland Garden Railway Society. That's right, there are others like him — about 100 in the local group.

Strong said that if there is a connection between his work and his hobby, it's that they both require creativity. His work in the Scientific Applications and Visualization Branch is charged with helping scientists turn the abstraction of numbers into visual images.

"What we end up with is a three-dimensional perspective of scientific data," Strong said. "There's no way you can look at an enormous amount of numbers and tell what's going on. We put these numbers into a visual image in a way the brain can understand."

For example, data on global snowfall can be transformed into a series of Earth images that show the snow cover. Going a step further, those images can be animated into a kind of motion picture that illustrate the snow cover advancing and receding.

Until recently, Strong had been involved in image processing and massively parallel computer computations. He was among a group of Goddard researchers who in 1983 developed a supercomputer called the Massively Parallel Processor (MPP), the first of its kind in the nation.

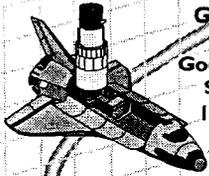
In something of a career shift five years ago, he got away from supercomputers and began using computer graphics, and animation on video disks, to help scientists analyze data.

"In fact, the reason I got into image-processing was because I was interested in images. When I got a chance to actually make images rather than having to analyze them, I just jumped at it," said Strong, who has been at Goddard for 30 years. "I'm sort of an artist at heart, and I always have been."

COMMUNITY DAY

NASA's GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

Goddard Visitor Center
Sunday, April 25, 1993
10:00 a.m. to 4:00 p.m.



SPECIAL-GUIDED BUS TOURS OF THE CENTER
10:30 a.m. until 3:00 p.m.

SCIENCE BOWL - Local Students Competing in
Science Quiz Show
11:00 a.m.

SPACESUIT DEMONSTRATIONS -
12:00 p.m. and 2:00 p.m.

HUBBLE SPACE TELESCOPE PRESENTATION -
1:00 p.m. - 1993 Servicing Mission of the Telescope

MODEL ROCKET LAUNCH - 3:00 p.m.

MUSICAL ENTERTAINMENT AT NOON



For more information call: (301) 286-8955
Visitor Center phone (301) 286-8981
TDD: (301) 286-8955

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HARRIS

Dr. Dale W. Harris was appointed deputy director for Institutional Project, Mission Operations and Data Systems Directorate, Code 500, recently. Dr. Harris is responsible for overseeing Level 1 Institutional Project Management, reviewing project status regularly, providing guidance to project activities, and maintaining and establishing the Directorate systems management policy.

Dr. Harris has served as deputy director of Flight Projects since 1989. He served project manager for the Tracking and Data Relay Satellite from 1984-1989 when he was responsible for all work related to satellite development, launch, and early orbit checkout.



On February 3, 1993, the Bloodmobile was held in the Building 8 Auditorium and 169 prospective donors volunteered to donate blood. The following is a list of Goddard employees who were cited by the American Red Cross with gallon pins at the Bloodmobile.

# of Gallons	Name	Code
1	Tim McClanahan	694
3	Rick Shafer	685
5	Mark H. Allen	400
1	Ken McKenzie	519.7
1	Michael O. Johnson	519.1
8	Warner H. Hord, Jr.	MDA/415
1	Richard Deutschmann	271

The next Bloodmobile is scheduled for April 7 in the Building 8 auditorium. Watch Dateline Goddard for more details.

Goddard Employee Colloquia Spring Series

Mark your calendars! Everyone is invited to these non-technical sessions, to be held in the Building 3 Auditorium. Refreshments will be served in the lobby at 3:00 p.m. Sessions will be conducted in the Auditorium from 3:30 p.m. to 4:30 p.m.

Dates	Topics
March 31	Ozone 101: A Primer
April 21	Goddard 2000: The Look of the Future
May 26	Space Highways: Satellites and Their Orbits

Sessions will be introduced by GSFC Deputy Director Peter Burr.

A sign-language interpreter will be at all sessions. Watch "Dateline Goddard" for details.

Scholarship Offered by University of Md.

The University of Maryland at College Park is offering a new award that provides scholarships and fellowship support for students enrolled in the fields of Earth or space sciences, or physics.

The scholarship was created by Drs. Jeffrey and Lily Chen on January 25, 1993 with an initial gift of \$250,000. Dr. Jeffrey Chen is President of General Sciences Corporation (GSC) located in Laurel, Md. Dr. Lily Chen is the Executive Vice President at GSC. GSC is a high-tech firm devoted to space, Earth and environmental science research as well as information system development for U.S. Government agencies.

The first scholarship award will be made during the fall 1993 semester. Under the program, up to four \$10,000 scholarships will be awarded annually to students of outstanding achievement.

Children of employees at GSC as well as Goddard and the National Oceanic and Atmospheric Administration/National Weather Service, and students from Taiwan will be given preferential consideration in the scholarship award.

For more information, call Gary Stephenson at (301) 405-4627.

February 1993, Black History Month Activities

Goddard's Black History Club (BHC) recently presented the Goddard community with several programs in commemoration of the 1993 Black History Month. The BHC highlighted the month of activities with its Annual Scholarship Dinner Dance at La Fontaine Bleu in New Carrollton, Md. Coppin State University, located in Baltimore, Maryland, was the 1993 recipient of a \$2,500 gift which will be given to an African-American student pursuing a degree in engineering, mathematics, or science. The BHC also presented Fredreda Akers (retired, Code 564.2) and the family of the late James Chapman (former Goddard Equal Employment Opportunity Specialist) with awards for their contributions to the club. NASA Administrator Daniel Goldin attended the event and offered remarks on African-Americans and NASA. Goldin commended the club for its accomplishments and encouraged club members to take responsibility for reaching their career goals.

Black History month activities included a musical and dramatic presentation of African-American history and contemporary social issues by the group, "UPRISING". UPRISING is made up of local students who range in age from 8 to 18. Other events included a live satellite broadcast of "Beyond the Dream V," featuring a distinguished panel of writers: Terry McMillan, Charles Johnson, Nikki Giovanni, Houston A. Baker, Jr., and Marita Golden. Cultural Historian Anthony Browder, founder



Pictured is Black History Club President David Carter (left) with NASA Administrator Daniel Golden at the annual Black History Club Scholarship Dance at La Fontaine Bleu in New Carrollton.

of the Institute of Karmic Guidance, discussed the Nile Valley contributions to civilization and emphasized that African contributions must be recognized and acknowledged.

The month ended with a performance by the Ballou Senior High School Gospel Choir of Washington, D.C., and a presentation by Dr. Benjamin Carson, Director of Pediatric Neurosurgery at Johns Hopkins University Hospital in Baltimore. Carson became world famous with his much publicized separation of German Siamese twins in 1987. He cited his personal struggles with poverty, negative peer pressure, and poor self-esteem. Carson said that, "his mother turned his life around by forcing him to read." Reading set him on the path to academic excellence. He also mentioned that after performing surgery to remove half of a young child's brain due to severe epileptic seizures, the young girl recovered and excelled academically. Carson added, "If a child with half a brain can achieve, just imagine what a person with a full brain and some determination can do!" Students from area high schools, middle schools, and elementary schools were invited to all the events.

Goddard Black History Club members invite everyone to attend their monthly meeting on the second Tuesday of each month at 11:30 a.m. The meetings normally are held in building 12, room C206. For more information, call Dana Dunsen at 286-4994.



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Deadline for submitted material is the fifteenth of each month. For additional information contact Fred Brown (301) 286-7277, TDD (301) 236-8955.

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1993 Spring Community Day Volunteers Are The Key To Its Success



Photo by Nina Desmond

Model rocket demonstrations delight a crowd of more than 500 on a picture perfect Sunday in April.

by Nina Desmond

How do you successfully educate, enlighten and entertain 4,000 visitors on a beautiful Sunday afternoon in April? With the help of enthusiastic, dedicated, hard-working Goddard volunteers!

According to Carl Poleskey of the Office of Public Affairs, "Without the help of our volunteers, it would have been next to impossible to host Goddard's Community Day on April 25." Volunteers contributed their time, energy and talents by serving as bus escorts, facility tour guides, assistants to the disabled, greeters, and information specialists.

Special events during the day included a presentation, to a standing-room only crowd, on the 1993 Servicing Mission of the Hubble Space Telescope (HST), by Joseph H. Rothenberg, Associate Director for HST. Another very popular event was the space-suit demonstration presented by Visitor Center Manager Kathy Pedelty, Computer Information Specialists, Inc., Code 130.

Many visitors may tell you that the highlight of their day was the special guided tour of the Center. Tours included the Spacecraft Systems Development and Integration Facility; Spacecraft Test and Integration Facility; the Goddard Machine Shop; the

Hubble Space Telescope Control Center; and the NASA Communications and Flight Dynamics Facilities.

"This was one of Goddard's most enjoyable Community Days ever, thanks to our dedicated volunteers," said Poleskey.



Photo by Jane Semeraro

Volunteer Tom Mooney greets visitors of all ages as they arrive for a 'fun-filled' day of tours and activities at the Goddard Visitor Center.



Directors' Dialogue

Following are two questions about snow removal during March.

Q. Why were GSFC personnel told to report for duty at regular hours on Monday, March 15, 1993 when the parking lots and sidewalks had not been cleared of snow? I work in Building 22 and its back lot by the loading dock was not plowed except for a central furrow creating hills of snow one had to drive over to find a parking space on top of snow and ice. The lot between Building 22 and Building 8 was plowed so that less than half the parking spaces were cleared and the others were covered with ice and snow. When I called the Parking Lots and Streets Snow Removal number (x6-6977) I was told that the man in charge was out and that there wasn't much they could do to remove ice. When I called the Sidewalks/Loading Docks Snow Removal number (x6-5575) I was told that there have been a lot of complaints and they would get over to Building 22 in turn. Monday afternoon it had warmed up enough to melt the snow and soften the ice. Of course, they couldn't plow then because of all the cars parked everywhere.

Q. The "blizzard of 93" was a handi-

cap to us all regarding the road and parking conditions. While the roads on base were cleared very well, the parking lots and walkways remained treacherous through March 16, 1993.

This situation is far worse for those of us with physical handicaps and the lack of attention by those responsible for the snow removal. Because the majority of the handicap parking spots are situated at the end of the lot, all the snow gets piled there. If you imagine a physically handicapped person (in my case hip and leg mobility problems) climbing over mounds of ice and snow, you can see the potential for injury.

I know the routine would be to call your building FOM, however, it was center-wide. I did note that the two handicap parking (HP) spots in front of Building 8 were clear, but they were the exception. Two of the three spots in front of Building 7 were blocked, the other never cleared, the HP behind Building 1 was half blocked with mounds, likewise at Building 6.

A. The March 13-14, 1993, snow storm was an anomaly that extended the limited resources the Center has for snow removal. Snow removal

operations began prior to the onset of the storm. We committed our resources to assure that roads, sidewalks, and parking lots were cleared in accordance with our snow removal announcement.

The storm's intensity, in conjunction with low temperatures and different mixtures of precipitation, created a snow fall over a layer of ice that was difficult to remove from sidewalks and parking lots. Over four days, we expended 1,134 hours of overtime and applied over 15 tons of sand/salt mixture and calcium chloride/sand to clear the Center.

Center management, after being appraised of conditions on Center and the surrounding communities, decided to open the Center on March 15, 1993. All employees were extended the opportunity to request annual leave via a liberal leave policy.

We regret the inconvenience to not only our physically challenged employees, but all of our employees.

**Sherry Foster, Director,
Management Operations
Directorate
Code 200**

Questions for Directors Dialogue may be sent in to Directors' Dialogue, Code 130, with or without identification. Due to space limitations, not all questions can be answered. Questions are sent to the appropriate directorate office as written but may be edited for space and clarity before being printed. Some questions may be answered outside of this forum.

Venus Loses Earth Size Oceans

by Fred A. Brown

Final data from the Pioneer Venus Orbiter spacecraft provided important information on Earth's sister planet Venus. On October 18, 1992, after 14 years in orbit, the Orbiter entered that planet's atmosphere and burned up shortly after making its final transmission.

"By studying the new data from the 'Pioneer,' you can determine that Venus has lost Earth-size oceans of water," said Dr. Richard Hartle, who worked on the project with Dr. Joseph Grebowsky. Both work in Code 914.

The final evidence shows that the planet, which today is very dry and searing hot, once had three and a half times as much water as previously thought, enough water to cover the entire planet surface between 25- and 75-foot (8 and 23 meters) deep.

Hartle and Grebowsky studied the

planet's atmosphere using several instruments aboard the spacecraft: the Ion Mass Spectrometer to measure the ion density of the planet's atmosphere, the Langmuir Probe to gauge the temperature and density of its electrons, and the Retarding Potential Analyzer to measure the ion temperature.

Hartle and Grebowsky measured the heavy hydrogen (deuterium) that was left behind when hydrogen escaped from Venus into space. The measurements reveal an unusually high concentration of deuterium which indicates that the planet at one time had large concentrations of water.

"This latest finding is very important and exciting to us. We think we'll learn a lot about water on the planet and the evolution of its atmosphere from studying the new data,"

Hartle explained.

The Pioneer Venus Orbiter was launched from Cape Canaveral, Fla., onboard an Atlas Centaur on May 20, 1978. It was ejected into orbit around Venus on December 4, 1978, after completing its 300-million-mile (approximately 483 million kilometer) voyage. The Orbiter was originally designed to last two years; however, it stayed operational for 14.

The end of the Orbiter does not mean that the Pioneer Venus project is over, Hartle said, rather now it will move to a different phase. "With funding ending for the original project September 30, we plan to move on to the Venus Data Analysis Program and, under that program we will continue to analyze the Pioneer data for the next three years," he said.



The Hubble Space Telescope Servicing Mission (STS-61) astronaut crew spent a week at Goddard recently training for their flight, scheduled for December. Seated (left to right) are Kathy Thornton, mission specialist; Tom Akers, mission specialist; Dick Covey, commander; Jeff Hoffman, mission specialist; Ken Bowersox, pilot; Claude Nicollier, mission specialist, and Story Musgrave, payload commander. Standing (left to right) are Peter Burr, Deputy Center Director; John Klineberg, Center Director; Frank Capollina, Flight Systems and Servicing Project Manager; Greg Harbaugh, backup astronaut; Vern Weyers, Flight Projects Director, and Joe Rothenberg, Associate Director of Flight Projects for Hubble Space Telescope.

What's UP?

May 1993

Compton Gamma Ray Observatory — *Days in orbit: 757*

Interesting Fact: Compton reboost operations are underway. Engineering test burns of the four B-side attitude control thrusters were performed successfully on May 4. The test burns were the first time the thrusters were fired since the observatory was launched in April 1991. Priming of the propulsion system in preparation for orbit reboost was completed successfully on April 22. Propellant at tank pressure now is available, from all four tanks, to the B-side attitude control thrusters, which will be used to perform the reboost. A series of two 16-minute thruster burns is planned each day beginning June 15 and continuing for about two weeks to boost the observatory's orbit from 217 to 280 miles (from 350 to 450 kilometers).

Extreme Ultraviolet Explorer (EUVE) — *Days in orbit: 328*

Interesting Fact: The EUVE observatory continues to operate flawlessly. EUVE observed its first target-of-opportunity with a coordinated observation of the moon during STS-56 in April. The EUVE Bright Source list currently is being scrubbed for public release and is expected to be finished before the end of May. Early results from EUVE will be presented at the American Astronomical Society meeting in June being held in Berkeley, Calif.

Hubble Space Telescope (HST) — *Days in orbit: 1,010*

Interesting Fact: The High Resolution Spectrograph (HRS) initiated target-of-opportunity observations of the supernova SN-1993J which was discovered on March 31 in the Galaxy M81 (NGC 3031). The Faint Object Spectrograph (FOS) also has initiated ultraviolet observations of the supernova as part of an ongoing Supernova Intensity Study

(SINS). Preparations continue on schedule for the December 2, 1993 HST First Servicing Mission which has been approved as an 11 day mission with five planned Extra Vehicular Activities and the capability for an additional two, if needed. Priority objectives for the mission will be changing out the gyros, solar arrays and Wide Field/Planetary Camera (WF/PC) and installing the Corrective Optics Space Telescope Axial Replacement (COSTAR).

International Ultraviolet Explorer (IUE) — *Days in orbit: 5,574*

Interesting Fact: IUE is intensively monitoring the ultraviolet emissions from the Seyfert galaxies NGC 3516 and NGC 5548. This program is part of an extensive study involving other satellites (including ROSAT and HST) and ground based observers, of the time variations in the fluxes emitted from the energetic centers of these galaxies over a range of wavelengths. Such data is crucial to modeling the physical conditions in these violent galactic cores. The IUE participation consists of obtaining spectra of the Seyferts approximately every other day over a period of 55 days, and builds on a very successful similar program carried out last year. IUE also periodically tracked the light variations of the variable star W Serpentis over an eight day interval as this binary star system underwent an eclipse. One member of this system has evolved to a stage at which gas from its expanded atmosphere is falling on the normal companion star, which is surrounded by an accretion disk. The IUE observations will be used to explore the details of this interaction and of the resulting circumstellar disk.

National Oceanic and Atmospheric Administration (NOAA)-12 — *Days in orbit: 731*

Interesting Fact: Due to the longevity and reliability of NOAA series spacecraft already in orbit, NOAA-D, the last of the TIROS-N series spacecraft was kept in protective storage for five years before launching May 14, 1991. After being declared operational, it became known as NOAA-12. Now as it passes its official design life of two years, it continues to exhibit nominal performance in serving the National Environmental Satellite, Data and Information Service, a division of NOAA. NOAA-12's performance may very well keep its slated successor, NOAA-J, locked in storage for the foreseeable future. These spacecraft are developed under Goddard's MET-SAT project management.

Upper Atmosphere Research Satellite (UARS) — *Days in orbit: 595*

Interesting Fact: The overall health of the UARS spacecraft is good going into its 20th month on orbit. On April 16, 1993, UARS went into safe hold during a real-time Tracking and Data Relay Satellite System pass. One of two Earth sensors on board the spacecraft demonstrated erratic behavior that was outside operating limits which put the spacecraft into a safe hold. The ground teams performed a software patch that instructed an on board computer designed to measure the sensor output only to look at the good sensor. On April 20, 1993 UARS was brought out of safe hold and resumed operations. The Cryogenic Limb Array Etalon Spectrometer (CLAES) instrument depleted its supply of cryogen on Wednesday, May 5, 1993. The cryogen was predicted by Lockheed Palo Alto Research Laboratory, Calif., to last for approximately 20 months. CLAES marked 19 months of in-orbit operations on May 1.

1992-93 Global Ozone Levels Lower Than Any Previous Year

by W. Allen Kenitzer

In the second half of 1992, global ozone levels were 2 percent to 3 percent lower than any previous year and 4 percent lower than normal, according to a paper published in the April 23 issue of *Science*. This news follows extensive scientific analysis of data from the Total Ozone Mapping Spectrometer (TOMS) on board NASA's Nimbus-7 satellite.

Dobson unit is the physical thickness of the ozone layer if it were brought to the Earth surface (300 Dobson units equals 1/10th of an inch or three millimeters).

Extensive analysis of independent data from the National Oceanic and Atmospheric Administration (NOAA-11) Solar Backscatter Ultraviolet spectrometer (SBUV/2)

(SSBUV) instrument, as part of the recent ATLAS-2 mission flown aboard the Space Shuttle Discovery last month, also observed low springtime northern hemisphere ozone levels, in agreement with Nimbus-7 TOMS.

Only in the equatorial region were ozone values well within the range of the previous years' data.

Scientists say they only can speculate on the cause of the 1992 low ozone values. While the exact cause is unknown, the low ozone may be related to the continuing presence of particles from the Mt. Pinatubo eruption in the Philippines in June 1991.

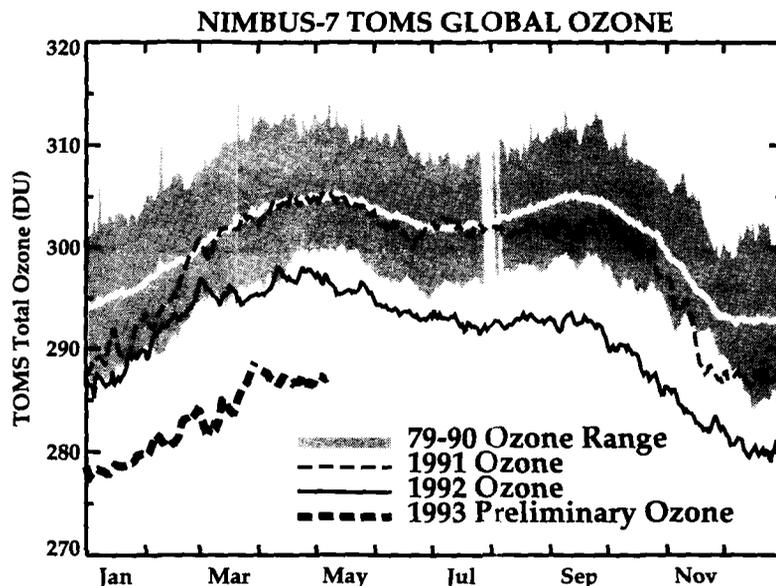
The Nimbus-7 TOMS has measured ozone levels since November 1978 and continues to be the primary monitor of global ozone levels. The NASA TOMS instrument on the Russian Meteor-3 satellite was launched in August 1991. The NOAA-11 SBUV/2 has measured ozone since January 1989. The SSBUV has flown annually on the space shuttle since 1989.

Mission to Planet Earth is NASA's long term, coordinated research effort to study the Earth as a global environmental system. It comprises satellites such as Nimbus-7 and the Upper Atmosphere Research Satellite, space shuttle missions such as last month's flight of ATLAS-2, and airborne and ground-based studies.

The TOMS instruments, the Nimbus-7 satellite and the SBUV project are managed by Goddard for NASA's Office of Mission to Planet Earth, Washington, D.C.

The NOAA-11 SBUV/2 instrument was launched in December 1988 and is one of a sequence of operational ozone measuring instruments on board the NOAA operational spacecraft series. The spacecraft and instruments are managed by NOAA/National Environmental Satellite Data and Information Service. The data processing and evaluation is a cooperative NOAA-NASA effort.

This figure represents a time sequence of daily globally averaged ozone amounts as reported by the Total Ozone Mapping Spectrometer (TOMS) on-board the Nimbus-7 satellite. The historic range of daily global ozone amounts is represented by the large gray area. The white line indicates the daily global ozone average. The broken black line indicates 1991 daily global ozone values. The solid black line represents the 1992 data and the thick broken black line indicates the preliminary 1993 data. The last point on the 1993 line is the data from May 6, 1993.



"We are seeing lower global ozone values than we've ever seen before," said James F. Gleason, Ph.D., an atmospheric scientist with University Space Research Association working in Code 916. Dr. Gleason is the lead author of the paper in *Science*. "We predicted lower ozone in 1992, but nothing like the values we actually observed," he explained.

Ozone, a molecule made up of three atoms of oxygen, comprises a thin layer of the upper atmosphere which absorbs harmful ultraviolet radiation from the Sun. The very lowest global levels were observed in December 1992 when the global average was approximately 280 Dobson units. By comparison, a normal December value is about 293 Dobson units. Previously, the lowest level of 286 Dobson units was observed in December 1987. A

and the Russian Meteor-3 TOMS instrument confirm the Nimbus-7 TOMS results. Comparison of all systems with the ground-based World Standard Dobson Instrument and the Dobson network indicates that the satellite instrument measurements are consistent during the period.

The 1992 low ozone levels were especially low in the mid-latitudes of the northern hemisphere. The December 1992 mid-latitude ozone levels were 9 percent below normal. The low mid-latitude ozone values continued, into 1993. The January 1993 ozone levels were 13-14 percent below normal. Preliminary observations of March 1993 mid-latitude ozone show that the ozone levels continue to be 11-12 percent below normal.

Preliminary results from the Shuttle Solar Backscatter Ultraviolet

NASA Satellite Shakes Theories On Gamma-Ray Bursts

by Michael Finneran

The findings of a Goddard satellite suggest that one of the great mysteries of astrophysics — flashes of high-energy radiation called gamma-ray bursts — may be more powerful than most scientists had thought. Data from the orbiting Compton Gamma-Ray Observatory also indicate the bursts might be occurring far beyond our Milky Way galaxy, much deeper in space than many had believed.

The discoveries challenge long-standing theories about these bewildering bursts from the cosmos and even raise the possibility they are created by some unknown object or phenomenon in the Universe, according to scientists at NASA's Goddard and the Marshall Space Flight Center in Huntsville, Ala.

"These results eliminate some theoretical models entirely and produce severe constraints on other possible theories," said Goddard's Dr. Carl E. Fichtel, Code 600, co-principal investigator for Compton's Energetic Gamma-Ray Experiment Telescope (EGRET), one of the instruments that gathered the new data.

The critical new data are the observations of the highest-energy gamma-rays ever recorded from a burst, and a two-year mapping survey that shows the bursts are evenly distributed in space.

Extragalactic Origin?

The mapping was done by another instrument on Compton, the Burst and Transient Source Experiment (BATSE), which has seen an average of one gamma-ray burst a day since the observatory was launched April 5, 1991.

The pattern of the bursts on the sky has shown them to be distributed like no other known objects in the Milky Way, indicating they may originate outside our galaxy, said Dr. Chryssa Kouveliotou, a BATSE team member who works for a contractor, Universities Space Research Association, at Marshall. An impor-

tant clue to the puzzle was obtained on Jan. 31, 1993, when EGRET recorded a gamma-ray burst that was 10 times higher in energy than any previously observed since the launch of Compton on April 5, 1991. The burst — dubbed the "Super Bowl Burst" because it was seen on Super

"These results eliminate some theoretical models entirely and produce severe constraints on other possible theories," said Goddard's Dr. Carl E. Fichtel.

Bowl Sunday — was more than 100 times brighter at its peak than the brightest steady source of gamma rays in our galaxy and more than 1,000 times brighter than any other known sources outside the Milky Way.

Element of Luck

Aside from its extreme brightness, this event is similar in most other respects to the other bursts recorded by Compton and earlier satellites. Because bursts this bright are relatively rare and the EGRET experiment views only a small portion of the sky at a particular time, astronomers were incredibly lucky to have this event occur when EGRET was pointed in that general direction.

The nature of the burst indicates that many more may be occurring than scientists detect.

"The EGRET observation of the highest-energy gamma rays suggests they may be emitted in a small beam, like a spotlight, in order to escape the source," said Dr. Brenda Dingus, an EGRET team member who works for Universities Space Research Association, Code 600, at Goddard. "However, in order to observe such a small beam, it must be pointed at us. So there may be many more objects emitting gamma-ray bursts that we

do not see because their beams point elsewhere."

Both the BATSE and EGRET results undercut the two most widely accepted types of models that attempted to explain gamma-ray bursts prior to Compton's launch.

Still A Mystery

One type of model says the bursts are energy releases from neutron stars and are confined to our Milky Way Galaxy and a region, or "halo," surrounding it. A neutron star is the small, extremely dense remnant core of a star that has exploded in a supernova. Since the Earth is in the outer suburbs of the Milky Way, more bursts should be seen toward the more densely populated center of the galaxy than elsewhere, according to this model.

"But that hasn't turned out to be the case. Gamma-ray bursts do not seem to cluster in a preferred region of the sky," said Kouveliotou. "These bursts are emitted from all directions and vary greatly in intensity and time structure."

Another type of model suggests that gamma-ray bursts emanate from the distant reaches of the universe, possibly the result of stars exploding, or neutron stars or black holes colliding. Black holes are believed to be stars that have collapsed to such high density that light cannot escape their resulting super-gravity. Many of these models predict that the gamma-rays are the thermal energy from the hot, glowing body produced in these explosions or collisions. But the gamma rays seen by EGRET from the Super Bowl Burst are not of the thermal type.

"This begs the question: If these collisions or explosions are not the source of gamma-ray bursts, what are? We don't know yet," said Marshall's Dr. Gerald Fishman, the BATSE principal investigator. "It is possible that some new object or phenomenon is producing these bursts."

A Little Piece Of Goddard In Florida

by W. Allen Kenitzer

"We're kind of chief cook and bottle washer. We'll do anything, whatever it takes to get the job done and make the [payload] processing go smoothly," said David Cristofalo, manager, Goddard Resident Office, Kennedy Space Center (KSC), Fla.

doing a lot of extraneous, unexpected things."

Cristofalo explained that HST processing success brought other projects, including the Upper Atmosphere Research Satellite and the Compton Gamma Ray Observatory.

who really do the work, get them the assistance they need and tell them what's available."

Cristofalo says he defines the Resident Office mission as "advising and coordinating anything and everything." The new defined role is overseeing all Goddard-managed

payload processing for flight. "We like to produce a little island here that is Goddard," he said. "People can come down here, use the office facilities and have all that they would normally have at home right here. We also can provide the technical expertise because we know the terrain."

The operation also is cost effective because it can use KSC resources instead of shipping goods and personnel from Maryland, he said.

Meanwhile, the "Goddard Oasis" is also in the public relations business. "The people at Kennedy are our cousins, but we're a guest in their house, and

there's a certain protocol that we have to follow which we welcome," Cristofalo explained.

On the topic of working time-sensitive issues, he says knowing the right resource can help cut through the "red tape." "Not many people realize this but Goddard is the biggest payload processor in NASA," he noted. "It's really amazing how much work Goddard does with Kennedy...and Kennedy recognizes this. Consequently, they are more apt to give us what we need."

With more space research in the works, the Goddard/Kennedy relationship is sure to continue, he predicted. Cristofalo sees a bright future between the two centers, but has concerns about the future of the space program.

Pictured (left to right) are members of the Goddard Resident Office at NASA's Kennedy Space Center: Terry Terhune, Maggie Carson, Dave Cristofalo, Mary Halverstadt, Jerry Guthrie, Bill Starkey and Dianne Austin.



Tucked away in the wildlife refuge of central Florida in a small and unassuming office in the KSC operations and checkout building is an organization that's been in the business of NASA center-to-center relations for more than 10 years. The Goddard Resident Office at KSC was conceived in 1982 when Goddard's Tracking and Data Relay Satellite System (TDRSS) project needed on-site representation at the Cape. Since the one-person operation began, the remote office has grown.

"Becoming a full-fledged office was kind of a slow transition," Cristofalo said. "STS-6 was really our first big venture. We started in 1982 directing the TDRSS payload operations for all of NASA. Later, HST [Hubble Space Telescope] came through, and we ended up

"I wasn't looking to get bigger," Cristofalo said. "I thought that if we got bigger, we would lose our intimate, one-on-one contact with our KSC co-workers. But, because of our diverse and innovative staff, it's worked out very well. The office has become a great asset to Goddard." In the new expanded role, from a TDRSS office to a Resident Office, Cristofalo says the old generation of payload managers actually fell by the wayside. "The new generation started taking over about 1986," he said. "They had a vigor, no preconceived notions and just wanted to get the job done. They're doing a great job."

"It was then we began taking on more of an advisory role," he explained. "We really just try to stay out of the way of the people

Goddard Presidential Rank Award Winners

Three Goddard directors are recent recipients of the Presidential Rank Award. The awards are given annually to members of the Senior Executive Service (SES). The Distinguished Presidential Rank Award is bestowed for sustained extraordinary accomplishment in the SES, each year fewer than one percent of SES executives receive this award. The Meritorious Presidential Rank Award is given to only five percent of career SES executives government-wide. The honor of "Distinguished Executive" carries a \$20,000 stipend and is the highest of the two rank awards. The Meritorious Executive award, which carries a \$10,000 stipend.

Robert Baumann, the Director of Flight Assurance at GSFC, recently received a Distinguished Executive Presidential Rank Award. Baumann currently is responsible for the independent evaluation of the flight readiness of more than 20 GFSC projects.

Baumann received the Meritorious Executive award in 1988 during the Reagan Administration.

Baumann joined Goddard in 1958, when he was appointed head of the Mechanical Systems Branch. In 1979, he was appointed to

the Senior Executive Service by President Jimmy Carter. From 1982-88, he served as Deputy Director of Flight Projects. In that capacity, he was responsible for the overall technical quality of a wide variety of Goddard's flight and related ground system projects. Baumann was appointed to his current position as Director of Flight Assurance in 1988.

Dr. Stephen S. Holt, director of space sciences at Goddard received a Presidential Rank Award as a Meritorious Executive.

Holt began his Goddard career in 1966 as a member of the Cosmic Radiations Branch of the Particles and Fields Division, where he remained through its development into the current Laboratory for High Energy Astrophysics. He became chief of the laboratory in 1983 and in 1989 was appointed deputy director of space sciences. Holt was named director of space sciences in May 1990.

Holt is also an adjunct professor of astronomy at the University of Maryland and has participated in numerous professional organizations, including as a fellow of the American Physical Society, an editor of the professional journal *Experimental Astronomy*, member of various panels and committees of the National Academy of Sciences, and chairman of the

High Energy Astrophysics Division of the American Astronomical Society.

Dr. Vincent V. Salomonson, director of Earth Sciences, received a Presidential Rank Award.

Salomonson began his career at Goddard in 1968 as a research meteorologist. He was appointed head of the Hydrospheric Sciences Branch in 1973 and became the project scientist for Landsat 4 and 5 in 1977. In 1980, he was made chief of the Laboratory for Terrestrial Physics in 1980 and named as deputy director for Earth Sciences in 1988 prior to receiving his current position in 1990.

Salomonson also serves as the science team leader for the Earth Observing System (EOS) facility called the Moderate Resolution Imaging Spectrometer (MODIS). EOS is part of Mission to Planet Earth which is NASA's long term, coordinated research effort to study the Earth as a global environmental system.



Appointment

Joe Alexander recently was appointed the Associate Director of Space Sciences, Code 600. His duties are to handle issues related to Goddard's program responsibilities in science management and in space science spacecraft operations and data analysis. He also heads up the Space Sciences Directorate's efforts in community outreach, education, recruitment, and work force development. Prior to his current appointment, Alexander served as the Assistant Associate

Administrator for Space Science and Applications in the NASA Office of Space Science and Applications, in Washington, D.C., from September 1987 to March 1993.



GSFC/AIAA Symposium

Goddard and the National Capital Section of the AIAA will sponsor a Professional Study Symposium on "Small Satellite Subsystems Architecture" in the Building 8 Auditorium for five consecutive Tuesdays starting June 1, at 4:30 p.m. Information and registration procedures can be obtained through the Goddard Division or contact Don Wood on X6-3726.

Goddard Engineers Help Local Students Become Rising Stars

by Fred A. Brown

African-American engineers from GSFC are working with area high school students and educators to overcome two of the toughest challenges educators are faced with today. The GSFC volunteers and teachers from the Owens Road Elementary School (ORES), Oxon Hill, Md., are trying to spark student interest in math and science and increase the number of African-American males who graduate from high school.

The engineers and teachers are part of the Technology Opportunities Promoting Success (TOPS) phase of the Rising Stars Program, a school-wide drop-out prevention program designed and coordinated by the staff at ORES. The program is "funded by a 'Just Do It' Teachers' Grant made possible by a partnership between the National Foundation for the Improvement of Education and NIKE, Inc.," said ORES program director Ted Fedders.

The overall goals of TOPS, according to GSFC coordinator Herman Hines, Code 562.7, "are to boost the performance and self-esteem of students and to get parents involved in their children's education.



Photo by Debora McCallum

Owens Road Elementary School students involved in the Rising Stars Program look over a space suit during a recent Saturday visit to Goddard's Visitors Center.

When we became involved in the program in September 1992, we went to the school and spoke with parents, teachers and students," Hines said.

The GSFC volunteers are Hines, Harrison Booker, Code 562.6; David Carter, Code 924; Arnie Cephas, Code 502; Barry Green, Code 271;

and Bob Hamilton, Code 560.7. They work in concert to provide 30 fourth, fifth and sixth-grade students and their parents an opportunity to participate in special science and math sessions that include everything from chemistry and electricity lessons to studying robots.

An important feature of the program is that it uses Potomac High School students, Oxon Hill, Md, as mentors and role models. Hines and company meet with the students once a month to provide direction, discuss their jobs at GSFC, careers in science, work on projects and go on field trips to places such as the United States Naval Academy, Annapolis, Md. The Potomac High School students, meanwhile, work with the elementary students on a weekly basis.

"It's too early to tell what the students are getting out of the program," says Hines, "however, we represent positive role models of people doing something other than sports and entertainment."

Fedders echoes those sentiments, saying "Herman and the other engineers provide real life examples of successful black males. They further enhance our student's experiences by providing video tapes of Goddard projects, field trips, and hands-on classroom experiences."



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