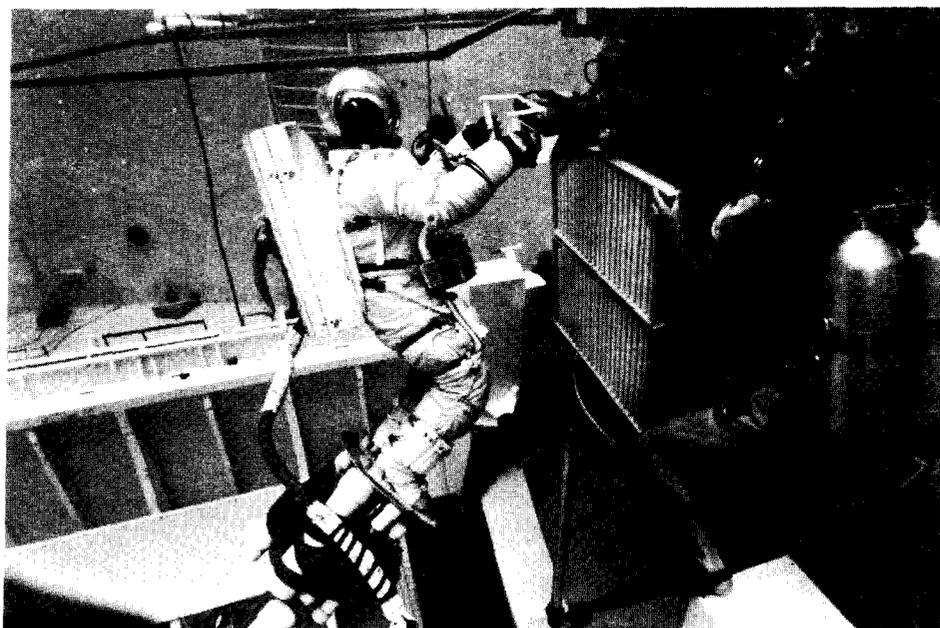


## *Planning, training keep apace for STS-13 repair mission*



Astronaut George Nelson, in space suit, trains for the STS-13 mission in an underwater training facility at Marshall Space Flight Center, Huntsville, Alabama. Looking on is a diving safety official.

Planning and training on Goddard's project for the repair of the Solar Maximum Mission (SMM) spacecraft during the STS-13 mission continued at an increased pace in recent weeks with heightened activities taking place at several locations, according to Frank Cepollina, Goddard's project manager.

At Goddard, work is progressing nicely on construction of a mockup of the Shuttle payload bay, where the astronauts will train with the Flight Support System (FSS). The FSS is the device to be carried on Challenger on the STS-13 flight into which the SMM spacecraft will be deposited for repair by the astronauts. The device has been fabricated and tested by Goddard.

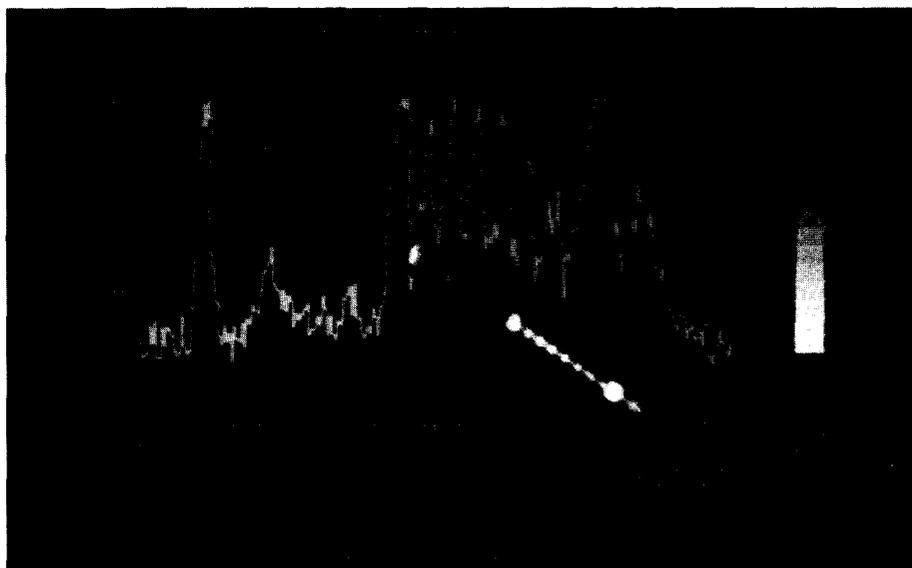
The Shuttle mockup is expected to be completed about September 1, Cepollina reported.

*Continued on page 8*

Shortly after its discovery by an infra-red satellite and two amateur astronomers, a second astronomical satellite observed Comet IRAS-Araki-Alcock as it made its closest approach to the Earth (2.95 million miles). The satellite, the International Ultraviolet Explorer managed by Goddard, made a startling discovery while observing the comet as it appears in ultraviolet light. The comet seems to contain a substance neither observed before in comets nor anticipated by theory, diatomic sulphur. The tentative identification of diatomic sulphur was made by two university astronomers using the International Ultraviolet Explorer as guest observers: Dr. Michael F. A'Hearn of the University of Maryland, and Dr. Paul D. Feldman of Johns Hopkins University. The astronomers made their

*Continued on page 4*

## *IUE makes startling comet observation*



Joe Walters photo

A spectrum of Comet IRAS-Araki-Alcock taken on May 11 with a superimposed graph of intensity versus wavelength. The strongest emissions are due to OH; nearly all others are due to S<sub>2</sub> and CS.

## Mobile tracking system being used

*offers rapid deployment to remote sites*

Goddard has developed and is using a new type of highly mobile satellite laser tracking system called the Transportable Laser Ranging System (TLRS-2), with a tracking accuracy of approximately 2-4 cm, designed for rapid deployment to remote sites. The system was constructed and tested here and arrived on Easter Island in the Pacific Ocean earlier this year.

To meet rapid deployment and precision requirements, the system employs modular construction, and low power laser and single photon detection techniques. The TLRS-2 is packaged to fit in the cargo holds of passenger jet airliners.

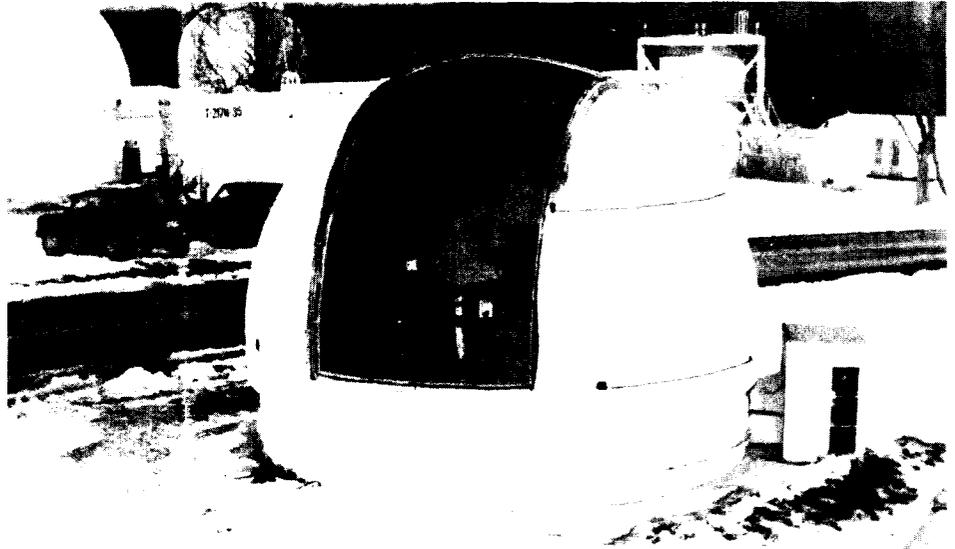
Satellite tracking operations were successfully accomplished last summer, and the TLRS-2 began formal collocation intercomparisons with Goddard's Mobile Laser Ranging System (MOBLAS-7) in September of 1982. After collocation tests were completed, the system was shipped to Easter Island. Routine tracking of the Laser Geodynamic Satellite (LAGEOS) began March 5 and will continue for six months. Lageos acts as a reflector for Earth based laser signals, measuring the transmit times to and from the spacecraft, permitting extremely accurate measurements of changes in the Earth's crust (as small as 0.8 inches).

The Easter Island observations are to be repeated annually, and are important for measuring baselines between the Nazca Plates and the Pacific and South American Plates, where predicted relative motions are expected to range from 8 to 15 cm/year.

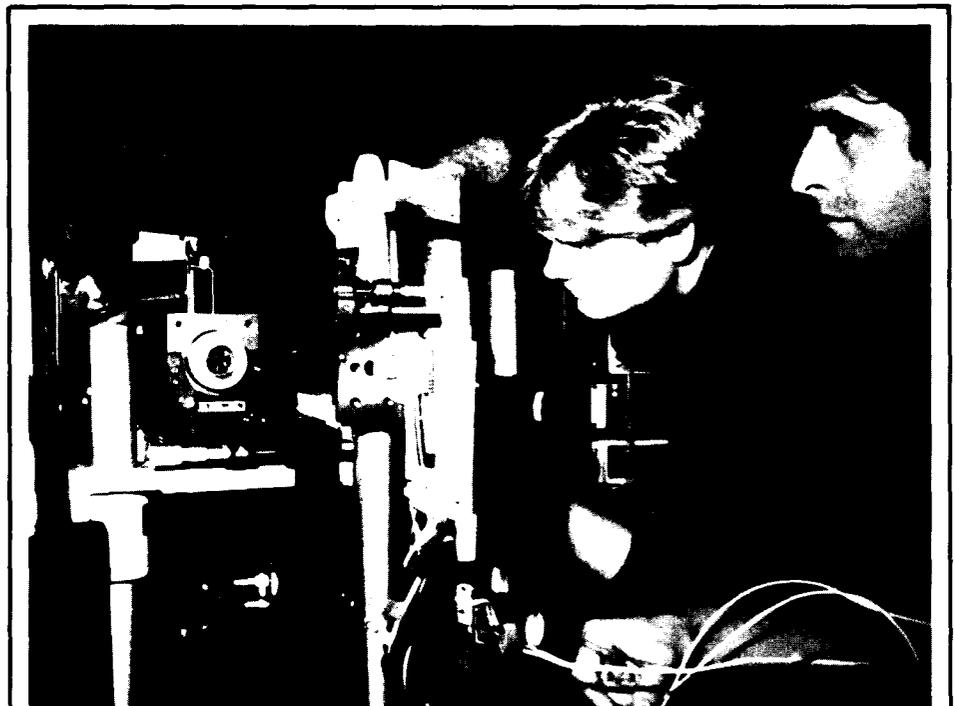
Scheduled to begin in 1984, TLRS-2 observations from Easter Island will also support highly mobile Satellite Laser Ranging observations along and within the deformation zone of the Andes in western South America.

Following the Easter Island operation, the system will be returned to the continental U.S. for an observational campaign at project sites in the southwestern U.S. and Mexico.

## TLRS-2



The TLRS-2 highly mobile laser tracking system while in collocation testing at Goddard. The system is designed for 2 cm precision and rapid deployment to remote locations for ranging to orbiting satellites.



Joe Walters photo

*Don Cornwell (l) and Goddard's Dr. James Kalshoven experiment with a prototype model of a scanner to be used in testing the next generation of NASA's remote sensors. Cornwell is a local high school student who works in Dr. Kalshoven's Multispectral Linear Array (MLA) Assessment Laboratory (code 925). The MLA concept is the all solid state remote sensor in the Landsat class now being developed. The arrangement of mirrors is a patentable technique designed to simulate spacecraft motion while keeping both scene and detectors fixed while maintaining exact focusing. The technique was proposed by Mitch Finkel (code 972), assigned to the lab full time. Cornwell helped David Tom (code 925), also assigned to the lab full time, build the prototype model, using wood to save time and costs for the large mirror mounts. The model has successfully demonstrated the new scanning technique and represents the early stages of what could be one of NASA's most advanced sensors.*

# Library User Committee

SMOKING

NO SMOKING



Marjorie Small photo

Front row l-r: Hubert Tschunko, code 717; Ken Schatten, 961; John Boggess, library staff; William Lau, 915; Ken Behannon, 692; Adelaide Del Frate, librarian; and Dr. Steve Paddack, 400A. Back row l-r: Robert Nelson, LUC president (code 502); Richard Fahey, 685; and Hugh O'Donnell, 855. Not pictured are: Helen Rothman, 110; Mary Holland, 200; Walter Viehmann 313; Robert Streitmatter, 661; and Bhaskar Choudhury, 924.

Since 1965, Goddard's Library User Committee (LUC) has provided valuable services to the Center, assuring that all library users' needs are properly addressed, according to Goddard's Librarian Adelaide Del Frate.

"The committee serves three important functions," Del Frate said. "First, the LUC provides valuable feedback from the user community. This communication channel is essential for an effective library system. Second, the group anticipates research needs based on the changes and modifications in Goddard's mission. This ensures appropriate library resources to support mission personnel. Third, the LUC works with the library to develop long range plans for both facilities and resources."

An increased book budget is probably the most recent and the largest impact that the LUC has had. Del Frate noted that the library's book budget doubled in 1981, "a direct result of the committee's lobbying efforts." Other benefits from the LUC are: the conversion from microfilm to microfiche for searches, and the labeling of rows of books by subject, added to the usual numbering system,

making "walk through" browsing easier.

"The LUC envisions a future remote terminal reference system for the library," said LUC Chairman Bob Nelson (code 502). This will allow convenient access to library data from an office equipped with a terminal, telephone, and modem.

The LUC encourages feedback from users or potential users. If you have inquiries or suggestions please contact your LUC representative.

## A few famous firsts

- Goddard is the first and only national laboratory with competence of developing, designing, fabricating, testing, launching and analyzing space science missions.
- Goddard is the nation's first laboratory to have developed world-wide communications facilities in support of U.S. manned and unmanned missions.
- Goddard provided the first links with Apollo astronauts on the moon. Voice and data links between the astronauts and Earth were received by Goddard's world-wide tracking network, relayed to Goddard and then sent to Manned Space Flight Mission Controllers in Houston, Texas.

# Visitor Center happenings

Below is a list of forthcoming special events and displays offered to the public at the NASA Goddard Visitor Center and Museum. The Visitor Center is open Wednesday-Sunday 10 am to 4 pm for free self guided tours and is located east of the Washington beltway off Route 193 in Greenbelt, Maryland. There is free parking, a picnic area and a museum shop. Telephone: (301) 344-8981.

- |                   |   |
|-------------------|---|
| June 25-26        | Amateur Radio Field Day. Goddard members of the American Radio Relay League participate in a national emergency preparedness drill. 10 am-4 pm  |
| July 4            | Independence Day. Museum open 10 am-4 pm  |
| July 10           | Spacecraft Integration. Explorer Scouts of America prepare science experiments for loading aboard a space shuttle. 10 am-4 pm   |
| July 17*          | Space Week Model Rocket Contest. National Space Institute and American Institute of Aeronautics and Astronautics award prizes to youngsters who have the most accurate and longest duration model rocket flights. 9 am-3 pm |
| And on Thursdays  | Guided tour of spacecraft mission control areas <sup>1</sup> 2 pm   |
| *July 24 raindate | <sup>1</sup> tour suspended during space shuttle missions   |

## Dr. Yoji Kondo is visiting professor in Japan



Dr. Yoji Kondo

Dr. Yoji Kondo of the Laboratory for Astronomy & Solar Physics has been invited to be a visiting professor at the Institute of Space & Astronautical Science (ISAS) in Tokyo, Japan.

ISAS is renowned for its research activities in space science. They have been responsible for such successful satellite programs as Hinotori (firebird or phoenix) solar satellite, Hakucho (swan or cygnus) and Tenma (sky horse or pegasus) X-ray satellites, the last of which was launched in February this year and is yielding exciting scientific results.

At ISAS, Kondo will be engaged in astrophysical research of common interest with the Japanese, including planning of coordinated observations with the International Ultraviolet Explorer (IUE) and Tenma. It is also anticipated that his visit at ISAS will help enhance the communication link between the U. S. A. and Japan in regard to possible future collaborations in the space program.

Kondo, who is Project Scientist for the ongoing IUE, will be paying two visits to ISAS in 1983, each consisting of one and a half months; his first visit will be from May 23 to July 8. During his absence, Dr. Robert D. Chapman, associate chief for Laboratory for Astronomy & Solar Physics, will be acting as IUE Project Scientist.

### **Think About it...**

**Consider the postage stamp. It secures success through its ability to stick to one thing until it gets there.**

**-Josh Billings**

## *IUE comet observation*

*Continued from page 1*

tentative identification from the spectra obtained with the satellite's spectrographic detector. The detection of diatomic sulphur could

contribute significantly toward our understanding of the chemical processes in comets on their approach to the sun.

## *Sounding rocket experiments support solar system theory*

Recent sounding rocket experiments involving the release of two metallic gases into the ionosphere have provided tentative additional support for a solar system evolution model which was first presented in 1942.

This past March an international team of experimenters from the University of Alaska (Fairbanks), Cornell University (Ithaca, New York), University of California (San Diego), and the Max Planck Institute for Extraterrestrial Physics (Garching, Federal Republic of Germany), carried out two rocket-borne experiments from Peru as part of the NASA-sponsored Project Condor.

The experiments used shaped explosive charges with liners of two different metals—strontium and barium—to produce high velocity gases. The experiments were designed to test a theory proposed by Dr. Hannes Alfvén, University of California, San Diego, that a neutral gas will ionize if it crosses magnetic field lines at greater than critical velocities.

Since this theory was first proposed both theoretical work and laboratory experiments have been devoted to testing the effect. Until the Project Condor experiments, however, none of the tests had been carried out in space — the only plasma laboratory where containment vessel effects are nonexistent.

To verify and understand the physical effects proposed by this theory, experiments were needed which created conditions similar to those in the gas cloud from which the solar system was formed. The Project Condor experiments mimicked those conditions by injecting neutral gas

across magnetic field lines at speeds greater than the critical velocity. At the magnetic equator, near the launch site, this can be done with sounding rockets due to the horizontal geometry of magnetic field lines.

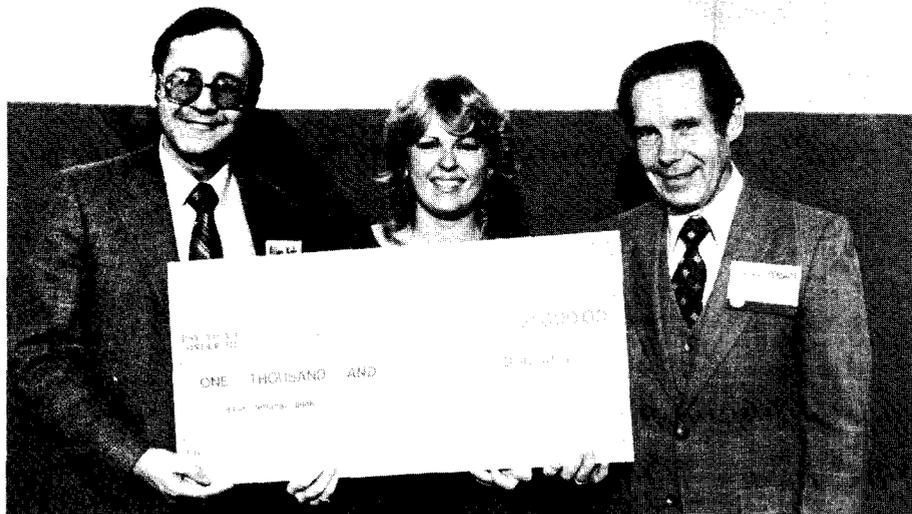
In the barium experiment, measuring instruments were placed in the gas stream about 2 kilometers from the explosive release at 447 km altitude. Electrons, ions and plasma waves expected in the Alfvén ionization mechanism were detected. Because the sounding rocket experiments are extremely short-lived, some initial ions were required to seed the process. Solar ultra-violet light provided the seed ionization and the subsequent barium ionization was observed to be very efficient, Dr. Eugene Wescott, the University of Alaska investigator, said.

The strontium experiment differed in that there was a negligible seed ionization due to ultraviolet radiation resulting in very little strontium ionization. Although the strontium experiment was not as efficient as the barium, on the solar system evolution scale of millions of years, this process could be quite efficient and would produce the desired differentiation and energy transfer required to produce the conditions for planetary formation.

The Alfvén — Arrhenius theory is an attempt to answer the question of why all the gas and dust from the solar nebula did not fall into the sun and why all the planets have differing compositions. Dr. Gustaf Arrhenius, Scripps Institution of Oceanography, University of California (San Diego), has collaborated with Alfvén on this theory.

# PEOPLE

## Co-op student wins scholarship



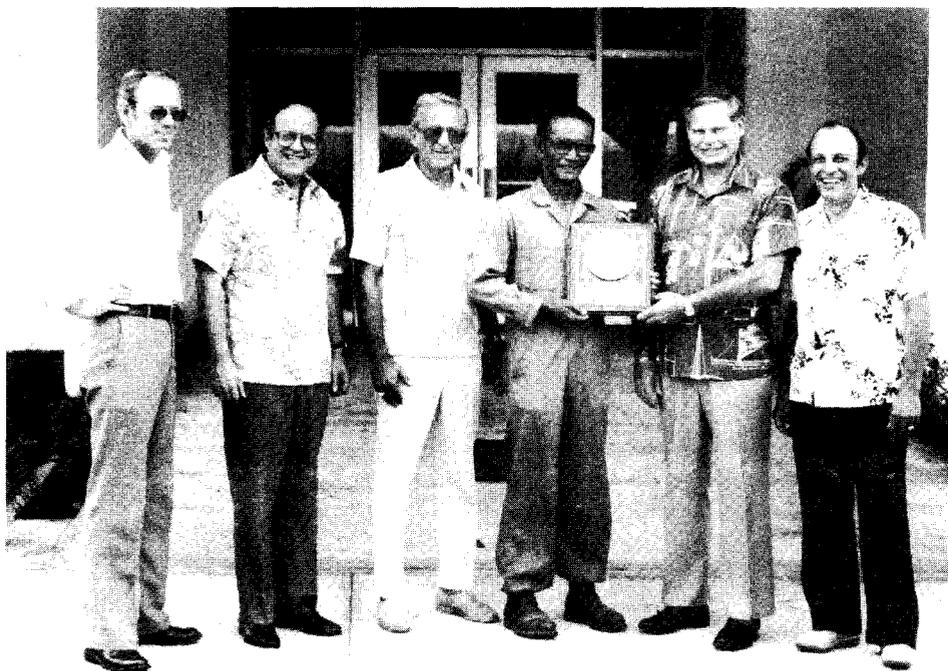
Lori K. Lewis is awarded a \$1,000 scholarship from Riggs National Bank for her academic performance as well as responses to essay questions regarding career goals, community involvement, student activities, work experience and banking course relevance. Lewis is an accounting major at Strayer College and has completed a co-op in Goddard's Budget Analysis Office. She is returning to Goddard's Wallops Flight Facility late this month to begin another co-op. L: Allen H. Katz, chairman, Strayer Accounting Department; R: James E. O'Neill, vice president and comptroller of Riggs, and Strayer College alumnus.



Dr. Eugene Garfield

Dr. Eugene Garfield, an expert on the uses and abuses of scientific literature citations spoke at a Scientific Colloquium last month, and described how a carefully performed citation analysis can lend objectivity to performance evaluations. Garfield is president of the Institute for Scientific Information and is publisher of "Current Contents" and the annual "Citation Index."

He discussed practical and conceptual limitations of citation data, and offered guidelines for using the citation analysis technique. A recently developed literature classification scheme called co-citation clustering was also discussed. Some of its applications as an evaluative tool were illustrated.



**OUTSTANDING PERFORMANCE AWARD** - Guam tracking station has received its fourth Outstanding Performance Award. Art Mantanona, antenna maintenance technician, accepts the award from Donald E. Smith, vice president of Spaceflight Tracking and Data Network (STDN), Bendix Field Engineering Corporation (BFEC). The award, for the July, August, September, and October 1982 performance period, was made in conjunction with the STDN Motivational Program. The program's purpose is to improve overall performance in all phases of the Bendix contract operation for Goddard. From l-r: M. Edward Briggs, manager, STDN station operations; Daniel A. Spintman, chief, Network Operations Division, Goddard; John P. Obloy, BFEC senior manager, Guam; Mantanona; Smith; and George J. Karras, NASA station director, Guam.



Dr. Ronald G. Prinn

Dr. Ronald G. Prinn spoke at a Scientific Colloquium last month and lectured about the chemical composition of the satellites of Jupiter and Saturn being largely determined by the conditions of their formation. According to Prinn, in many ways, the birth of these miniature planetary systems resembled that of the solar system. Yet the interaction between chemistry and dynamics was not the same in both cases, so that the compounds of nitrogen and carbon produced in the Jovian subsystems differed from those produced in the early solar system as a whole.

Prinn, from the Massachusetts Institute of Technology, has researched the chemistry, dynamics, and evolution of planetary atmospheres. His talk was entitled "The Early Solar System and Jupiter's Satellites."

# MOD Awards



The Management Operations Directorate held its annual awards ceremony last month, acknowledging individuals for their contributions and achievements. Clockwise from bottom left: MOD Director Benita A. Sidwell (1) presents Jorsie M. Sutton the Golden Star Award, the highest award bestowed on MOD employees; Albert Bush (in chair) is congratulated by Michael Ladomirak for receiving a 25-year service award; Ladomirak receives a knightly gesture; Joan E. Belt receives the Golden Star Award from Sidwell; Preston Pope receives the Gold Star Award from Sidwell; Marjorie Gustafson wins one of the many door prizes; Robert Keefe presents Valarie Parker with a door prize; Jim Mills presents Jack Knox with a Safety Award as safety clown Colleen Quinn looks on; Center: Sidwell makes opening remarks.

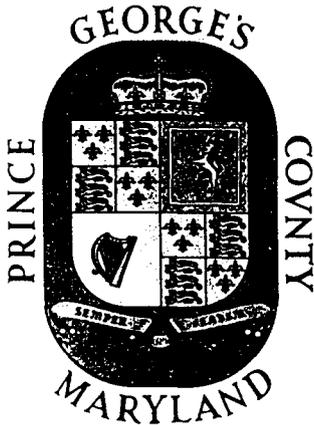
Pete Baltzell photos

THE BOARD OF EDUCATION OF THE  
PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS, MARYLAND

CERTIFICATE OF RECOGNITION

TO

GODDARD SPACE FLIGHT CENTER



The Board of Education proudly presents this Certificate of Recognition to the staff of the Goddard Space Flight Center with deep appreciation for the many outstanding science enrichment programs it has offered to the students of the Prince George's County Public Schools since 1963.

Through film productions, vocational development programs, art projects, internships, workshops, mini-courses and volunteer programs, the Center has helped elementary and secondary students better understand and appreciate the aerospace industry and has increased their interest in the field of science.

For twenty years the Goddard Space Flight Center has actively demonstrated its interest in arousing the scientific aspirations of young men and women in the county. And, with its most recent commitment in the "Get Away Special" space shuttle project, it is providing invaluable assistance in helping students develop experiments which will indeed fly into space.

The Board of Education highly commends the center for its outstanding interest in and commitment to the students of the public schools.

DATE: May 24, 1983

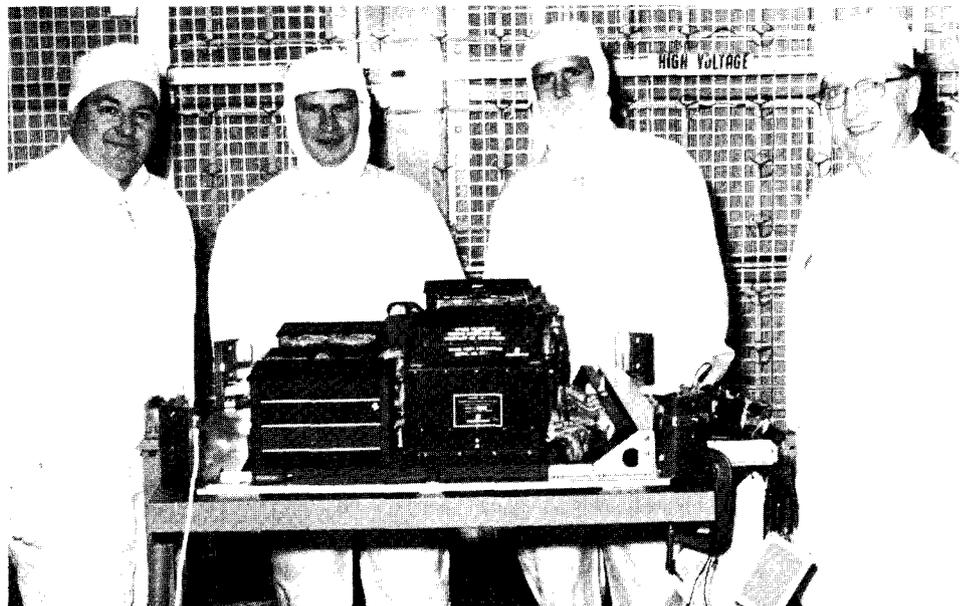
*Edward J. Lee*  
SUPERINTENDENT OF SCHOOLS  
*B. Bismarck*  
CHAIRMAN, THE BOARD OF EDUCATION

**Space Telescope subsystem tested**



Donald A. Krueger, chief, Applied Engineering Division, has received the 1983 Moe I. Schneebaum Memorial Award. Krueger received the award for his exceptional contributions and leadership in the development and implementation of the Landsat-D Mapper Image Processing Facility.

The Schneebaum Award is given in memory of Moe I. Schneebaum, who served as chief of the Earth Observations Systems and Systems Engineering Division and was instrumental in the development of cameras for early meteorological satellite programs. He joined Goddard in 1958 and died in 1973.



The Science Instruments Control and Data Handling (SI C&DH) subsystem for the Space Telescope was delivered March, 1983 to the Goddard to complete its acceptance test. The subsystem is now in the Bldg. 7 clean room, where it will be electrically integrated with the five Science Instruments for the Verification Acceptance Program (VAP).

The SI C&DH is the command and data interface between the spacecraft and the five instruments, stores delayed commands, collects engineer telemetry, collects and formats the science data, and provides a general computing facility for instrument use. The SI C&DH components are mounted on a tray which is designed for on orbit replacement. L-R: J. Lesko, E. Thomas, D. Stottlemeyer of Fairchild Space Company, and R. Weitzel.

## STS-13 repair mission

*Continued from page 1*

In the meantime, astronauts Dr. George Nelson and Dr. James van Hoften have completed neutral buoyancy training in water tanks at the Marshall Space Flight Center and the Johnson Space Center. The training was carried out in their space suits to give them a better "feel" of the difficulties they might encounter in making repairs to the 5,000-pound spacecraft while they are in a near-zero gravity environment in orbit.

In addition, Nelson and van Hoften spent time at Martin Marietta in Denver, where they worked with the Manned Maneuvering Unit (MMU) simulator. Astronauts Bruce McCandless, II and Bob Stewart who will fly on STS-11 and conduct the initial operational tests with the MMU, also were at Denver at the same time. Martin Marietta and Goddard Public Affairs cooperated in conducting demonstrations for the media while the astronauts were in Denver.

McCandless, a Navy Captain, and Stewart, the first Army Aviator sched-

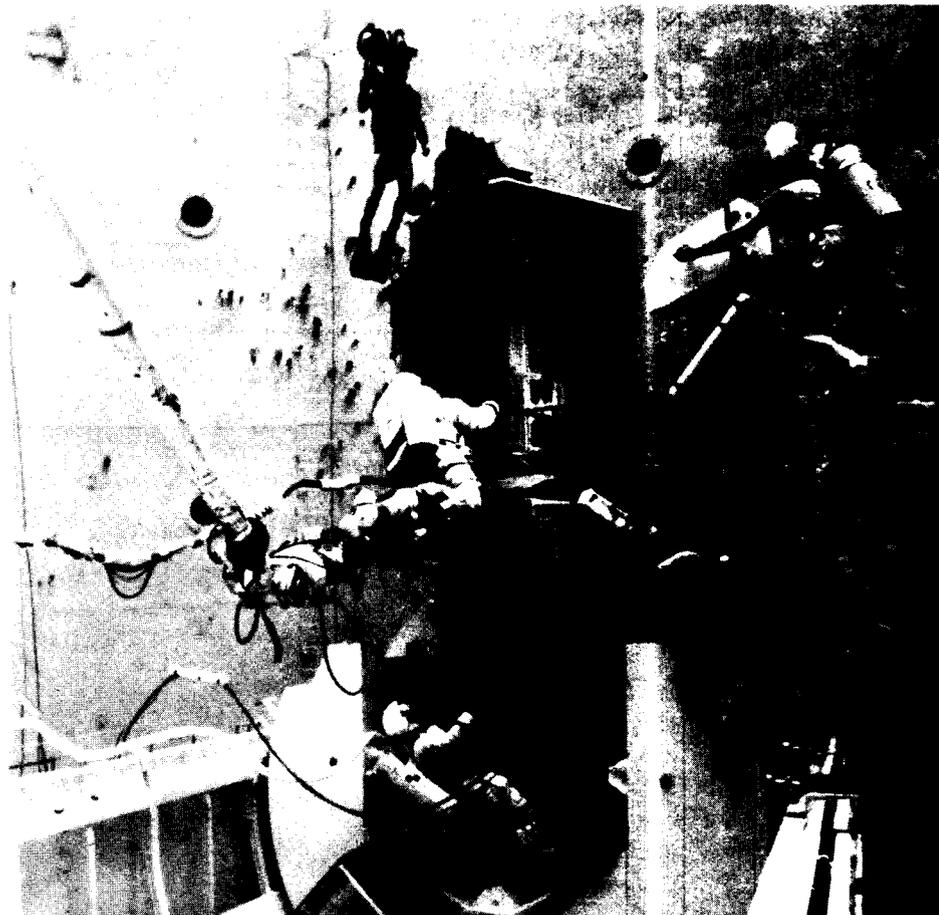
uled to fly on the Shuttle, will test the 420-pound self-contained unit on the STS-11 mission, scheduled for January, 1984. First tests will be conducted with a tether. However, later tests on that mission will be free, with the astronauts flying out distances of up to 300 feet from the orbiter without a tether. The MMU is a spacecraft itself with 24 1.7-pound thrusters and an auto pilot that will allow the astronauts to maintain their attitude in space while flying "hands off."

The more spectacular activities will take place on STS-13, scheduled for April, 1984. On that mission, Nelson, a 33-year-old astronomer who is not a rated pilot, will don his MMU and fly out approximately 300 feet from the Challenger, which will be in orbit at approximately 270 nautical miles, to grapple the SMM spacecraft and then hold it steady while the Remote Manipulator System (RMS) arm grabs the SMM and brings it into the Challenger's payload bay. Once in the bay, the astronauts will replace the spacecraft's attitude control system (ACS) and make repairs to the X-ray Polychromator and Coronagraph/Polarimeter instruments on the satellite, which was designed to make the most comprehensive studies of the Sun ever conducted.

SMM was launched from the Cape Canaveral Air Force Station in Florida in February 1980. Following nine months of operation, however, problems developed in the spacecraft's attitude control system. Since then, only three of the seven instruments on board have been able to collect data because the spacecraft, rather than being centered on the Sun, is rotating in something like a figure eight pattern, allowing the sensors to pass through the Sun for short periods of time periodically.

Nelson will be the astronaut who flies out to the SMM to make the grapple and to hold it steady. Astronaut Terry Hart will direct the 50-foot-long orbiter arm to grab it, and Astronaut van Hoften will assist in that operation and be responsible for making some of the repairs after the SMM has been brought into the payload bay.

Following the repairs, the spacecraft will be placed back into orbit by the remote manipulator arm and will resume its investigations of solar activity.



Astronauts (in space suits) train for the retrieval and repair of the Solar Maximum Mission under neutral buoyancy conditions in an underwater training facility at Marshall Space Flight Center, Huntsville, Alabama. Others in the photo are diving safety officials and underwater cameramen.

## NASA GODDARD NEWS

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