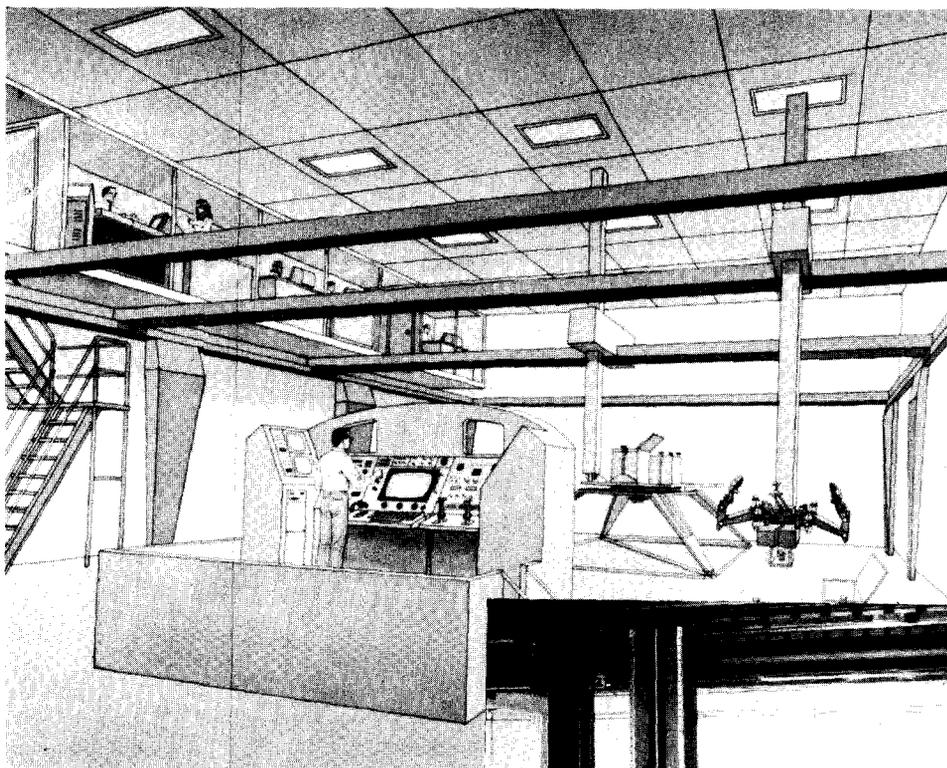


## New Robotics Facility Nears Completion



by Michael Braukus

A new state-of-the-art robotics facility expected to be in operation at Goddard by late April will play an important role in developing a space robot to do things that have never before been done in space.

This highly sophisticated facility in the high-bay area of Building 11 will be used by Goddard's robotic team to create, test and evaluate new robotic technologies required to support Space Station Freedom, as well as other missions being planned by NASA in the 21st century.

As part of the S.S. Freedom project, Goddard is responsible for managing the development of the Flight Telerobotic Servicer (FTS), a robotic device that combines teleoperation (using a human operator to direct the machine) and autonomous capabilities for performing tasks by itself, but supervised by an astronaut.

Grumman Corporation and Martin Marietta Astronautics Group are competing currently for the contract to develop the FTS. The winning contractor will be selected this summer.

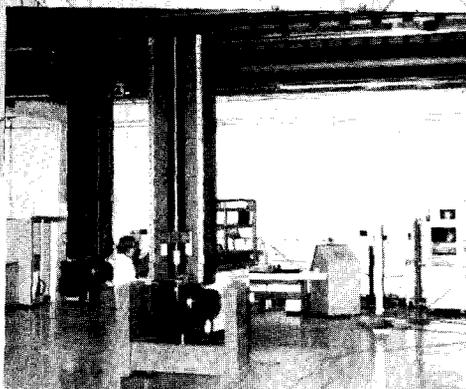


PHOTO: P. BALTZELL

**ROBOTICS FACILITY** — This artist's concept shows Goddard's new robotics facility in Building 11, as it will appear when it is in operation. The insert shows a technician working on one of the two gantry robot masts, as work on the facility continues.

According to Stanford Ollendorf, Chief, Telerobotics Engineering Office, plans call for FTS to assist astronauts in the assembly of Freedom Station. "After assembly is completed, FTS will perform minor spacecraft servicing and maintenance tasks at the station. Ultimately, FTS will be able to reach, retrieve, and service unmanned satellites such as polar platform which are currently unreachable by the Space Shuttle, saving millions of dollars annually," he said.

"The primary function of the robotics facility," said Ollendorf, "is to provide input to the FTS contractor in areas of high risk, such as controls and safety, thereby

reducing research and development costs. We'll do the actual testing here in our new facility with our equipment and then pass the results on to the contractors for their use in designing the flight system."

The new facility contains a gantry robot 40 feet wide, 60 feet long and 20 feet high (12x18x6 meters) with six degrees of freedom, capable of lifting up to two tons (800 kilograms) of payload and applying 4000 foot pounds of torque. Suspended from one mast of the gantry will be a set of six degree of freedom industrial arms, which will be used as an FTS operational simulator. The other mast carries a grapple to emulate the S.S. Freedom's remote manipulator system, which will be used primarily to transport payloads to and from the work site.

The facility also includes an operator work station installed in a mockup of the Space Shuttle's aft flight deck. This simulator will permit teleoperation of the robot, providing valuable information about operating the FTS in the constrained environment of the shuttle.

### Unique Technologies

Located in a glass enclosed mezzanine overlooking the gantry robot, is the Graphic Robot Simulator—what David Provost, Head, Robotics Data Systems and Integration Section, said is one of the unique technologies being developed by Goddard for the FTS Project.

"This computerized simulator uses animated graphics to determine such things as the robot's reach capability and collision avoidance information," said Provost. "It allows our engineers to use engineering and design concepts to evaluate what would be seen at S.S. Freedom six or seven years from now."

*Continued on page 8*

INSIDE

**Dr. Anne  
Thompson,  
from Polliwog  
to Ozone Scientist**

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## Talk from the Top

*John W. Townsend Jr.*

Two employees wrote ecological questions:

*Q: When does Goddard plan on becoming environmentally conscious? At the present, Goddard recycles paper on a voluntary basis only, does not appear to be recycling bottles or cans used by employees, and allows the use of styrofoam in its cafeteria!*

*Q: If GSFC is so involved in the study and preservation of our atmosphere and environment why do we continue to use styrofoam plates, trays, and bowls in our cafeteria?*

**A:** According to the supplier of the foam cups and containers used in the cafeteria, their containers are manufactured using the "steam chest molding" technique, and have never been manufactured with chlorofluorocarbons. . . . Periodic Manager's Days are held in the Building 21 Cafeteria in order to receive comments and opinions from employees regarding both cafeteria and vending foodservice operations on-site. The next Manager's Day will be held on April 10, if anyone would like to further discuss this matter with the Cafeteria Managers.

Following is an update on the toilet doors situation in the Child Development Center:

According to Goddard Child Care Center Director Barbara Karth, privacy is currently provided when needed by pulling foam core across the doorway. [Architect] Richard Rohrbaugh of Bendix suggests that a permanent solution based on this idea is feasible. The design would provide privacy as needed by the children, visibility for supervision by the teaching staff, visibility by staff to prevent privacy that could lead to abuse of children, minimization of injuries from swinging doors and small fingers in door jams and a hard surface to maintain cleanliness. Barbara Karth has approved this design for additional children's toilets that will be installed when the facility is expanded, and is working on having the children's toilets in the current facility be fitted with these doors.

*Center Director John W. Townsend, Jr. wants to hear from you! Send your questions to: TALK FROM THE TOP, Code 130.*

## Goddard Supports Black History Activities

In keeping with a tradition established at Goddard by the Black History Club, in conjunction with the Equal Opportunity Program Office, February was filled with a schedule of activities to celebrate Black History Month.

The month's activities began on February 1 with a telecommunications program, "Beyond the Dream," hosted by NBC's Jim Vance. Featured among a list of distinguished panelists was educator Dr. Mary Hatwood Futrell, and NASA Astronauts Colonel Charles Bolden and Mae Jemison, M.D. A question-and-answer period during the program allowed viewers to phone in with questions on various aspects of black culture and history.

The Music and Drama Club (MAD) Orchestra performed a program, entitled "Black Influences in American Popular Music," on February 15. The program surveyed black American artists and composers from the Jazz Age through the contemporary sounds of today. The MAD

Orchestra is managed by Velma Anderson (Bendix Field Engineering Corporation, BFEC) and Bill Boyer, Code 621.

Continuing the musical tribute to Black History Month, the award-winning Washington, D.C. Eastern High School Choir presented a concert focusing on "The Role of African-American Churches in Economic, Political and Social Development at Home and Abroad." The choir received a number of awards last year at the 1988 International Youth and Music Festival in Vienna, Austria.

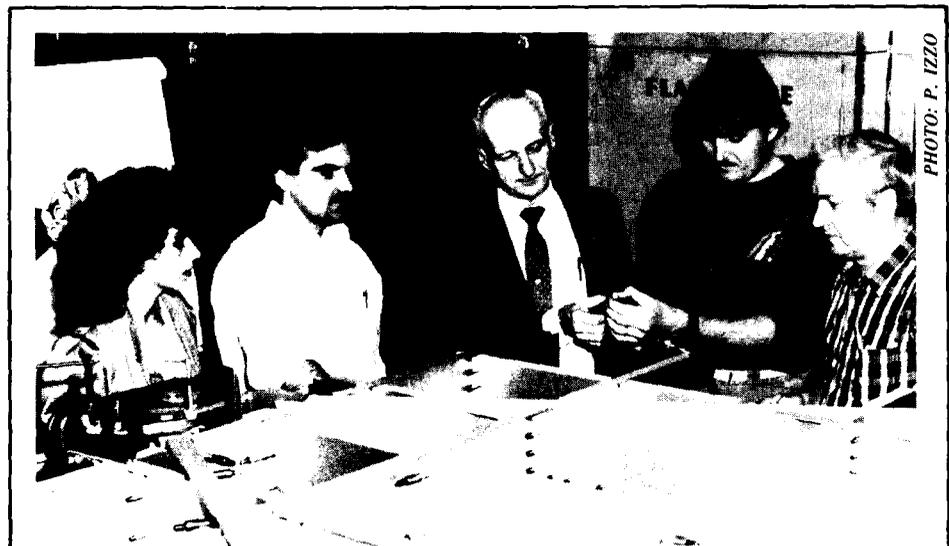
The month-long festivities concluded with the Scholarship Dinner/Dance on February 24. Proceeds from sales of tickets for this dance are used to create a scholarship for a young black high school student.

William Weston, Code 553, President of the Black History Club, and Dillard Menchan, Chief, Equal Opportunity Program Office, Code 120, organized the schedule of activities.

## Goddard Pioneers-Test Your Memory!

Do you have a good memory for space achievements? The Public Affairs Office has challenged Goddard retirees, alumni, and employees to recall as many Goddard **FIRST** achievements as possible, for recognition during Goddard's 30th Anniversary Celebration, May 1st through May 5th.

Help us recognize the many unique accomplishments of GSFC and the pioneering people who made it what it was to become. Please send as many details as you can remember about Goddard **FIRSTS** to "Goddard Firsts, Mail Code 130." Please include your name and code with each entry.



**PROGRESS CHECK**—Jerry Longanecker, Director, Flight Projects Directorate (center), listens to Mike Lenz, Aerospace Engineering Technician (second from right), explain how a wedgelock (temporary fastener) he is holding works on the Instrument Support Platform (ISP) of the Extreme Ultraviolet Explorer (EUVE). Using computer-directed drills, Goddard specialists drilled out the 40 by 68-inch aluminum platform. EUVE is scheduled to be launched in August 1991. Also participating in the briefing are Maggie Carson, Quality Assurance Representative, and Lee Niemeyer, Mechanical Systems Manager, (to the left of Longanecker), and Roger Wood, Aerospace Engineering Technician (far right).

PHOTO: P. IZZO

## Goddard-Sponsored Program to Yield New Glucose Sensor

**G**oddard's Office of Commercial Programs is collaborating with Johns Hopkins Applied Physics Laboratory (APL) and the University of New Mexico (UNM) to develop a quicker, more accurate way for diabetics to monitor glucose levels while eliminating the discomfort of repeated finger pricking.

Currently known as RePS (Rechargeable Physiologic Sensor), the device would eliminate the numerous daily finger pricks required of the estimated 1 million Type 1 (insulin dependent) patients in the U.S. alone, for proper monitoring of glucose level. The device also will provide a more accurate analysis of glucose level than is possible with finger prick techniques.

Such accurate monitoring and subsequent control of blood glucose should greatly decrease the severity of diabetes complications, according to the developers. RePS also is designed to be rechargeable in one step, unlike most other glucose sensors currently being designed, according to Wade Radford, APL Program Manager for the RePS.

### Goddard Sponsorship

APL receives approximately \$300,000 annually for the development of Biomedical Implantable Devices, according to Goddard's Office of Commercial Programs Chief, Donald S. Friedman.

The Office of Commercial Programs sponsors about ten such programs with different institutions each year, said Friedman, as part of NASA's technology transfer program to find practical applications for technology designed for space programs.

"The glucose sensor is particularly exciting," he said, "because there are no implantable glucose sensors currently available. Combined with a device previously developed as part of this collaborative program, the Programmable Implantable Medical Delivery System (PIMS), the RePS will form a totally internal, closed system for the treatment of diabetes—the RePS will measure the level of glucose in the blood, and the PIMS will administer the proper dosage of insulin."

### How it Works

The proposed unit will determine the glucose level using a sensor designed by

## NASA Pipeline

**AMES RESEARCH CENTER, Mountain View, CA**—Results of the collaborative U.S./USSR biosatellite mission from Cosmos 1887 have confirmed the adverse physiological and biomedical effects of prolonged space flight. Tissue samples from five of 10 rats flown aboard the spacecraft were provided to researchers at Ames, who participated in the collaborative project. The analyzed mammalian biospecimens suggest that adolescent vertebrate animals will experience significant alterations in calcium metabolism, immune functions and musculoskeletal mass and structure.

**NASA HEADQUARTERS, Washington, DC**—NASA recently announced the selection of scientific investigations for the Earth Observing System (Eos) program, a multi-mission observation system of the 1990s to study global changes taking place in planet Earth's environment. Eos will be a long-term, integrated scientific observing system enabling a multi-disciplinary study of planet Earth, including its atmosphere, oceans, land surfaces and the solid Earth.

**LANGLEY RESEARCH CENTER, Hampton, VA**—Instruments developed at Langley for the Earth Radiation Budget Experiment (ERBE) have provided the most accurate Earth radiation budget measurements ever made and confirmed a theory that clouds result in a net cooling of the Earth. Previously, atmospheric scientists were divided on the impact of clouds on the Earth's temperature. These measurements will serve as a baseline for climate modelers to determine whether clouds will partially offset or enhance a future warming of the Earth due to the greenhouse effect. The greenhouse effect is the term given to the warming of the Earth's atmosphere and surface resulting from increased concentrations of gases, such as carbon dioxide, methane, nitrous oxide and chlorofluorocarbons.

Dr. Ebtisam Wilkins at UNM. Electronics, designed by engineers at APL, will amplify the electronic signal identified by the sensor and send it to a receiving unit outside the body, using technology similar to that used by orbiting satellites to telemeter data back to Earth. The external, hand-held unit then would display the numerical glucose reading necessary for accurate insulin dosage, according to Friedman.

The telemetry system operates on a lithium battery similar in power and size to those used in hearing aids. Because the unit does not need to contact the blood directly, but instead monitors the electrical charge produced when glucose in the body tissue is in proximity to a metallic glucose salt compound present in the device, it can be placed just under the skin in the abdominal area.

Researchers expect that a prototype of RePS will be completed by the end of the 1989 and that a marketable unit could be on the market in about four years.

### Coming Next Month!

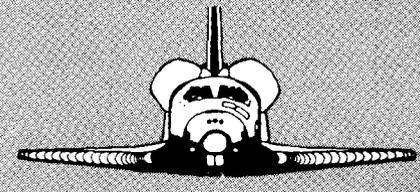
See next month's *Goddard News* for a full story on Goddard Scientists selected to participate in the Eos (Earth Observing System) project.

## Launch Update: New Shuttle Crews Named

NASA has named flight crew members to two Space Shuttle missions scheduled to fly in 1990.

USN Capt. John O. Creighton has been named to command shuttle mission STS-36, a Department of Defense-dedicated flight aboard Atlantis set for February 1990. USAF Col. John H. Casper will serve as pilot. Mission specialists are USMC Lt. Col. David C. Hilmers, USAF Col. Richard M. Mullaney and USN Lt. Cmdr. Pierre J. Thuot.

Two NASA astronauts also have been named as mission specialists aboard the Space Shuttle Columbia on mission STS-40. M. Rhea Seddon, M.D., and James P. Bagian, M.D., have been assigned to the space life sciences-dedicated payload, SLS-01, scheduled for launch in June 1990.





# Truly Presents STS-2

In honor of the many Goddard personnel who contributed to the success of NASA's return to flight, Discovery mission STS-26, Associate Administrator for Space Flight RADM Richard H. Truly visited Goddard on February 21 to recognize

Goddard civil servants and contractors with NASA Honor Awards.

The awards were presented by Admiral Truly and Center Director Dr. John W. Townsend, Jr. at a ceremony held in the Building 3 Auditorium.

Following are the Goddard civil servants and contractors who received awards:

**PUBLIC SERVICE MEDAL**—this medal is granted to any United States citizen who is not an employee of the Federal Government or was not an employee during the period in which the service was performed. The award is granted for exceptional contributions to the engineering design and development, or management coordination of programs related to the accomplishment of the mission of NASA.

**Philip Johnson/Bendix Field Engineering Corporation**  
Vice President for Space Operations

**PUBLIC SERVICE GROUP ACHIEVEMENT AWARD**—presented to a group of non-Government employees in recognition of an outstanding accomplishment which has contributed substantially to the mission of NASA.

**STS-26 Requirements, Planning and Analysis Team**  
Bendix Field Engineering Corporation

**Network Control Center Operations Group**  
Bendix Field Engineering Corporation

**GROUP ACHIEVEMENT AWARD**—an outstanding accomplishment which is the culmination of many individual efforts and the accomplishment of the mission

**Ground Network Engineering**

**Ground Network Operations**

**NASA Communications**

**Network Control Center Activities**

**Office of Public Affairs**

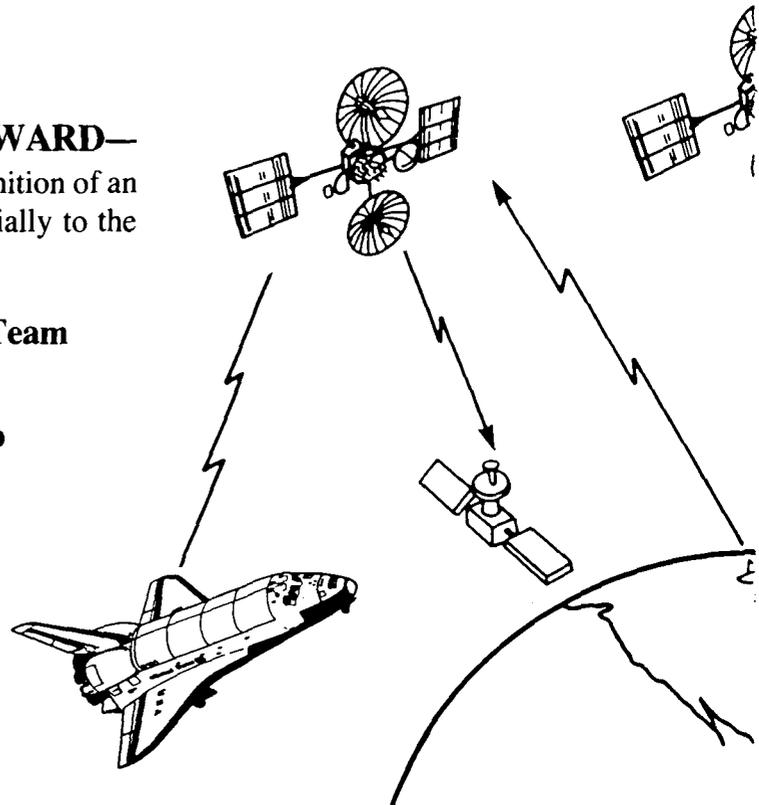
**Shuttle Simulation**

**Spaceflight Tracking and Operations Management**

**STS-26 Networks Team**

**STS-26 Systems Review**

**STS-26 White Sands Operations**



# 6 Recovery Awards to Goddard

**AWARD**—given in recognition of work that has been made through the coordination and has contributed substantially to the mission of NASA.

**Engineering Team/Code 531**

**Operations Team/Code 530**

**Systems Team/Code 542.3**

**Management Project/Code 532**

**Affairs/Code 130**

**Personnel Team/Code 515**

**Tracking and Data Network  
Management Team/Code 534.1**

**Test Team/Code 533**

**Review Team/Code 301**

**Operations Team/Code 530**

**EXCEPTIONAL SERVICE MEDAL**—this medal is awarded for significant achievement or service characterized by unusual initiative or creative ability that clearly demonstrates substantial improvement in engineering, aeronautics, space-flight or space-related endeavors or administration and support of these endeavors which contribute to the programs of NASA.

**Thomas M. Janoski/Code 501**

Mission Support Manager

**George T. Jenkins, Jr./Code 530**

MILA NASA Station Manager

**Robert T. Stanley/Code 515**

Head, Simulations and Compatibility Test Branch

**Robert L. Stelmaszek/Code 533**

White Sands NASA Station Manager

**Virgil True/Code 530**

STS Network Test Manager/Network Test Operations Manager

**Thomas C. Underwood, Jr./Code 530**

Assistant Chief for the Tracking and Data Relay Satellite System

**OUTSTANDING LEADERSHIP MEDAL**—this medal is awarded for notably outstanding leadership which has a pronounced effect upon the aerospace technological or administrative programs of NASA. The leadership award may be given for an act of leadership or for sustained contributions based on an individual's effectiveness as a leader, the productivity of the individual's program or demonstrated ability to develop the administrative or technical talents of other employees.

**Gary A. Morse/Code 530**

Network Director

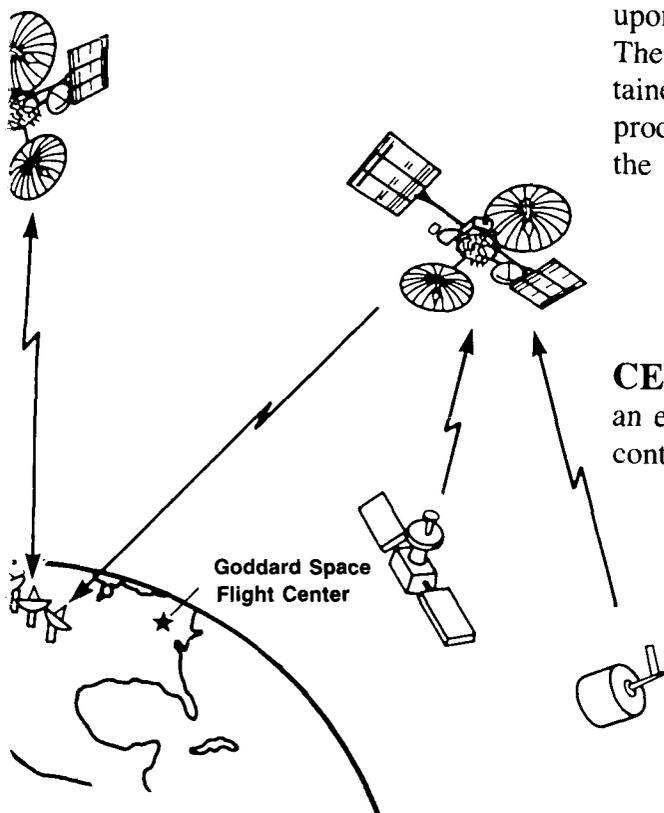
**CERTIFICATE OF APPRECIATION**—this award is given to an employee in recognition of outstanding accomplishment which has contributed substantially to the mission of NASA.

**J. Gay Carls/Code 501**

Network Requirements Assistant

**Robert L. Burns/Code 515.2**

Flight Missions Simulations Coordinator



INSIDE

# Dr. Anne Thompson, From Polliwog To Ozone Scientist

by Carolynne White

**D**r. Anne Thompson's first post-doctoral assignment as a physical chemist found her cruising across both the equator and the international date-line aboard the R.V. Knorr, on a mission to measure hydrocarbons in the marine atmosphere that ultimately earned her status as a "shellback"—known among the enlightened to be those who have crossed the Equator by ship.

Those who have not passed this milestone are referred to as "polliwogs." Many young oceanographers and atmospheric scientists may earn the distinction of "shellback" in the course of their research, but for a beginning researcher to earn both "shellback" and be admitted to the Domain of the Golden Dragon (those who have crossed the international date-line by ship) in one fell swoop, is a rare achievement. Anne Thompson did both during her first voyage as a postdoctoral researcher at Woods Hole Oceanographic Institute, Woods Hole, MA.

Following her cruise, however, Thompson's first research assignment at Woods Hole wasn't quite so glamorous. A research project to measure formaldehyde in rainwater had her running outside to collect samples every time it rained.

## Rainy Nights

"I hadn't paid any attention to meteorology up to that point in my career," she said. "But I soon realized that it usually rained at night. I lost a lot of sleep that year!"

"I drove the security guards at Woods Hole crazy because I was always popping up all over the place with my sampling setup. I wanted to see if there were differences in the formaldehyde depending on where I was with respect to the wind and ocean, so I'd go down to the docks with the wind whipping the waves, and there I'd be collecting the rainwater in a flask..."

Thompson no longer has to collect rainwater in a cup in her current position as an Atmospheric Chemist in the Atmospheric Chemistry and Dynamics Branch (Code 616) of the Laboratory for Atmospheres here at Goddard, of course. But she does share her office with an unorthodox colleague, a puppet Gator named Gardenia, "my alter ego," said Thompson.

Gardenia keeps watch from the computer terminal, which is Thompson's



PHOTO D. MCCALLUM

THOMPSON AND "GARDENIA"

link to her current research tool, a numerical model of tropospheric photochemistry. The troposphere is the layer of atmosphere closest to the Earth, while photochemistry refers to the chemical reactions caused by light. Thompson's work focuses on ozone. Tropospheric ozone (smog) is the result of photochemical reactions involving hydrocarbons and nitrogen oxides.

## Traveling Scientist

Talking about ozone has taken Thompson to locales as nearby as Du Val High School and as far away as Germany. In May, she will go to Beijing, China for a meeting on Global and Regional Environmental Atmospheric Chemistry. "Atmospheric chemistry is new to China and part of the reason for the meeting is to offer a tutorial to Chinese scientists," said Thompson.

Thompson's husband, Nels, an architect, plans to join her in China to tour old and new Beijing. "He says, 'I love to tag along and ask for shopping money,'" Thompson said.

## Role Model

With her long, dark hair and youthful appearance, Thompson is a likely role model for the high school and college students she talks to. She emphasizes the excitement and challenge of a career in science—especially an interdisciplinary science such as atmospheric chemistry, and points out Goddard as nearby, realistic career opportunity for prospective scientists.

"There is definitely a problem with scientific illiteracy in this country," she said. "Somehow the excitement of being a scientist has been lost to young people. But I tell them about the chances I've had to travel—for my career, to do field work,

and to attend scientific meetings. They think that's terrific."

Thompson's enthusiasm for her work is not only contagious, it's all-encompassing. She is excited about science itself. "I tell the students I speak to that the questions are never answered and the work is never done—it's very exciting!"

To college students, and to her colleagues around the world, Thompson emphasizes the urgency of atmospheric chemical changes. While media attention has been focused on the depletion of ozone in the stratosphere—Earth's upper atmosphere—phenomenon such as those Thompson studies occurring in the troposphere, the atmosphere closer to the Earth, are not as well understood.

"People don't understand that the changes that are happening in the stratosphere and changes that are happening in the troposphere, like air pollution and acid rain, are all linked together," she explained. "I try to explain to the groups I speak to that all these atmospheric phenomenon are interrelated."

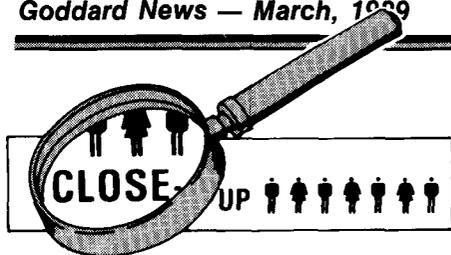
## Full Circle

Thompson came to Goddard five years ago after what she calls her "peripatetic postdoc," spread out over six years and three institutions. After Woods Hole, Thompson served as a postgraduate marine chemist at the Scripps Institution of Oceanography, La Jolla, CA, and spent three years at the National Center for Atmospheric Research in Boulder, CO. The main difference, says Thompson, between being a postdoc and a scientist is whose name is on top of the proposal. "Since I've been here at NASA," she says, "I know I'm a scientist because I write a lot of proposals!"

One of these proposals is bringing her full circle, from NASA back to Woods Hole. She has just been selected a co-investigator on an Interdisciplinary Investigation for the Earth Observing System (Eos), a series of polar-orbiting platforms carrying Earth science experiments, the first of which is scheduled for launch in the mid-1990s.

The Goddard people on this Eos project plan to go to Woods Hole this coming summer."

"I'm going to show them some of our model results," said Thompson, "and who knows—maybe I'll get to go to sea again!"



**HOLT**

**SALOMONSON**

**DR. STEPHEN S. HOLT** has been appointed Deputy Director for Space Sciences in the Space and Earth Sciences Directorate, although he will continue to serve as acting Chief, Laboratory for High Energy Astrophysics (Code 660). In his Deputy Director position, he will be responsible for the advocacy and facilitation of space science research at Goddard.

The new Deputy Director for Earth Sciences in the Space and Earth Sciences Directorate is **DR. VINCENT V. SALOMONSON**, formerly Chief, Laboratory for Terrestrial Physics. In his new position, he will be responsible for facilitating and developing support for interdisciplinary and multidisciplinary efforts that span the research areas covered in the Earth sciences laboratories of the Directorate. He also will seek to promote the development and maintenance of technological, computational, and other facilities that support Earth science research activities.



**McDONALD**

Goddard's Chief Scientist and Associate Director **DR. FRANK B. McDONALD** has been named the 1989 recipient of the American Institute of Aeronautics and Astronautics (AIAA) Space Science Award. The award is presented for "distinguished achievements in studies of the physics of atmospheres of celestial bodies." McDonald received the award for his "pioneering studies of rays, interplanetary particles, and the magnetospheres of Jupiter and Saturn." The citation continues: "Under his guidance the NASA/GSFC Laboratory for High Energy Astrophysics has achieved eminence."

## Goddard Educator Receives Community Award

Goddard's Educational Programs Chief, Elva Bailey (Code 130) recently was named one of the nine recipients of the 1989 Prince George's County Public Schools Outstanding Public Service Awards.

Bailey received the award at the fourth annual Breakfast in Honor of Outstanding Public Service by Business and Community Leaders on February 22 at Kenmoor Middle School.

"The award was presented to me," said Bailey, "but I think it represents a 'thank you' from the Prince George's County Public Schools for things which our institution and our people have been doing over the years to help P.G. schools accomplish their educational objectives."

As Chief of Educational Programs, Bailey places high school students with technical people at Goddard, provides educational materials on space and Goddard's mission to teachers and students, and arranges special programs for students.



PHOTO D. McCALLUM

**COMMUNITY OUTREACH**—Goddard Educational Programs Office Chief, Elva Bailey (Code 130), receives the 1989 Prince George's County Public Schools Outstanding Public Service Award from Sara J. Johnson, Chairman of the Prince George's County Board of Education.

"One of our goals in Educational Programs at Goddard has been to be a model community resource for local area schools and school systems," he said.



## Spreading the Word

A round of applause for Goddard's "local vocals"—members of the Speaker's Bureau—who spread the word about NASA throughout the community. The Speaker's Bureau is composed of Federal and contractor employees who volunteer their time to explain our Nation's space program to a host of audiences throughout 12 northeastern states. For more information on Goddard's Speakers Bureau, contact Darlene Ahalt, X8101. Following is a list of recent presentations by members of the Speakers Bureau:

### January

- Larry Brace, Code 614 — National Capital Astronomers, Washington, DC
- Barbara Scott, Code 408 — Association of Women in Science, Washington, DC
- Joseph Walters, Code 253 — Andrews AFB Officers Wives, Andrews AFB, MD
- George Griffin, Code 754.1 — Miles River Power Squadron, Wye Mills, MD
- George Jenkins, STDN — Stromberg, Carlson Engineers, Orlando, FL
- Robert Ball, Code 503 — Society for the Advancement of Material Processing Engineers, Boston, MA
- David Thompson, Code 662 — Frederick Rotary Club, Frederick, MD
- Patricia Sisson, Code 633 — United Communications Group, Bethesda, MD

### February

- John Degnan, Code 723.2 — Loyola College, Baltimore, MD
- Neil Gehrels, Code 661 — National Capital Astronomers, Washington, DC
- Harvey Moseley, Code 685 — National Capital Astronomers, Washington, DC
- George Jenkins, STDN — Racial Milgo, Ft. Lauderdale, FL
- Donald Friedman, Code 702 — B'nai Brith, Silver Spring, MD
- Carol Crannel, Code 688 — James Madison University, Harrisonburg, VA
- George Griffin, Code 754.1 — Vienna Wireless Society, Vienna, VA
- Joseph Walters, Code 253 — Telford Scouts Blue & Gold, Telford, PA
- Jack Kaye, Code 616 — AT&T Engineers, Reading, PA
- James Andary, Code 409 — Pennsylvania Society of Professional Engineers, Scranton, PA

### March

- David Suddeth, Code 400.6 — Leisure World, Silver Spring, MD
- Joseph Rothenberg, Code 510 — Instrument Society of America, Rochester, NY
- William Webster, Code 622 — IEEE, Lancaster, PA
- Jack Kaye, Code 616 — New Jersey Society of Professional Engineers, Cranford, NJ

## Last Instrument Installed on Goddard-Managed Gamma Ray Observatory

by Carter Dove

Assembly of the Goddard-managed Gamma Ray Observatory (GRO) is now basically complete with the recent installation of four science instruments to investigate gamma rays, an invisible form of energy that may hold clue to the formation and future of the universe.

Scheduled for launch from the Space Shuttle not earlier than April 1990, the Gamma Ray Observatory will orbit 279 miles (448 km) above the Earth gathering data on gamma rays, a form of energy that cannot be viewed through Earth's obscuring atmosphere.

The process of installing the four instruments was begun by the prime contractor, TRW Space & Technology Group in Redondo Beach, CA, in early December and was completed in early January, according to Jerry Madden, GRO Project Manager at Goddard. The spacecraft now requires only the installation of smaller hardware, such as solar arrays and the high gain antenna, and external thermal insulation before beginning environmental testing.

The spacecraft is scheduled for shipment to Kennedy Space Center (KSC) in the last quarter of 1989 for launch aboard the Space Shuttle. Because of the size and weight of the instruments needed to trap gamma rays, it will be the heaviest NASA

payload ever launched. It will weigh 34,000 pounds (15,400 kg).

The four instruments on the GRO are designed to study gamma rays at different energy ranges. They are: the Burst Transient Source Experiment provided by Marshall Space Flight Center; the Compton Telescope provided by the Max Planck Institute, the University of Leiden, ESTEC and the University of New Hampshire; the Energetic Gamma Ray Experiment Telescope (EGRET), provided by Goddard, Stanford University (Stanford, CA), the Max Planck Institute, and Grumman Aerospace; and the Oriented Scintillation Spectrometer Experiment provided by the U.S. Naval Research Laboratory, Northwestern University and Rice University.

GRO's basic science mission uses a circular, 279-mile (450-kilometer) orbit, inclined 28.5 degrees to the equator. The Space Shuttle will carry GRO to its mission altitude allowing the observatory to use fuel that was originally planned for unassisted ascent for an extended mission lifetime of four to six years.

Data from the GRO will be returned to Goddard via the Tracking and Data Relay Satellite System (TDRSS), and the NASA Communications Network (NASCOM). Commands will be uplinked to the GRO in the same way.

## NCC Employees Give The "Shirts Off Their Backs"



**GODDARD GIFTS**—RADM Richard H. Truly (second from left) holds a print of a NASA/Goddard symbol designed by Network Control Center (NCC) employees David Duffy, (holding print) Mark Pepin, and Tom Russel (on Truly's left) and Donny Gates, not pictured, (all of Bendix Field Engineering Corporation, BFEC). The print was signed by the entire NCC crew and presented to Admiral Truly when he visited Goddard in December. Originally designed as a new symbol for the NCC, the image now graces another signed print and t-shirts presented to the crew of upcoming Shuttle flight STS-29 to wear during the mission. The NCC employees also coordinated an effort to print the image on t-shirts, sweatshirts, jackets and hats. Another t-shirt was presented to astronaut Mike Lounge when he visited Goddard after the STS-26 mission.

## Robotics

(Continued from page 1)

"The simulator is a very cost effective system," said Provost. "It reduces the construction costs considerably for major spacecraft and instrument subsystems and makes results available in much shorter time."

Provost said that the new robotics facility is second to none in the world.

Commenting on the use of the robotics facility with the FTS project Ollendorf said, "The Center has been given a technical challenge to build a robot to do things which have never been done before in space. With this facility, the team we've put together and with help from universities, industry, and other NASA centers, Goddard will have a positive impact not only on S.S. Freedom and the Nation's space program but improve the United States' ability to compete in world markets through technology transfer to private industry."

**NASA**  
National Aeronautics and  
Space Administration

Goddard Space Flight Center

# Goddard News

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