



COMET KOHOUTEK, shown here in a picture taken on December 11, 1973, was one of the big scientific events of last year and continued to be of interest in 1974. This photograph was taken at the Joint Observatory for Cometary Research located at 10,600 feet on South Baldy Mountain in New Mexico. The Observatory is operated by Goddard and the New Mexico Institute of Mining and Technology. Goddard's Dr.

Stephen Maran is Manager of Operation Kohoutek, a NASA-wide effort that studied the comet from all possible angles including ground-based observations like the above, aircraft, balloons, sounding rockets, and manned and unmanned spacecraft. For this and other highlights of 1973, see Page 2.

## AE Probes Outer Atmosphere

Goddard's latest Atmosphere Explorer (AE-C or Explorer 51) is providing scientists with a unique platform for long-term studies of regions of the upper atmosphere that effect such diverse phenomena as the Earth's weather, the heat balance of the atmosphere, the aurae, and the geomagnetic storms that cause radio blackouts. An onboard propulsion system is allowing ground controllers to maneuver the spacecraft in and out of areas of the upper atmosphere where aerodynamic drag would cause non-maneuverable satellites to rapidly lose altitude and re-enter, and, for the first time, communications links with a sophisticated ground computer are allowing scientists across the country to analyze events detected by AE instruments as they happen.

Explorer 51 was launched from the Western Test Range on December 16, 1973, aboard Delta 99.

The purpose of Explorer 51 and two follow-on spacecraft, AE-D and AE-E scheduled for launch in 1975, is to explore the region from 120-300 kilometers, where energy transfer, chemical reactions and other atomic and molecular processes, critical to the heat balance of the earth's atmosphere occur. The main energy input to the atmosphere results from the absorption of solar ultraviolet radiation, a second substantial source results from the solar wind interacting with Earth's magnetic field. Explorer 51 will lead to a better understanding of the variability and magnitude of this high-latitude heat source. In addition, the spacecraft will measure particle fluxes, airglow intensities, plasma densities and temperatures, and magnetic fields at low altitudes where the energy dissipation occurs.

Perigee excursions from the normal 150 km. altitude to as low as 120 km. for short durations will be made into the atmosphere for low-altitude measurements. These excursions are made possible through the use of an onboard hydrazine Orbit Adjust Propulsion

Subsystem (OAPS). Perigee restorations, apogee restorations, and attitude maneuvers will also be accomplished using the OAPS. After approximately eight months, the orbit will be circularized by the OAPS and maintained at various altitudes between 300 and 600 kilometers for the remainder of the mission.

Should a solar flare or other interesting phenomenon occur, the central ground computer complex in Building 23 here at Goddard will enable the scientist-investigators in their laboratories across the country to communicate with each other and with the AE Control Center to coordinate the operations of the 14 onboard instruments while the event is actually occurring.

There has been no way for such real-time exchange of scientific information in the past. Generally, data have been collected by the NASA field center involved and transmitted on tape or via documents to individual scientists for study over weeks, months or years. This rapid data exchange among the participating scientists will allow them to use Explorer 51 like a scientific laboratory, and to make changes in orbit and instrument operations in the light of the preliminary results obtained. The Sigma 9 computer complex was provided by the Xerox Corporation.

A favorable early report by Project Manager David W. Grimes indicates that mission operations are proceeding well. All experiments and engineering measurement instruments are operating satisfactorily and both velocity-change thrusters and the yaw thruster have been exercised in calibration firings. Various spin rates from one revolution per orbit (despun) to ten revolutions per minute have been achieved by transferring angular momentum between a large internal wheel and the spacecraft body. Perigee has been lowered incrementally to 152 kilometers by firing in both the spinning and

(See Page 8)

## Goddard Projects New and Old Make 1973 a Busy Year

Goddard's year 1973 saw five successful Delta launches from both coasts and impressive results from previous flights continued to add to mankind's store of knowledge.

The Comet Kohoutek and Goddard's Operation Kohoutek, a NASA-wide undertaking to study the comet under the overall direction of GSFC, was at its height as the year drew to a close. It's still too early to list major conclusions about Kohoutek learned through investigations carried on Skylab, Orbiting Astronomical Observatory, Orbiting Solar Observatory, Mariner/Venus/Mercury, Pioneers, Sounding Rocket launches, aircraft flights, balloon flights and ground observatories, but the most scientific information ever obtained on a comet has been gathered by the Kohoutek Information Center.

As it turned out, the comet was a disappointment to the average citizen with a magnitude of about plus 3, a very dim star, rather than the expected brightness of Venus or even earlier predictions, possibly as bright as the full moon. However, Dr. Stephen Maran and written material released by Goddard early this fall had pointed out the unpredictability of comets. However, he says the scientific community is learning more about comets from Kohoutek than ever before. Kohoutek now heads back toward the edge of the solar system in its 75,000 year orbit.

Interest had been high beginning with a press briefing held at Goddard October 18 attended by about 40 members of the electronic and print media and continues at about the same level. Major magazines, newspapers, the TV and radio networks and relatively smaller publications and electronic media across the nation have carried the Goddard story, including a Time magazine Cover Story.

At almost the same time Kohoutek appeared, a major story from OAO was ready to be released. This one also evoked major interest not only to the scientific community, but the press as well. It's the black hole theory, now called fact by Dr. Peter Sanford of the Mullard Space Science Laboratory, University College, London. He says his OAO data has convinced him and his associates that the binary super giant star system, HD 226868, consists of a black hole orbiting a huge companion star.

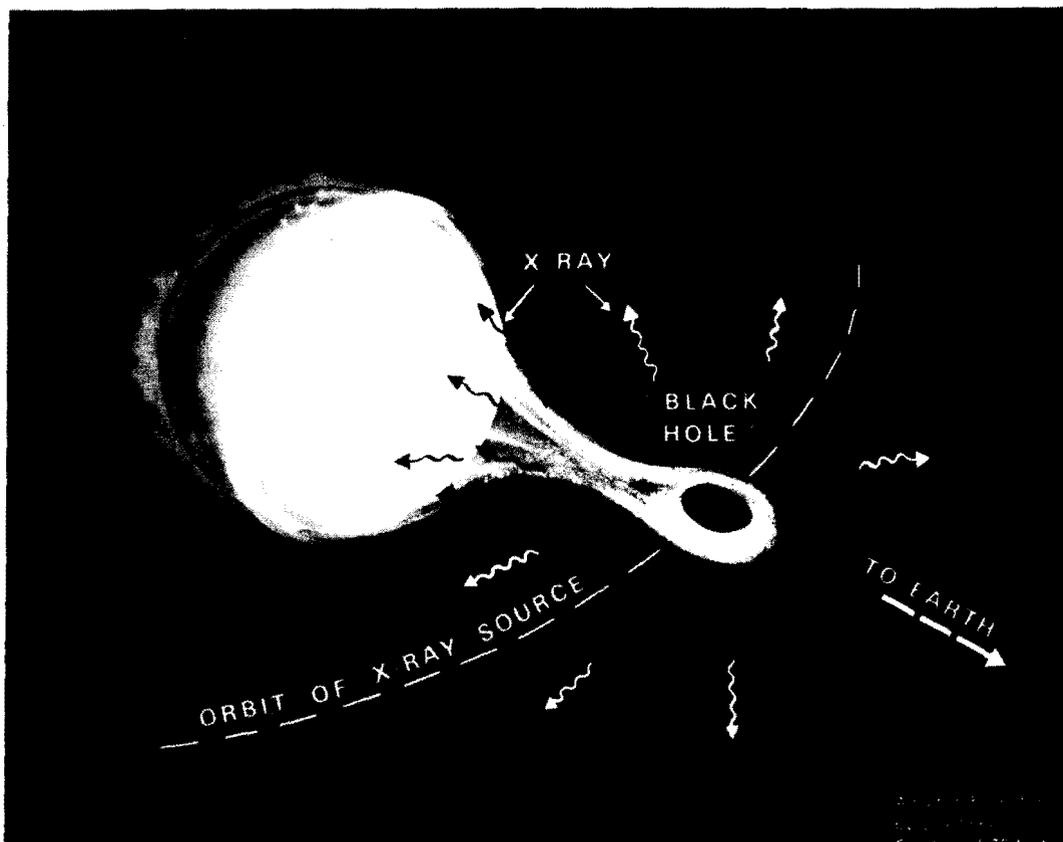
The black hole, Cygnus X-1, says Dr. Sanford, is sucking the visible star's gas clouds into the black hole and according to the longheld theory, the entire visible star will eventually follow leaving no trace of its former existence.

A black hole is a dying star that has collapsed on itself. Neither light nor matter can escape because of its intense gravitational field. The star's material is so densely packed that a spoonful of material from the center would weigh more than a billion tons.

Pioneer-10, launched on March 2, 1972, made its closest pass of 81,000 miles from Jupiter on December 3, giving mankind its first close-up look at the solar system's largest

(See Page 9)

A BLACK HOLE as seen in an artist's concept.



THE MISSISSIPPI RIVER as seen by the first Earth Resources Technology Satellite in March and May of 1973. The mosaic shows flood conditions of the river from New Orleans to St. Louis. Although the dates of separate frames used to compose the picture differ by over a month, the water levels were similar during the "100 year flood." This is but one of many ways the ERTS has been used to study the earth's surface.



## Seven Aerobees Successfully Launched from Australia

Late last year, seven Goddard sounding rockets were launched from Australia's Department of Supply range in Woomera, Australia.

Reports Project Manager Morgan Windsor of the Sounding Rocket Instrumentation Branch, "We had a 100 percent success rate with the rocket launches and the quick-look data for the experiments looks good."

The seven Aerobee rockets carried experiments designed to study the X-ray spectra of selected stars and sources such as the Magellanic Clouds which can be seen only from the Southern Hemisphere. The experiments were provided by U.S. scientists from the California Institute of Technology, the Naval Research Laboratory, the University of Wisconsin and the Massachusetts Institute of Technology. The payloads were recovered by parachute.

Australia's Department of Supply Weapon Research Establishment, which operates the Woomera Range, assisted in launching the rockets, provided and operated instruments for tracking them, and helped with payload recovery. The operation was conducted for NASA on a cost-reimbursable basis.

When the agreement to launch the rockets was originally announced on September 18, 1973, the Australian Prime Minister and Minister for Supply, Mr. Lance Bernard, said, "Australia welcomes the opportunity to assist in these civil, scientific experiments of NASA from which Australia derives considerable value. Such co-operation is a further example of the valuable and wide-range activities conducted jointly between Australia and the United States, for the mutual benefit of both countries."

The 1973 program was similar to one undertaken in 1970, and is in accordance with the spirit of co-operation inherent in the agreement concluded between Australia and the United States on March 25, 1970 concerning a continued program of co-operation to facilitate space flight operations contributing to the advancement of mutual scientific knowledge.

Goddard men who took part in the November expedition, and who received a GSFC Group Achievement Award for their efforts are Richard A. Baylor, Thomas J. Budney, Jon R. Busse, Robert W. Conrad, Robert H. Demorest, Ronald W. Drewry, Joseph Ducosin, Robert Y. Flynn, M. Douglas Gunter, William F. Lau, George E. MacVeigh, Robert W. McIntyre, Maurice A. Nygaard, Bruce R. Pincus, Leroy F. Shiflett, David J. Shrewsbury, Raymond J. Starrel, Lawrence R. Thomas, Paul Velgos, and Richard M. Windsor.

### Goddard Mourns. . .

Wendell S. Smith, 38, head of the Experiments Management Office of the Laboratory for Meteorology and Earth Sciences at Goddard, died Thursday, December 13, 1973, of cancer at Baltimore City Hospital.

When he first joined NASA in 1959, he worked on early explorations of the meteorology of the earth's upper atmosphere. More recently, he participated in the development of advanced remote sensors for use on earth satellite observatories. Earlier last year, he headed a NASA group which performed a cooperative experiment with Soviet scientists. They used aircraft and ship observations to verify corresponding satellite measurements.

Results of Mr. Smith's work have been published in numerous journals and technical reports.

Dorothy L. Dick died on January 24, 1974. Mrs. Dick had retired from Goddard on October 3, 1973. She had been a Personnel Clerk in the Manpower Utilization Division since coming here in June of 1961.



DORA PULEO, Goddard's New Equal Employment Opportunity Specialist in the Special Programs Office, came here on December 10, 1973, from the Department of Labor Management Administration Office of Personnel. In her new post, she helps evaluate and put into effect the Center's Affirmative Action Plan by which the EEO Program objectives are accomplished. Born in Puerto Rico, Mrs. Puleo attended the University of Puerto Rico and received her BA in English and Psychology in 1966. She has done graduate work in vocational rehabilitation. Her husband, Vincent W. Puleo, is a Mechanical Engineer for the Navy Department. They have one daughter, Isabelle, age three.

## NASA Club Sponsors Two Overseas Tours

The NASA Headquarters Employees Club is sponsoring two overseas tours in 1974. An 8-Day Tour of Mexico, May 4-11, 1974, will include Mexico City, Taxco and Acapulco. A 17-Day Tour of the Orient, August 8-24, 1974, will include Tokyo, Hong Kong and Bangkok. Detailed information can be obtained from B. Maggin, Code: RK at NASA Headquarters.

## New Colloquia Series Covers Broad Range of Topics

ENGINEERING COLLOQUIA. Robert B. Hotz, Editor-in-Chief of *Aviation Week & Space Technology* speaks on "The Soviet Aerospace Industry—Where it is Going and Why" during the January 14 session of Goddard's Engineering Colloquia. The new lecture series, which began last fall, covers a broad range of technical and semi-technical topics. Past lectures have included "The Life and Achievements of Dr. Goddard," the "Wired City Concept: Communicate or Commute," "Housing of the Future," and "The 70th Anniversary of Kitty Hawk." Coming up in February will be "The Future of Satellite Communication" by Louis L. Pollack, Director of Research and Development, of the COMSAT Laboratories. The Engineering Colloquia is held on Monday afternoons beginning at 4:00 in the Building 3 Auditorium. Everyone is welcome.



## 1973 Ceremony Honors Outstanding Goddard Team Members

A significant number of Goddard employees working in many fields were honored during the Center's annual awards ceremony held in the Building 8 Auditorium on December 3. Dr. John F. Clark, Goddard Director, presented the awards which included GSFC Exceptional Performance Awards for individuals who made outstanding contributions to Goddard programs in 1973.

Also presented were team awards and 62 Career Service Awards.

A special NASA Apollo award went to "those who made significant contributions to the Apollo Lunar Landing Program. This medal was struck from a die carried to the moon on Apollo 11." Past and present Goddard staff members receiving this award were: John F. Clark, Ozro M. Covington, Robert J. McCaffery, John T. Mengel, Robert L. Owen, Tecwyn Roberts, Laverne R. Stelter, Henry F. Thompson, Michael J. Vaccaro, Eugene W. Wasielewski, and H. William Wood.

GSFC Group Achievement Awards went to: the Copernicus (OAO) On-Board Processor Team, the Real-Time Operations Support Computing Team, the Maritime Satellite Experiment Team, the Flight Operations Team, the P-MOS Integrated Digital Circuits Team, the Sounding Rocket Australian Expedition Team, the Station Directors of the Spaceflight Tracking and Data Network, and the Radio Astronomy Explorer Team.

Goddard Equal Employment Opportunity Awards were presented to William N. Weston, Elmer C. Terry and Doris A. Martin.

Elmer J. Carter and Shuford Schulman, both with 35 years of government service to their credit, topped the list of Goddard receiving Career Service Awards.



REGINA WASIELEWSKI accepts an Apollo Award in behalf of her husband, the late Eugene Wasielewski, Goddard Associate Director.



DR. JOHN F. CLARK, Goddard Director, receives an Apollo Award from Vincent Johnson, Deputy Associate Administrator of the Office of Space Sciences at NASA Headquarters. Dr. Clark also received a 30 year service pin during the ceremony.

### EXCEPTIONAL PERFORMANCE AWARDS

Nineteen employees received Goddard's top award for contributions in 1973. Receiving the GSFC Exceptional Performance Award during the December 3 ceremony were:

Earl D. Angulo for "initiative and creativity in the conception, design, and development of mechanisms, booms and boom deployers for Explorer class satellites."

William R. Bandeen for "leadership in formulating, guiding and implementing NASA's meteorology program."

David L. Blanchard for "initiative and leadership in the development of the Flight Dynamics System."

Charles P. Boyle for "contributions to the public image of the Goddard Space Flight Center for his contributions to public awareness of the Space Program through the publication of 'Space Among Us.'"

Gilbert A. Branchflower for "leadership and expertise in managing the first ERTS spacecraft which resulted in the successful completion of the mission."

John C. Brandt for "contributions in the observation and interpretation of the solar wind, the Gum Nebula, and external galaxies, and in the investigation of ancient astronomical records in North America."

Ronald O. Britner, II, for "success in combining the Manned and Unmanned Tracking Networks to form the Spaceflight Tracking and Data Network while meeting all station operations and mission requirements."

Paul Butler for "an outstanding record of cost control and savings while achieving full mission objectives of the IMP Program."

Danny A. Dalton for "contributions to the design and implementation of the ground data handling system in support of the manned space program."

Stanley C. Freden for "leadership in organizing and managing the analysis, interpretation and application of observations from the ERTS-I Satellite."

John M. Hayes for "contributions in the development of the successful Wideband Video Tape Recorder flown on the first Earth Resources Technology Satellite."

Paul D. Lowman for "pioneer research in the study of lunar and planetary geology from space."

Ruth E. Marsh for "technical excellence and initiative in the reduction and analysis of data from the SAS-II Gamma Ray Spark Chamber Telescope."

Ann C. Merwarth for "leadership in the EEO Program which has resulted in the Goddard Day Care Center."

Paul A. Mowatt for "pioneering the concept of co-located management support to the Projects Directorate and for contributions as the Management Team Member of the ITOS Project."

Robert L. Owen for "development of tracking techniques for the Apollo Program which resulted in substantial cost savings to the Spaceflight Tracking and Data Network."

Friedrich O. Vonbun for "contributions in the definition and establishment of the NASA Earth and Ocean Physics Application Program."

On December 20, Dr. Clark presented GSFC Exceptional Performance Awards to two men who could not make the earlier ceremony. They were:

William Kneval for "leadership and management techniques in developing a constructive and highly effective Goddard Parts Program."

Daniel A. Spintman for "demonstrated performance in the financial and resources control management of the Spaceflight Tracking and Data Network."

Award citations are quoted here in part.

# Energy Conservation

By David G. Lewoc  
Assistant Chief, POMD

The specific conservation steps currently underway (noted in GSFC Announcement #1659 of December 4, 1973), while possibly having inconvenienced people, have resulted in considerable energy savings. Specific measures which have been taken are:

- Reduction of room temperatures during the heating season to a range between 65° to 68°F.
- A prohibition in the use of electric heaters to raise space temperatures above the 65° to 68°F. range.
- Extensions in downtime on air-circulating systems.
- Minimization of the intake of outside air (increased recirculation of air within buildings).

Because of these measures, Goddard has achieved a 26 percent reduction in fossil fuels (oil and gas) and a nine percent reduction in electricity for the first six months of FY 74 as compared with the first five months of FY 73.

The amazing reduction in fossil fuels was also accomplished as a result of the installation of a 3000-ton electric chiller in the Central Power Plant which precluded the use of the steam-driven chillers. The Plant Operations and Maintenance Division (POMD) also secured steam to selected buildings during the summer heat wave, which, while saving fossil fuels lost humidity control in those buildings. In light of the installation of the electric chiller, only a nine percent reduction in electricity use is favorable. Additionally, the weather through November was relatively mild.

The disturbing factor is the probability of an additional mandatory reduction in utilities (oil, gas, and electricity) usage. While we may be able to function with a reduction in fossil fuels, any further reduction in electricity will present a problem. Where can we help to alleviate the electrical shortage? Lighting? Yes. It accounts for 20 percent of Goddard's total electrical load. Equipment left operating when not required? Yes. This, however, requires user cooperation. Let's analyze each of the two suggestions in turn.

**Lighting:** POMD has already removed half of the fluorescent lamps from corridors and is removing lamps from occupied areas upon request. Any further reductions in this area will have to be accomplished by people using lights only when required.

**Securing Equipment When Not In Use:** This is the largest area of electrical waste on Center—computers, diffusion pumps, etc. left on when not in use. It will take a good deal of effort to convince people that computers and pumps are not damaged by turning them off. By the way, there are some 1500 HP of heating and air conditioning fans left on 24-hours-a-day, seven-days-a-week, 365-days-a-year to provide environmental conditions for equipment which is never turned off. This represents 63 separate heating and airconditioning systems.

With the cooperation of all Center employees, the impact of any energy shortage could be minimized.

## Speakers Bureau Being Expanded

For a number of years the Office of Public Affairs has provided qualified speakers on a variety of specialized and general space research topics to civic and community groups. This service is now being expanded and we request your participation in this challenging area. It is, of course, voluntary.

Those who volunteer for the program can elect to handle technical audiences in their areas of expertise; more general audiences of essentially laymen or both. In any case, the Public Affairs Office will provide audio visual support together with "blobs" of printed materials. Compensatory time off and limited travel expenses can be arranged when feasible.

Those who wish to participate, please fill out the form at the bottom of Goddard Announcement 1672 and send it to the Public Affairs Office as soon as possible, or call extension 4101.

## CLIP AND SAVE

This is the seventh of a series of articles by Earl D. Ellis on plating, protective coatings and electrochemical processes available from Goddard's Engineering Services Division. For further information, Mr. Ellis can be reached on extension 4870.

## Metallic Depositions on Non-conductive Surfaces

Electro-plated plastics have many potential uses and are far more corrosion resistant than electroplated metals. On commercial plastic products electroplating has been used primarily for decorative purposes. However it has many functional advantages in the aerospace program.

There are many non-conductive materials such as plastics and elastomers, that can be electro-plated once the necessary pretreatment applications are properly applied. For example, Delrin, Teflon, Glass Epoxy and Fiber Glass are some of the non-conductive materials that have been successfully electroplated for experimenters and scientists at Goddard.

Chemical or vacuum depositions on non-conductive materials requires meticulous surface preparation and elaborate pretreatment procedures. Once this is completed and a conductive surface has been obtained almost any electrodeposition such as copper, nickel, gold, silver, etc. may be applied.

At GSFC high bond strength electroless copper coatings were successfully applied to laminates of fiber glass and teflon. The procedure was originally developed to meet the requirements for a copper coated Hyperboloid to be used in a radar experiment. It has since been used to provide RF shielding and electrical conductors on teflon parts. This process has been used for thru hole plating of printed circuit boards and is also a convenient method for soldering non-conductive surfaces.



COMET KOHOUTEK was the topic of an Italian television program that was filmed at Goddard and transmitted live to Italy from Building 14. Above, a combined Italian and Goddard TV crew monitor the final rehearsal. From left are Dave Wade, Pat Lombrosco of RAI, the Italian TV network; Aldo Bruno, Director RAI; and Lee Burke. Wade and Burke are RCA Data Instrumentation Engineers attached to the Code 512 Technical Support Group under Ray Suggs. Chris Maskaleris, John John Arslanian, Ray Lauver, Henry Wagner, Denny Exley were part of the Goddard technical team which made up the production crew.

# A New Goddard Organization

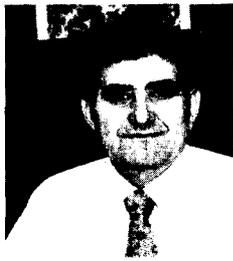
On January 17, 1974, NASA Headquarters officially approved a comprehensive reorganization of Goddard personnel. The three-fold purpose of the reorganization is to help focus Goddard leadership on the Center's commitment to the Space Applications Program, to strengthen Goddard's engineering capability, and to centralize Goddard's Project Management organization by properly balancing the business and technical aspects of flight project management.

Although the new scheme involves most Goddard directorates, the most outstanding change is the formation of a new Applications Directorate. Two other directorates have been reorganized and renamed. Space and Earth Sciences is now the Sciences Directorate, and Space Applications and Technology is now the Engineering Directorate.

THE OFFICE OF THE DIRECTOR is responsible for establishing the policy and planning Goddard's major change in the Goddard Institute for Space Studies in New York City. The Office of the Director is also responsible for the Administration and Application of the Director's Office.



**George F. Pieper**  
Director  
Sciences



**William Nordberg**  
Director  
Applications



**Joseph Purcell**  
Director  
Engineering



**Robert N. Lindley**  
Director  
Projects



**John H. Boeckel**  
Applications Assistant Director  
Operations



**Robert C. Baumann**  
Engineering Deputy Director



**Robert R. Ziemer**  
Projects Deputy Director



**Friedrich O. Vonbun**  
Applications Assistant Director  
Earth & Ocean Physics  
Applications Program



**Alton E. Jones**  
Engineering Associate Director  
Flight Projects

SCIENCES conducts a broad program of scientific research, both theoretical and experimental, in the study of space phenomena. The retitled directorate is essentially the same as the old Space and Earth Sciences Directorate. Several internal organizational changes are being made to more clearly reflect the present activities of Goddard in the field of science.

APPLICATIONS has been newly organized to analyze the need for and the benefits from the use of space systems for observation of earth and its resources for the broad benefit of mankind. Directorate elements include the Meteorology Program Office from the Office of the Director, a Missions Utilization Office, a Systems Analysis Office and five divisions.

ENGINEERING has been organized to concentrate most of Goddard's engineering activities in one organization. It includes many of the elements of the old Space Applications and Technology Directorate.

PROJECTS, under the new organization, will concentrate on the Project Management aspects of Goddard's spacecraft and Delta launch vehicle operations. Many technical and engineering personnel have transferred to other directorates where they will provide colocated support of Projects. The Explorer Projects Office is transferred from the old Space Applications and Technology Directorate. Projects are: OAO, AE, ERTS/Nimbus, OSO, TIROS-N, ATS, Delta, ITOS, and SMS/GEOS.

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OF THE DIRECTORATE for determined to accomplish missions. Prior to the transfer of the Space Sciences Directorate to the Goddard Space Sciences Directorate to take effect.



**Michael J. Vaccaro**  
Assistant Deputy Director  
Management



**Donald P. Heath**  
Deputy Director



**John F. Clark**  
Goddard Director



**Leslie H. Meredith**  
Assistant Director

**Systems Reliability**

**Mission & Data Operations**

**Networks**

**Administration & Management**



**Herman E. LaGow**  
Director  
Systems Reliability



**Albert G. Ferris**  
Director  
Mission & Data Operations



**Tecwyn Roberts**  
Director  
Networks



**Samuel W. Keller**  
Director  
Administration & Management



**Merland L. Moseson**  
SR Deputy Director



**James J. Flemming**  
M&DO Assistant Director  
Center Automatic Data Processing



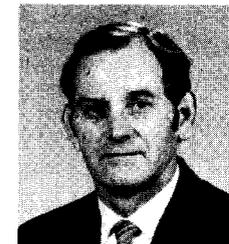
**L. R. Stelter**  
Networks Associate Director  
Engineering



**William A. Mecca**  
A&M Deputy Director



**H. William Wood**  
Networks Associate Director  
Operations



**William E. Mathis**  
A&M Assistant Director  
Resources and Procurement



**Richard S. Sade**  
A&M Deputy Assistant Director  
Resources & Procurement

**MISSION & DATA OPERATIONS** is responsible for flight mission support and information processing. The reorganization has dissolved the Advanced Data Systems Division, transferring some functions to the Engineering Directorate. Other M&DO elements have been combined to form the new Mission Operations Computing Division. The rest of the directorate remains unchanged.

**NETWORKS** is responsible for the operation of the world-wide Spaceflight Tracking and Data Network and the NASA Communications Network. The directorate is unchanged by the reorganization.

**ADMINISTRATION & MANAGEMENT** provides management support for Goddard scientific and technical programs. Many changes have been made to tighten and improve this function. They include the establishment of the posts of Assistant Director and Deputy Assistant Director for Resources and Procurement, and combining the functions of the old Procurement and Program Support Divisions, many of which will be collocated with the technical elements which they support.

**SYSTEMS RELIABILITY** reviews the technical aspects of all Goddard projects, spacecraft systems, launch vehicle systems and ground systems to assure that they can reliably achieve program goals. This directorate remains unchanged.

**ATMOSPHERE EXPLORER . . . From Page 1**

despun modes. Mr. Grimes reports that the next perigee lowering is planned for late February.

The spacecraft was built under contract by RCA Corporation, Astro-Electronics Division. It has the shape of a 16-sided polyhedron, 53.5 inches in diameter and 45 inches high. There are 14 scientific experiments and four engineering instruments on the spacecraft provided by five universities and three government agencies. GSFC investigators are Nelsen Spencer, Larry Brace, Bob Hoffman, Henry Brinton, Dave Pelz, and Don Heath. Earle Young provided one of the engineering instruments. Design lifetime of the spacecraft is one year.

The success of AE-C is due to the devoted efforts of many people at GSFC, RCA, and the various universities and government agencies involved. Some of these are listed below.

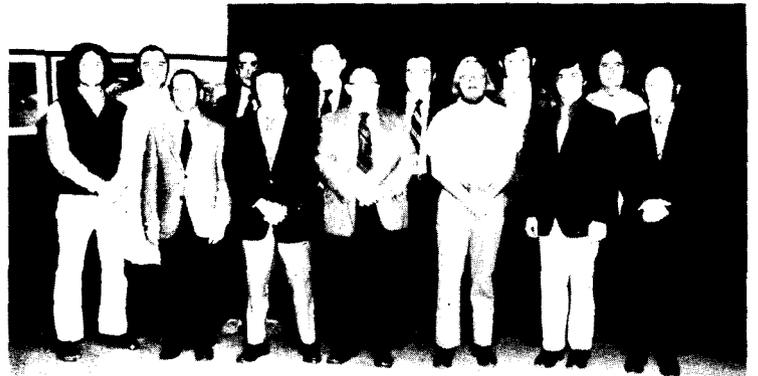
- |                  |                                       |
|------------------|---------------------------------------|
| Frank Gaetano    | Program Manager                       |
| Dave Grimes      | Project Manager                       |
| Dale Nelsen      | Assistant Project Manager             |
| Nelsen Spencer   | Project Scientist                     |
| Bill Hoggard     | Project Coordinator                   |
| Bob Weaver       | Spacecraft Manager                    |
| Jim Findlay      | Experiment Manager                    |
| Dave Haykin      | Project Operations Director           |
| Roger Tetrick    | Mission Operations System Manager     |
| Warner Hord      | Systems Reliability Manager           |
| Dino Machi       | Project Systems Engineer              |
| Ed Moses         | Assistant Spacecraft Manager          |
| Wayne Hembree    | Project Systems Engineer for ADP      |
| Jim McGuire      | Electrical Systems Engineer           |
| Jack Peddicord   | Business Representative               |
| Forest Wainscott | Project Control Officer               |
| Dick Donnelly    | Experiment Coordinator                |
| Milt Sing        | Experiment Coordinator                |
| Bill Woodruff    | Propulsion Engineer                   |
| Sam Willis       | Thermal Engineer                      |
| Tom Ratliff      | Tape Recorder Engineer                |
| Bob Halli        | Structure Engineer                    |
| Ken Dolan        | Attitude Control Engineer             |
| Rick Obenschain  | Power Subsystem Engineer              |
| Rodger Cliff     | C&DH Engineer                         |
| John Pandelides  | Communications Engineer               |
| Virgil Cleveland | T&E S/C Support Manager               |
| Pat Melia        | T&E Experiment Support Manager        |
| Bob Schools      | R&QA Engineer                         |
| Rudy Gerace      | R&QA Engineer                         |
| Dick Borig       | Configuration Management Officer      |
| Bill Spear       | Financial Analyst                     |
| John Thomas      | Schedule Analyst                      |
| Vince Gigliotti  | Schedule Analyst                      |
| Sandy Norton     | Secretary                             |
| Diane Shepard    | Secretary                             |
| Carl Gustafson   | Assistant Project Operations Director |
| Dennis Hewitt    | Thermal Engineer                      |



**AE OPERATIONS CONTROL CENTER.** From left are J. Rhodes, J. McCloskey, I. McCormack, M. LaFleur, D. Haykin, D. Faust, C. Gustafson and W. Meiners.



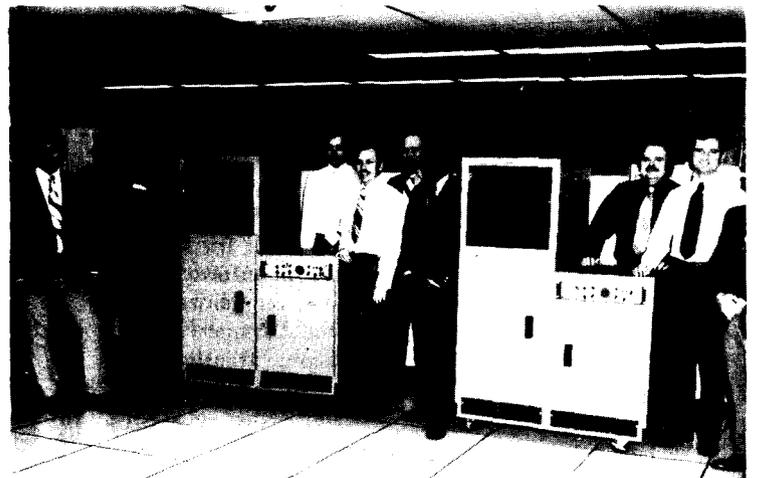
**AE CENTRAL COMPUTER TEAM.** From left are G. Toth, F. Shepherd, G. Fleming, C. Freeman, M. Mahoney, W. Hembree, R. Grigsby, and R. Durachka.



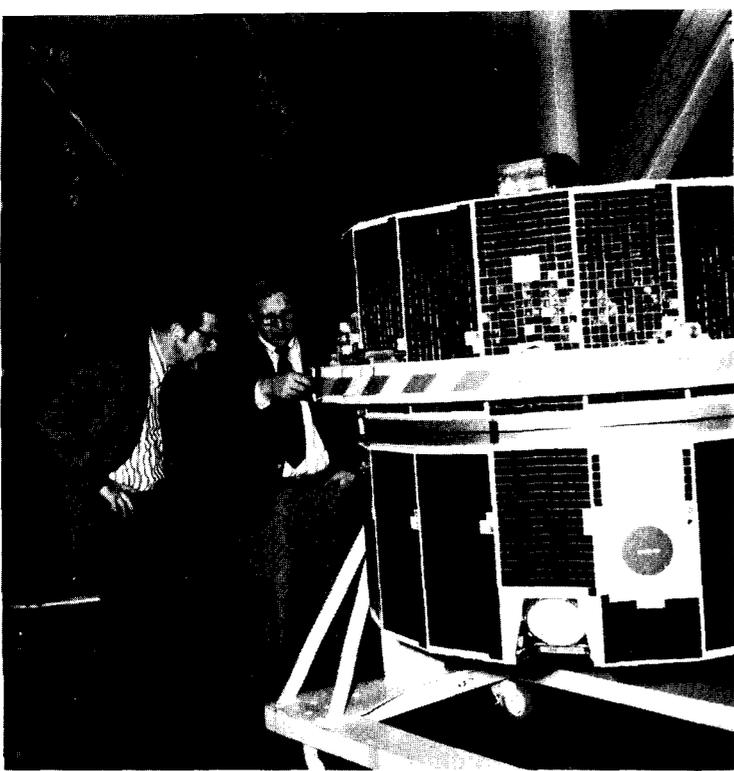
**T&E DIVISION personnel who worked on AE are (from left) T. Roy, D. Righter, P. Caruso, C. Harris, E. Young, D. Mason, B. Brown, D. Hershfeld, B. Gotthardt, J. Stecher, C. Willis, V. Cleveland, and P. Melia.**



**Atmospheric Explorer Project Team.**



**TEST AND EVALUATION spacecraft/Experiment Simulator Team members are (from left) W. Blakeslee, S. Parisi, C. Cavey, A. Ruitberg, W. Mocarisky, D. Provost, R. Morgan, G. Youse, D. Coolidge, and N. Beard.**



**EXPLORER 51.** Donald P. Hearsh, Goddard Deputy Director, and David W. Grimes, AE Project Manager, inspect the Atmospheric Explorer satellite at Goddard's Magnetic Test Facility before it was sent to the Western Test Range for Goddard's last launch of the year. It was sent aloft on December 16 by a Delta Booster.



**PIONEER-10 FLYS PAST JUPITER.** The Red Spot and a shadow of the moon Io, plus Jupiter's cloud structure, are shown in this photograph taken at 11:20 p.m. PST on December 1 as Pioneer-10 was about 2,500,000 kilometers from the giant planet. The spacecraft passed closest to the planet on December 3 and is continuing to transmit data as it passes on towards the orbit of Saturn. Among the 11 scientific instruments on board is a Cosmic Ray Telescope developed by a team under the direction of Goddard's Dr. Frank B. McDonald.

## 1973 Highlights . . . From Page 2

planet. Among the Pioneer experiments is Goddard's Cosmic Ray Telescope which, in operation for much of the spacecraft's long journey, has returned data on space beyond the orbit of Mars and the magnetic, electrical and radiation environment near Jupiter. Frank B. McDonald, Principal Investigator, reports that data includes indications of a new component of cosmic rays.

On a more down-to-Earth subject, Goddard's Earth Resources Technology Satellite continued to pump out data of consistently excellent quality achieving its one millionth photographic image product in November.

At symposiums in the Spring and in December, investigators continued to sing the praises of the Earth Resources knowledge gleaned from the satellite's imagery.

ERTS has been shown to be valuable for such things as mineral resource exploration activities; hydrology (flood control especially); pollution detection; the geologic and cartographic disciplines; urban planning; land use development; volcanic activity; agriculture and forestry; oceanography, and the list continues to lengthen.

In fact, ERTS teamed up with ATS, Nimbus and NOAA satellites to help ocean explorer Captain Jacques Cousteau out of a tight spot in the Antarctic last February.

Cousteau had APT and ATS equipment on his ship, Calypso, to aid in getting environmental and oceanic information. As it turned out, the communications and weather data via ATS, the direct weather information via the APT with an ice field photo assist from ERTS, were crucial in helping him make a dash across the very rough Drake Strait to a safe harbor in Chile. Cousteau is including much material on NASA's participation in his four shows scheduled to run this Winter and Spring. The first one was broadcast November 29.

ATS satellites also continued to provide medical emergency service to Alaska, broadcast educational programs to remote areas of Hawaii, Micronesia and Alaska, provided splashdown support for Skylab missions and provided communications support for a US/USSR scientific experiment in the Bering Sea.

Nimbus-5 launched in December of 1972 provided some interesting information to NASA scientists. Dr. Per Gloersen took scanning microwave radiometer data to compare the first total picture of polar ice caps with that shown in standard world atlases. He found Nimbus 5 imagery not only produced the first true pictures of the caps, but the imagery is far superior to anything in use up to that

time. In addition, the Navy's Fleet Weather Facility, Suitland, Md., uses the pictures on an operational basis to support international arctic and antarctic shipping.

Another critical gap in man's understanding of his environment was filled by Nimbus-5 by measuring daily the distribution of rainfall over the oceans by the onboard Electrically Scanning Microwave Radiometer. Until Nimbus-5 weathermen had no adequate way to monitor ocean rainfall on a global scale.

Now, meteorologist John Theon says, knowledge of rainfall extent and rate "gives us a good handle on how much energy is being released into the atmosphere."

In the field of medicine, scientists and doctors of the Johns Hopkins University Applied Physics Laboratory held the first public demonstration in August of their new heart pacemaker which is both long lasting and much smaller than conventional units. This new equipment uses electrical and electronic components first designed by NASA for use in spacecraft. Goddard's Technology Utilization Office worked closely with Johns Hopkins on the project.

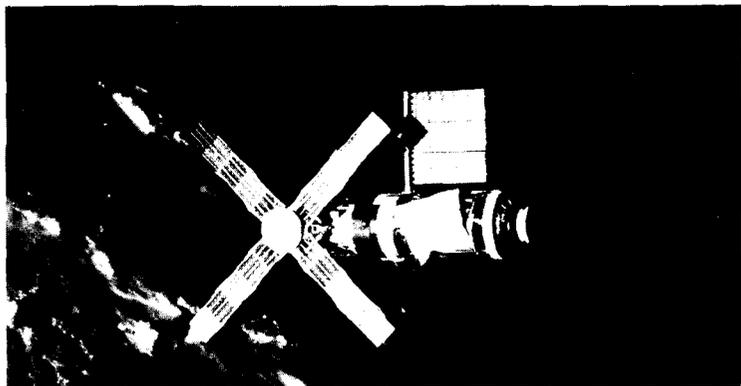
Goddard's launch year was a Delta operation with six of them getting off the pad and five satellites being placed in orbit. ITOS-E failed to make orbit due to a second stage vehicle failure.

However, the second of a series of Canadian Domestic Communications Satellites, ANIK-2, was placed in synchronous orbit over Canada in April. Explorer-49 or Radio Astronomy Explorer-B was placed in a lunar anchored orbit to make measurements of galactic and solar radio noise using the Moon as a shield against extraneous interference from Earth and the magnetosphere.

Interplanetary Monitoring Platform-10, the last in the series of IMP spacecraft designed to explore Earth's radiation environment over an entire solar cycle was placed in a high, 141,000 by 289,000 kilometers, orbit in October.

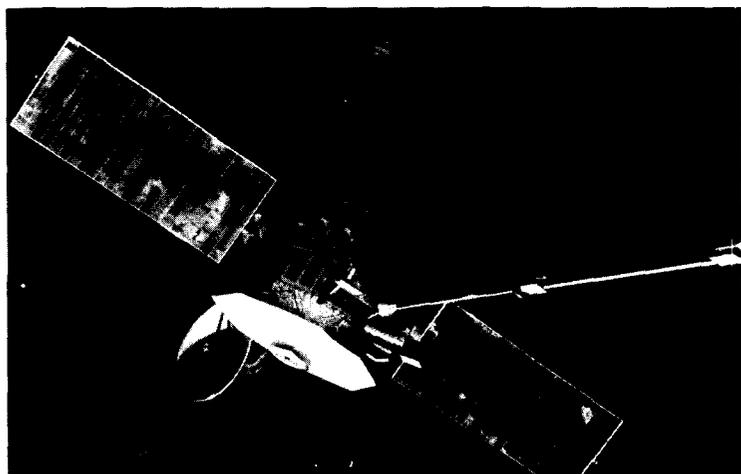
Then in December, Atmosphere Explorer-C, the first in the new series of spacecraft with onboard propulsion systems that lets it dip in and out of the atmosphere, was placed in a highly eccentric orbit. It is making the most comprehensive investigation of the upper atmosphere ever. It's also the wave of the future in space science in that the scientist in his laboratory for the first time has direct access to AE-C via a highly sophisticated ground computer here at Goddard.

(See Page 10)



SKYLAB was a big highlight of NASA's year. When technical difficulties crippled the space station shortly after launch, flight controllers at Mission Control pinpointed the problem and stabilized the 100-ton spacecraft. Eleven days after the spacecraft's launch, the first three-man crew arrived with deployable sunshields and special tools and managed to save the space station while taking a walk in space. They, and the two crews that followed them, were then able to settle down to planned studies that included solar astronomy, earth surveys, a wide variety of scientific and technological regimes, and a study of the comet Kohoutek—all from orbit above the Earth's atmosphere in space.

MARINER-10, launched in November 1973, flew past Venus in late February and will pass Mercury on March 29, 1974. It will provide man with his first close-up look at tiny Mercury, the closest planet to the Sun. Earlier in the year, NASA launched the second probe to the outer planets. Pioneer-11, launched in April, will arrive at Jupiter in early December 1974.



## NASA Launches of 1973

Pioneer 11	April 6	Second of two spacecraft launched by Atlas/Centaur from KSC to fly beyond Mars and through the asteroid belt to Jupiter. Flight time 2 years.
Telsat-2	April 20	Second of a series of Canadian ANIK domestic communications satellites. Delta launched from KSC.
Skylab-1	May 14	Saturn V launch of unmanned spacecraft to place Skylab in earth orbit.
Skylab-2	May 25	Saturn I-B launch of three-man crew in Apollo Command/Service Module for 28-day Skylab visit.
Explorer 49	June 10	Second Radio Astronomy Explorer (RAE-B). Delta launched into lunar orbit from KSC.
ITOS-E	July 16	Operational Meteorological Satellite funded by NOAA. Following WTR launch, Delta second stage failed.
Skylab-3	July 28	Saturn I-B launch of second three-man crew in Command/Service module for rendezvous and 59-day Skylab visit.
Intelsat IV F-7	Aug. 23	Global Communications Satellite launched by Atlas/Centaur from KSC for COMSAT.
Explorer 50	Oct. 26	Interplanetary Monitoring Platform (IMP-J). Delta launched from KSC.
Transit (NNSS/0-20)	Oct. 30	Navy navigation satellite. Scout launched from WTR.
Mariner Venus/Mercury	Nov. 3	First of two-planet flyby missions to obtain environment and atmospheric data on Venus and Mercury. Atlas/Centaur launched from KSC.
NOAA-3	Nov. 6	Operational Meteorology Satellite (ITOS-F) funded by NOAA. Delta launched from WTR.
Skylab-4	Nov. 16	Saturn I-B launch from KSC of third three-man crew for Skylab open-ended visit.
Explorer 51	Dec. 16	Atmospheric Explorer (AE-C). Delta launched from WTR.

### CLIP AND SAVE

#### Goddard Employees Welfare Association Executive Board Members for 1974

		EXT.	CODE
Administration & Management	Beverly Dinn Treasurer	4074	211
Systems Reliability	A. Ed Fitch 1st Vice Pres.	5521	321
Projects	John Tomasello Secretary	2272	470
Mission & Data Operations	Marc Selig	6073	564
Sciences	George Abid	4551	600
Engineering	Jack Libby President	4713	714
Networks	Paul Rall	6726	844
Applications	Alberta Moran 2nd Vice Pres.	4300	900
Advisor to the Director	Sam Keller	4641	200

## Goddard Retirees

Good luck and best wishes to the following people who retired from the Goddard in December 1973 and January 1974.

Dr. Isidore Adler  
Truman Aehle  
James L. Baker  
Frank M. Benedick  
James R. Butterfield  
Richard L. Fenton  
Michael Galli  
John C. Graham  
Rita Graham  
Norman J. Haiflich  
Hayes T. Jackson  
John E. Jackson  
Raymond E. Lauer  
Dr. Richard Lehnert  
Otto R. Link  
Frances N. Livingston

Robert J. McCaffery  
James W. McDowell  
Elmer S. McGuigan  
Karl R. Medrow  
Charles R. Myers  
John A. Popp  
Randall C. Reed  
R. James Rice  
Sachio Saito  
David J. Spiegel  
Ida M. Stewart  
Robert L. Stilmar  
Elmer C. Terry  
William P. Varson  
James H. Walls

## Robertson Wins Chess Tournament



SID ROBERTSON ponders a move during the Goddard Chess Club's 1973 Fall Tournament held on November 6, 13 and 20. With a score of 5½, Mr. Robertson topped the other 13 players in the six round Swiss-style tournament. Tom Vallee was Tournament Director.



DR. JAMES P. STRONG, III, of the Systems and Mission Analysis Branch displayed the Christmas spirit at his home in Upper Marlboro. The papier-mache characters are Disney-like reproductions of his children Keven and Lynda. The snowman was just a friend.



FRANK KELLY (left) with a score of 5, was second place winner of the Chess Club's fall tournament. Bruce Bodine (not shown) won the Ladder Improvement trophy.

## The Goddard Soccer League

During the fall season the Goddard Soccer League enjoyed the most closely fought competition in its three year history. In fact, after the completion of the full cycle of nine games per team, there was a three way tie for first place between the Astros, Armada and Novas, each with ten points (2 points are awarded for a win and one for a tie). The fourth member of the League, Los Madres, was still in the running until the last couple of games and finished with six points. After the play-offs extended the season into December the Astros emerged as the final winners having defeated Armada 2-0 and Novas 3-1 in exciting games, and thus became champions for the second successive season.

Games are played on the soccer field near Building 11 on Tuesdays and Wednesdays at 5:15 p.m., while light permits, or on Saturday mornings. Each year there are both fall and spring seasons. At present the League involves seventy players spread amongst the four clubs. Occasional games are arranged against outside teams. Dues are \$5 per season and anyone wishing to join us for the spring season, which commences in March, should contact League President Ed Pucinelli on extension 5081, or Secretary Clive Dyer, extension 5279.

## GODDARD AROUND THE WORLD



QUITO, ECUADOR. Station personnel display 29 rainbow trout, the results of a weekend expedition to 14,000 foot high Lake Micacocha, Ecuador. From left are John Ney, Ed Seman, Jerry Day, Jimmie Jones, and Lester Smith. The photograph was taken by the sixth member of the group, Station Director Charles Force.





SHEILA DUCK prepares to operate the projector in the Goddard Planetarium. The projector is the focal point for a new series of astronomy lectures.

## Planetarium Lecture Series

In November, the Planetarium located in Building 16-A began a series of lectures for all Goddard personnel. These lectures are presented by Sheila M. Duck of the Organization and Employee Development Branch at 3:30 p.m. on Thursday.

During January, the shows will be given on "Comet Kohoutek" followed in February by "Star Clusters." The rest of the schedule is: March, Age of Aquarius; April, Galaxies; May, Brother Sun; June, The Solar System.

It is requested that all people planning to attend these programs be at the Planetarium by 3:25.

The Planetarium is also being used throughout the year to provide a basic astronomy course. All interested employees are urged to sign up for this self-instructional course when the training survey is distributed in late April. The course is designed to enable non-technical personnel to identify constellations in the night sky and gain an understanding of stars, clusters of stars, the solar system, and the use of telescopes. At this time, 94 students are enrolled, and Miss Duck reports that after just two hours of instruction, most students are able to operate the planetarium to simulate different sky conditions.

Over the years, the Planetarium has offered programs to special groups that have particular interest in the night sky. High school astronomy clubs, scout groups, and school astronomy classes have used the facility. The Planetarium is now able to accommodate one such group a week, by special arrangement.

About twice each year, the facility offers support to the Goddard Educational Programs Office by presenting astronomy programs to teacher workshop participants. This helps the teachers gain some actual experience in the field of astronomy by using the Planetarium and star globes.

The Planetarium also serves as the meeting place of the Goddard Astronomy Club on the second Wednesday of each month.

Goddard's Planetarium was first installed in the spring of 1969

Some 2500 employees attended lectures during the first six months until activities were curtailed so that the staff could develop a self-instructional astronomy course. A learning laboratory was installed, and the activity of the facility was increased in the fall of 1972 with the start of a pilot astronomy course. By the summer of this year, the course was opened to the Center.

The heart of the Planetarium is a Nova III projector which can project approximately 1000 stars. The projector is housed under a 20-foot diameter dome with a seating capacity of 30 people. In addition to the projection room, the facility contains a black light display, an astronomy work area, an astronomical museum area and a small Learning Lab which contains a soundproof booth and nine individual study carrels.

For information about any of the Planetarium activities, please contact Miss Sheila Duck on extension 5085.

## Janitors Honored



INCENTIVE AWARDS for outstanding team achievement were recently presented to members of the team responsible for cleaning Building 22. From left are Amanda Young, G. A. Wieleder, Contract Project Manager; Mary Turner, Darnell Brown, Martha Willis, Leo Webber, Assistant Contract Project Manager, and Lawrence Grayson. Not shown is Team Leader Henry Garmon.



G. A. WEILEDER (right), Project Manager of the Janitorial Services Contract, congratulates his newest team leader James Duppins. Other team leaders are (from left) Henry Carmon, Allen Queen, Joseph Wood, Bernard James, Ralph Reedy, George Borden, Edna Jones, and Harold Johnson. The Transcontinental Cleaning Company, which holds Goddard's contract, recently opened many new leadership positions to its general cleaning personnel.



MR. WEILEDER (left) is shown with members of his team who have recently received Individual Incentive Awards. From second left are Bernard James, Working Group Leader, Building 23; Leon Brawley, Area Group Leader; Joseph Werner, General Cleaner, Building 5; Frizella Scott, General Cleaner, Building 4; and Roger Hedge, Area Group Leader.

## Note from the Editor

If you wonder where your paper went, the January issue of the GODDARD NEWS was never distributed due to problems beyond our control. This twelve page issue combines articles for both January and February.

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the Office of  
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 ons is the last  
 lowing month.

Thursday in the month of February

Nancy Mengel, Editor  
 Patricia Ratkewicz, Secretary, Phone Extension 4141