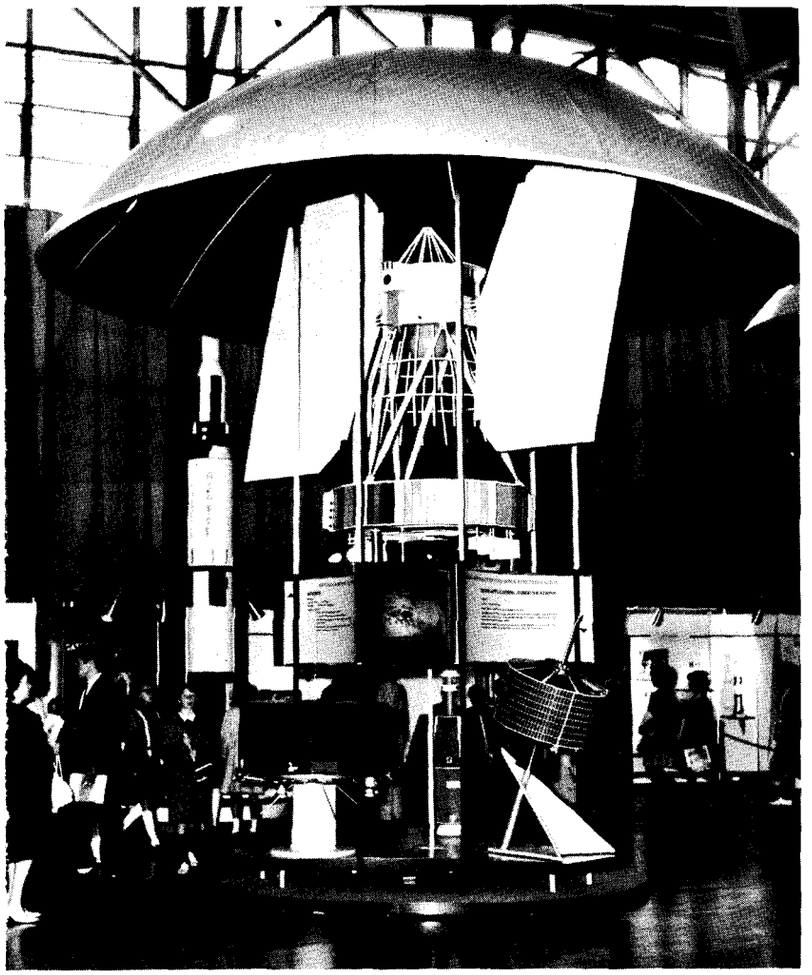


*This dome-covered display of Goddard's meteorological and communications satellites is part of the display at Boston's Northeastern University which ran concurrently with the Conference on Peaceful Uses of Space (see story below).*


# GODDARD NEWS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME VII, NUMBER 1 MAY 18, 1964


## Don't Forget Open House...

**Goddard will be host to Center and headquarters employees and their families at an Open House to be held this Saturday, May 23, 1964, between 10 a.m. and 4 p.m. Approximately 4,000 invited guests from nearby communities will also attend.**

**Open House activities will include tours of areas of interest in buildings 1, 3, 5, and 7, with appropriate displays, exhibits and films.**

**For the convenience of all guests, the cafeteria will be open from 12:00 noon until 3:30 p.m.**

**This promises to be an enjoyable and informative day. Employees who were unable to attend the Open House last May should take this opportunity to become more familiar with the Center.**

**If the program is cancelled because of bad weather, it will be announced periodically starting at 8 a.m. over the following radio and television stations:**

| | | | |
|---|---|---|---|
| WRC | 980 KC | WRC-TV | Channel 4 |
| WTOP | 1500 KC | WTOP-TV | Channel 9 |
| WWDC | 1260 KC | | |
| WMAL | 630 KC | WMAL-TV | Channel 7 |
| WOL | 1450 KC | WTTG-TV | Channel 5 |

**ON PEACEFUL USES OF SPACE:**

## *Dr. Goett, Goddard Scientists, Active in 4th National Conference*

Goddard was well represented at the 4th National Conference on the Peaceful Uses of Space in Boston on April 29 - May 1. The Director, Dr. Harry J. Goett, chaired a session on "Practical Uses of Satellites." Three other Goddard scientists took an active part in the proceedings.

Dr. Goett compared the Center's mission to the ultimate goals of its namesake, Dr. Robert Goddard—a son of Massachusetts. "From what I've learned about Dr. Goddard, I've come to feel he was interested in rockets primarily as a tool that would help him explore the Earth's atmosphere as we are doing today.

"More than that," Dr. Goett continued, "I've also been impressed in reading his notes by the orderly manner of his experiments, his excellent engineering foresight, and his practical approach combined with a readiness to accept innovation."

The present concept, mission and atmosphere at Goddard are patterned after "the tradition that characterized the man," he said.

### Other Goddard Participants

Dr. Robert Jastrow, Director of Goddard's Institute for Space Studies in New York City, addressed the morning session on April 30 in John Hancock Hall. His topic was "Discoveries from Exploration."

During the afternoon session which was chaired by Dr. Goett, William G. Stroud, chief of the Center's aeronomy and meteorology division, presented a talk on "Weather Satellites" and Albert L. Hedrich, communications consultant, spacecraft systems and projects division, discussed "Communications satellites."

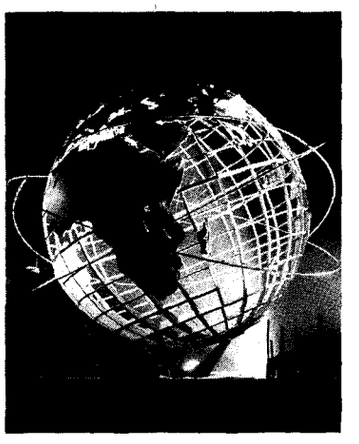
Leaders in space research from NASA, industry, the academic community and interested political entities heard sessions on "Space and the Nation", "Men in Space", "Machines in Space", "Practical Uses of Satellites", "Living in Space" and "Working in Space."

The conference theme was a familiar quotation of President John F. Kennedy: "*Space is the New ocean and we must sail on it.*"

A Student Space Conference was held on May 2 at Boston's Northeastern University, following a display of space hardware there which ran concurrently with the 4th National Conference downtown.

Goddard public information officers were active in Boston during the tenure of both conferences setting up the NASA display at the University and coordinating news coverage and informational tours.

## *NASA Exhibit At World's Fair*



**How to get there?**
**(See p. 7)**

# Woman Engineer Creates Unique Valve

A woman aerospace engineer at Goddard, in cooperation with one of her co-workers, has invented a new valve with no moving parts for controlling the flow of liquid propellants from satellite reaction jets. Such jets provide short bursts of power necessary to orient the satellite in space.

The valve, developed jointly by Mrs. Barbara Lunde and William D. Hibbard of the stabilization and control branch, freezes and thaws the liquid propellant right in the feed line from the fuel tank to the jet nozzle. Unlike present mechanical valves designed for similar use, it is impossible for the freeze valve to stick open or closed.

Conventional mechanical valves also leak due to dirt on the valve seats. The freeze valve does away with this problem because it has no valve seat. In addition to its reliability, the freeze valve eliminates the need for heavy storage tanks, regulators and mechanical parts used with present cold gas jet systems.

According to Mrs. Lunde, the freeze valve has potential industrial application whenever liquid flow is involved. It would prove particularly useful in eliminating sticky valve problems due to corrosion or dirt particles in the liquid.

Electrical current applied in one direction to the device draws heat from the line and cools it until the propellant is frozen. By reversing the current, heat is applied to the line. This melts the frozen propellant and allows it to flow free again.

The opening and closing time of such a freeze valve depends upon how fast the heat is applied. The minimum practical turn-on time for the valve is about one thousandth of a second. The turn-off time is longer, taking about one hundredth of a second.

*Barbara Lunde, who developed the freeze valve, completed high school, college, and requirements for her M.S. degree in seven years.*

With appropriate modification, the freeze valve can control the rate of propellant released during any given time. For such proportional valving, a porous plug would be fitted in the feed line next to the jet. By maintaining a temperature gradient across the plug, any portion of the plug could be frozen so that the thrust from the jet would be proportional to the amount of the plug frozen.

A proportional freeze valve would be able to produce just the right amount of thrust to counteract forces exerted on a satellite by solar winds and magnetic fields. Such undesirable forces cause a satellite to change direction in space thereby interferring with its mission.

Most any liquid can be used as a propellant in the freeze valve system so long as its freezing point is above minus 200 degrees Centigrade. However, the higher the freezing point, the better.

Water was selected as the propellant for use in evaluating an engineering model of the freeze valve system. This liquid was used because it has a suitable freezing point, a high specific impulse and is easy to work with.

A patent disclosure for the valve has been made by Mrs. Lunde and a joint disclosure for the proportional thermoelectric valve has been made by Mrs. Lunde and William D. Hibbard of the same branch.

**Recent Technical Publications Authored by Goddard Staff**

E. J. Devine, "Rolling Element Slip Rings for Vacuum Application," NASA Technical Note D-2261, April 1964.

G. B. Robinson, "Wide Range Phase Detector," NASA Technical Note D-2269, April 1964.

P. Musen, "On the Application of Pfaff's Method in the Theory of Variation of Astronomical Constants," NASA Technical Note D-2301, April 1964.

# 'Standing Room Only' Crowd at Science Fair Lecture

(See story on p. 8)

*Standing in the rear and coming through the curtain during the presentation, the crowd showed its interest in the Spacemobile lecture presentation at the science fair.*

*These two boys are representative of hundreds who came to the front after each lecture for a closer look.*

## News About Space & Aeronautics

● The SERT I spacecraft, designed to flight test electric rocket engines, was described by Harold Gold, head of the spacecraft branch, Lewis Research Center, at the Air Transport and Space meeting in New York on April 30. The two engines aboard SERT (Space Electric Rocket Test) will be NASA's first electric engines in space. SERT I is scheduled to be launched this summer on a ballistic flight aboard a Scout rocket from Wallops Island, Va.

Banks of such electric engines with their small but continuous thrust are being considered to propel future manned Mars missions but the engines probably will find more immediate use for attitude control or station-keeping of satellites, spacecraft or space stations.

These engines produce rocket thrust by creating and accelerating positively charged particles or ions which are exhausted from the engines at speeds much greater than the exhaust velocity of burning gases in conventional chemical rockets.

The two electric engines to be aboard SERT I are different types. The first, a Lewis-built engine, is an electron-bombardment ion engine using Mercury propellant. The other built by Hughes Aircraft Co.'s Hughes Research Laboratory, Malibu, Calif., is a contact-ionization thrustor using cesium propellant.

The Hughes engine will operate for the first 30 minutes of the hour-long SERT flight. The Lewis engine is scheduled to run the second half hour of the ballistic flight.

Although these small ion engines produce less than a pound of thrust, the increased exhaust velocity greatly increases the "impulse"—a miles-per-gallon-type figure for rockets. The engines can run much longer with much less propellant than conventional rocket engines.

Ion rockets have been operated successfully for hundreds of hours in the simulated space of vacuum tanks. However, there is one question that can only be answered in actual space flight: Whether or not the ion exhaust beam is neutralized. This is expected to be accomplished by injecting a stream of negative electrons into the flow of positively charged ions as they rush out the back of the engine.

• • •

● Stretched end to end the electrical wiring of the NASA Titan II/Gemini launch complex at Cape Kennedy would reach 800 miles.

• • •

● Syncom II has again been maneuvered in its approximately 22,300-mile-high orbit to change its rate of westward drift so it will be in position to serve as a backup in the event the Syncom C launch is unsuccessful.

Syncom II had been drifting westward at a rate based on a May 5 launch of Syncom C. The launch has been rescheduled to sometime after June 1.

Syncom II had been moving west at the rate of 1.3 degrees a day since March 17.

On April 24 the spacecraft's hydrogen peroxide jets were again activated to slow the westward drift to .8 degrees a day. It was put in a slightly lower orbit by slowing the velocity of the satellite about 4 miles an hour.

Syncom II was launched July 26, 1963, and has been successfully used to carry out communications transmissions between the United States and Africa, Europe, Central America and Hawaii. The Syncom program is under direct management of Goddard and was designed and built by Hughes Aircraft Co.

# Circuit Design Seminar Starts Soon

A new phase in employee education will begin at Goddard on Wednesday, May 27, when the first session of the "Advanced Electronic Circuit Design Seminar" meets.

Until recently most of the Center's in-house training activities for professionals consisted of courses which were primarily tailored to the needs of the younger professionals (engineers, scientists and mathematicians recently out of college). Relatively little had been done for senior professionals.

The idea for a seminar in electronic circuit design originated with James Gatlin, aeronomy and meteorology division. Mr. Gatlin had previously taught an in-service course in "Transistor Analysis and Design" for Goddard's graduate trainees. Based on his experience with the course, he felt that some device was needed whereby senior professionals could meet periodically to exchange information so that each could be kept abreast of the current "state-of-the-art."

Through the seminar process, it will be possible to become more familiar with many areas of electronic circuit design.

With the employee development branch acting as the catalyst, a committee representing Goddard's major areas of electronic circuit design was established for planning the seminar.

Justin Schaffert, spacecraft technology division, was named chairman of the committee.

Other members were: James Gatlin and Maxwell Strange, aeronomy and meteorology division; John Sos, and Paul Heffner, data systems division; Giles Spaid, space science division; Julius Kaiser, advanced development division; John Lyons, spacecraft integration and sounding rockets division; and Jerry Cancro, spacecraft technology division. The function of the committee was to plan the seminar and to recommend appropriate topics and speakers.

The seminar will meet in biweekly two-hour sessions beginning Wednesday, May 27. The first speaker will be Dr. Gene Strull, from Westinghouse Electric Corp. speaking on "Microelectronics."

On Wednesday, June 3, David Schaefer, flight data systems branch, will discuss "On Board Small Satellite Digital Data Processing Techniques." On Wednesday, June 17, Roland Van Allen, flight data systems branch will speak on "Investigation of Transistor Failure in Spacecraft due to Space Radiation." The seminar will then recess until September.

Topics to be covered in the Fall include: "Low Noise Amplifiers", "D. C. to D. C. Converters", "Long Duration Timers", "Semi-Conductors in R-F Design", "Tape Recorders" and "Circuit Design Reliability."

The first hour of each two-hour session will be spent in lecture and the remainder in discussion.

Class size will not be a factor. Any technical employee may attend with his supervisor's approval.

The program will use many speakers in Goddard who are actively engaged in electronic circuit design. Thus, the class will be raised to the intellectual level of self instruction.

There will be no tests administered or attendance required at any of the sessions. Moreover, the speakers in the program do not wish to be considered as lecturers or authorities in the field, but rather discussion leaders.

**(Cont'd on p. 5)**

**GODDARD NEWS**

*"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."*
—Dr. Robert H. Goddard

The Goddard News is a bi-weekly publication of the National Aeronautics and Space Administration's Goddard Space Flight Center, Greenbelt, Md., suburban Washington, D. C.

Phone—Ext. 4141 or 4142

Bruce Brough, *Editor* Shirley Deremer, *Inside Goddard*

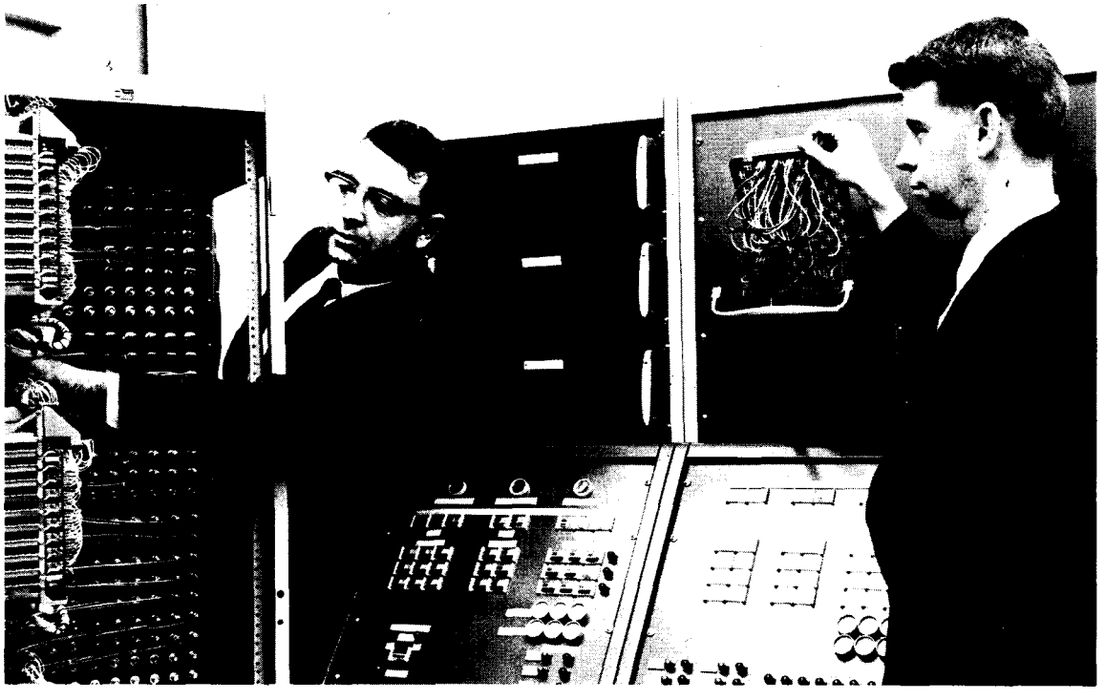
# New 'Satellite Switchboard' to Streamline STADAN

The first equipment switching system for streamlining STADAN (Space Tracking and Data Acquisition Network) will be installed in two stations in time for the upcoming Orbiting Geophysical Observatory (OGO) launch. The new system was conceived and designed here at Goddard by Dwight Fortna, network implementation branch and Wilson Lamb of Bendix, a contractor on the assignment.

Elapsed time since work began on the system until completion was less than four months. Installation will begin toward the end of this month at two of the 40-foot stations (Quito and Johannesburg).

A third will be installed later at the Santiago site, and six more are to be built and employed next year.

When completed, the new system will facilitate the capability of these sites to receive from three satellites simultaneously and to command two of them at a time.



*In the picture above, Carl Gustafson (left) and Dwight Fortna discuss features of the switching system. Gustafson is holding a project board, which is pre-set for one of the second-generation satellites.*

### What and Why?

What is a switching system and why is it necessary? The great complexity of the second generation of scientific satellites with their large number of experiments is the major answer.

The new system automatically, accurately and quickly sets the site's equipment up for passes. It greatly reduces the amount of time needed to change from one pass setup to another.

The latter was extremely difficult and exacting for station operators in the past, and would be nearly impossible with the complexity and quantity of new equipment being added to the stations for the new satellite series.

The equipment somewhat resembles, in function and appearance, a telephone switchboard. From that mental picture, a description can be easily followed:

Each satellite (OGO, for instance) has a pre-programmed (pre-planned) project board. When the OGO project board is inserted, OGO pass requirements "light up" on a display panel telling the operator what support elements will be needed for the satellite pass.

Since each site has three individual telemetry systems and two command systems available in addition to banks of tape recorders and other sharable equipment, the preparation commences from a display of what is needed to actual selection of the elements from the switching console.

When the operator of each needed piece of equipment has prepared it for action, he flips a "ready" switch which gives the switching console operator an indication light.

As each element (telemetry, tracking, and command) that has been selected according to the OGO project board proves both ready and available, the console operator knows that his mission is "go."

Thus, these are the major functions of the system:

- Push button selection of tape recorders and receivers needed for a satellite pass. In case of failure these elements can be quickly replaced by "borrowing" similar equipment from other telemetry systems in the building not already in use;
- A pre-programmed "patch board" is used to connect the data channels of the various equipment subsystems together. Each satellite will have its own pre-programmed project board;
- The status of individual pieces of equipment is displayed and the overall displays indicate that the equipment required for a pass has been selected and that each piece is in a ready condition; and
- Data outputs normally monitored by the equipment operators during a pass but not normally recorded for data reduction purposes are made available for use if needed.

After Fortna and Lamb presented the concept and design requirements for the system, other members of the branch helped put together the puzzle as follows:

Robert Wilson and Carl Gustafson worked on circuit design and John Bellamey did mechanical and electrical layouts and supervised fabrication, putting in long hours of dedicated service during the January to May effort.

Also, Earl Painter of the network engineering branch designed the project boards and line drivers. The fabrication division rendered valuable in-house assistance on the construction effort, and the major fabrication was accomplished by Bendix contract personnel of the College Park telemetry station.

Some of the features of the switching system that will be particularly valuable during tracking and data acquisition with second generation spacecraft include location in one

centralized spot for each telemetry system both colored lights for status and selection and provisions for quick and easy switching of tape recorders and receivers.

The system should make the setting up of equipment for a pass almost impossible to "muff." Provisions for emergency "patching" (wiring in) of equipment normally assigned to a specific telemetry system will enable borrowing or loaning, which adds a great deal of versatility for special project requirements or emergency situations.

The status indications of each piece of equipment placed before a central operator should keep the operation free of error, both human and mechanical.

The big job of the STADAN network when the large and complex offspring of today's satellites are launched will be made more trouble-free and workable as a result of these Goddard innovators. As easy as picking up the phone? Not quite! But perhaps it will be as easy as manning a switchboard (with no wrong numbers).

***John Bellamy (left) and Bob Wilson (standing, right) also had a hand in the new system (see story). Earl Painter (right front) designed the project boards and line drivers. The photo below was taken in building 12.***

***These two photographs record neither an invasion of Goddard or a U.N. Peace Force detailed here. Rather, it is one of the more interesting tours in recent weeks. The officers represent 13 nations, and are students at Fort Belvoir's Third Engineer Officer Career Course. They were here on April 30 for a tour of the Center. The officers are (TOP PICTURE, from left): BACK ROW—Majors Alvi and Amin, Pakistan; Capt. Khaldy and 1/Lt. Al Awissy, Saudi Arabia; and Colonels Chalerm and Stit of Thailand. FRONT ROW—Capt. Berthe and 1/Lt. Bello, Venezuela; Lt. Col. Sekine, Japan; Major Kim, Korea; and Capt. Irvin, United States. (BOTTOM PICTURE, from left): BACK ROW—Capt. Pinto, Brazil; Capt. Temple, Canada; Capt. Passoulis, Greece; Majors Sundaram and Verma, India. FRONT ROW—Captains Nouri and Razzavi, Iran; and Majors Azzabi and El Omrani, Libya.***

## Seminar (from p. 3)

Surveys conducted by technical divisions for the employee development branch indicate that approximately 70 Goddard professionals have expressed an interest in the seminar. Each of them will be notified as to specific dates and times of sessions.

If this approach proves successful it may be applied to other areas of technical education at the Center.

***Planning the seminar are (from left): John Sos, Charles Jones (employee development officer), Jerry Cancro, Julius Kaiser, James Gatlin, Justin Schaffert, Maxwell Strange, and Paul Heffner. Absent are John Lyons and Giles Spaid.***

*news from the Institute*

Goddard Institute for Space Studies
475 Riverside Drive, New York, N.Y.

# Microwave Meteorology Discussed in New York

*Seeking a better understanding of atmospheric phenomena, man has sounded the sky above with the aid of mountain observatories, manned balloons, instrumented balloons, kites and airplanes. With the advent of the Space Age, two powerful new tools were made available: the rocket, to pinpoint meteorological parameters well above balloon altitudes; and the earth-orbiting satellites, to provide broad worldwide distribution with some vertical detail.*

*Last month, approximately 15 meteorologists, physicists and earth scientists met at the Goddard Institute for Space Studies to consider problems of microwave satellite meterology. Some of their observations are discussed in this article:*

Although microwave meteorology is still in its infancy, it has been recognized for some time that in this region of the spectrum—which extends roughly from one millimeter to 30 centimeters—unique information can be gathered from spacecraft.

Microwaves penetrate clouds very efficiently—the reason for the usefulness of radar. This enables radiometers mounted on satellites to look deep into the atmosphere below and to the surface of the earth itself. One can therefore obtain information not only about the composition of the atmosphere, but about the surface as well.

In contrast, the longer wavelength of infrared radiation is absorbed by atmospheric water vapor, carbon dioxide and ozone, and does not penetrate clouds at all. Thus, at best, only a small fraction of the radiation received by the TIROS infrared radiometers originates at or near the ground, according to the panel participants.

Visible light, of course, can penetrate to the ground only in the absence of clouds.

One of the most important aims of satellite meteorology is to provide global information on the temperature at various levels in the atmosphere. In addition, if the true temperatures of the world's oceans are known, the observed microwave effective temperatures will reveal something about surface roughness. This information, in turn, can provide a great deal of knowledge about the conditions of the oceans at various times; and from that, meteorologists can infer such factors as wind velocities.

*Patrick Thaddeus*

Similarly, microwave satellite technique could provide information on the temperature of ice and snow in the polar regions.

### Narrowband is Best

The major difference between broadband and narrowband radiometers is that the former are more sensitive, but they sacrifice spectral resolution. Broadband radiometers can be built and flown today in satellites.

Narrowband radiometers, which could provide greater resolution, require high frequency oscillators aboard the spacecraft. The only ones available today at the frequencies in question are vacuum tube oscillators, which require a prohibitive amount of power for use in spacecraft.

Within the next few years, meteorologists hope that lightweight, economical solid state oscillators will be developed for this region of the spectrum.

*William Nordberg*

Narrowband diagnostic techniques were discussed during the second half of the one-day meeting. In a discussion of the atmospheric properties determined for observing the microwave spectrum of molecular oxygen, it was suggested that five temperature measurements — made simultaneously and judiciously in this spectral region—could provide much information about the stratosphere. With only these measurements, a map of the stratospheric temperature for the entire globe could be constructed.

Because of the instrumental problems involved in narrowband work, however, these experiments will probably have to wait for a few years, participants concluded.

### Water Vapor is the Exception

An exception is the study of the spectral line of water vapor at 1.35 centimeters; a series of useful experiments at this lower frequency appears feasible at the present time.

Patrick Thaddeus of the Goddard Institute, who organized and was chairman of the meeting, said that a report will be prepared for NASA, together with recommendations for further theoretical experiments.

William Nordberg of Goddard made the introductory presentation. Other participants included R. Stampfl and R. Hanel, both of Goddard; A. H. Barrett, Massachusetts Institute of Technology, Cambridge, Mass.; K. J. K. Buettner, University of Washington, Seattle; C. Falco, Space General Corporation, El Monte, Calif.; M. L. Meeks, Lincoln Laboratory, Lexington, Mass.; S. Weinreb, also of Lincoln Laboratory; R. Shotland, New York University; D. H. Staelin, MIT; V. E. Suomi, University of Wisconsin, Madison; D. Wark, Meteorological Satellite Laboratory, U. S. Weather Bureau, Suitland, Md., and S. I. Rasool, Goddard Institute for Space Studies.

## Goddard Speech and Paper Presentations

**(Technical presentations approved as of May 8, 1964 for period through May 31. Requests for copies of speeches and papers should be made directly to the author.)**

**SPEECHES**

***John C. Lindsay***, Princeton University Observatory, May 21-22, Princeton, N. J., ***"Orbiting Solar Observatories."***

***Dr. Louis S. Walter***, New York Academy of Sciences—Geological Problems in Lunar Research, May 16-18, New York, N. Y., ***"Lunar Differentiation Processes."***

***H. L. Eaker***, IEEE—New York Section, May 13, New York, N. Y., ***"Project Echo II."***

***Harold Stolov***, New York University, Department of Meteorology, New York, N. Y., May 1, ***"The Magnetosphere."***

***Patrick Thaddeus***, Columbia University, Department of Physics, New York, N. Y., May 1 and 15, ***"Atmosphere of Venus."***

***Jackson Herring***, Harvard University, Cambridge, Mass., May 1, ***"Turbulent Convection."***

***Patrick Thaddeus***, Princeton University, Princeton, N. J., May 2, ***"Science and the Human Environment."***

***S. Ishtiaq Rasool***, Yale University, New Haven, Conn., May 6, ***"Upper Atmosphere of Jupiter."***

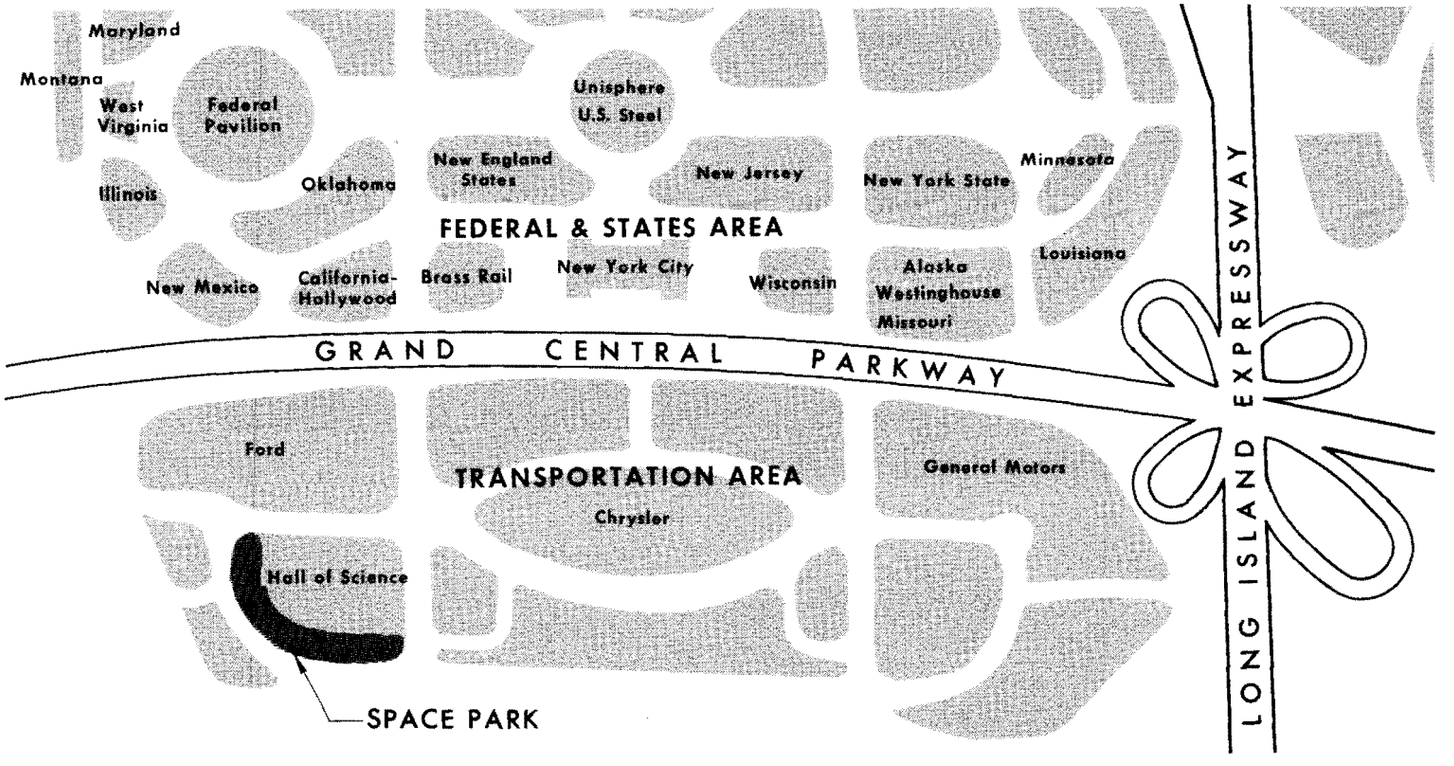
***Myron Lecar***, American Society for Public Administration, New York, N. Y., May 7, ***"Scientist Looks at Public Administration."***

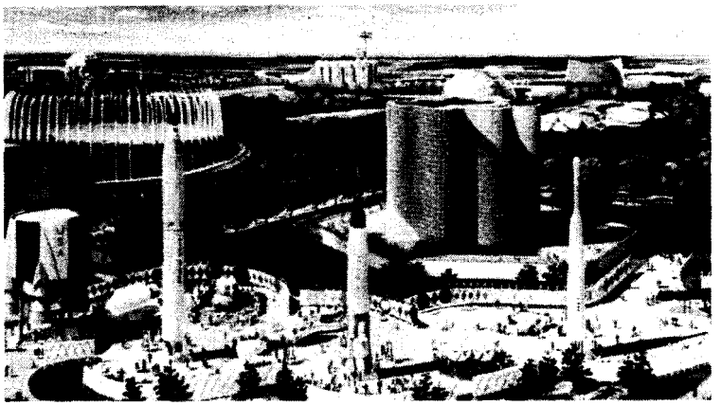
***S. Ishtiaq Rasool***, New York University, Department of Meteorology, New York, N. Y., May 11, ***"Contribution of Satellite Experiments to Meteorology: A Review."***

**PAPERS**

***George H. Jones***, Society of Aeronautical Weight Engineers—National Conference, May 18-21, Dallas, Tex., ***"A Bilfilar Moment of Inertia Facility."***

# Don't Miss the Space Park at the World's Fair



The United States Space Park, sponsored jointly by NASA, the Department of Defense and the New York World's Fair, will include the most imposing array of full-scale Air Force and NASA rockets and spacecraft ever assembled outside of Cape Kennedy. Highlighting the Park will be a full-scale "boattail" section of the massive Saturn V rocket which will carry American astronauts to the Moon. The model will be 85 feet tall and 33 feet in diameter. Towering over the two-acre exhibit will be a Titan II-Gemini launch vehicle and spacecraft. The Titan II booster, 110-feet high, will stand vertically with the Gemini capsule mated on top just as it would be on the launch pad at Cape Kennedy. Surrounding the Titan II-Gemini will be full-scale models of the Apollo Command and Service Modules, the Lunar Excursion Module, Gemini spacecraft and the actual Mercury capsule which carried Astronaut Lt. Cmdr. Scott Carpenter during the second U. S. manned orbital flight. Other full-scale exhibits in the Park will be the Atlas-Mercury and Thor Delta launch vehicles, an X-15 rocket-powered research aircraft and the Agena space vehicle. A full display of Goddard satellites and missions is featured in the Space Park. No charge will be made for the Space Park exhibits.

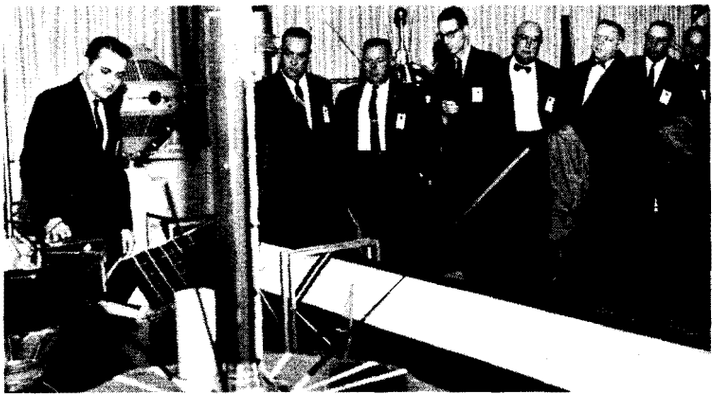
## Economic Group Sees Goddard

"Thoroughly enlightening—it was a revelation for all of us to see the scope and importance of the work being done at Goddard." This was the verbal reaction of Harrison Weymouth, executive director of the Prince George's County Economic Development Committee after he and some other members of the group toured the Center late last month.

### An Eye-Opener

The group considered the tour a real "eye-opener," and gathered facts which will help in their interpretation of our mission and capabilities to other thought leaders in the area. Some of the committee members are shown at right in the satellite room in building 1.

During the tour, the committee members, including A. A. Smith, president of the Citizens Bank of Maryland and H. Alton Swiger, vice president in charge of Public Relations, as well as a number of the bank's directors, inspected that firm's new branch office in building 17 which opened the previous day.



*Al Morin (left), Goddard space science lecturer, explains the mission of a satellite to (from left) H. Alton Swiger, vice president of Citizens Bank of Maryland; Albert W. Turner, president, Maryland Commercial Developers, Inc. and bank director; Harrison Weymouth, Jr., executive director of P.G.C. Economic Development Commission; John D. Hospelhorn, deputy director of Maryland Banking Commission; Harry A. Boswell, Jr., chairman of Maryland Economic Development Commission; A. H. Smith, president of Citizens Bank of Maryland and Chairman of Prince George's County Economic Development Commission and Dr. Aaron Deitz, director of the Bank.*

**SPACE SCIENCE LECTURERS:**

# *At International Fair, Baltimore, 'Standing Room Only!'*

The 15th National Science Fair International was held at Baltimore's Civic Center this year, and Goddard supplied the Spacemobile demonstrations which put the fair participants "in class" even though they were excused from school for the day.

John Bannister and Roscoe Monroe, Spacemobile lecturers operating from Goddard, filled a small theatre to "standing room only" 14 times. More than 3000 students and adults sat through the 45-minute exhibitions which were repeated seven times daily.

Many observers noted that the students seemed extremely impressed about the lecture-demonstration in spite of the fact that they attended voluntarily on a "day off" from school.

Elva Bailey, head, educational programs and services, said, "The physical facilities for the presentations consisted of a theater curtained off on two sides with temporary thin drapes. Audiences were free to enter or leave as they chose.

"They didn't leave; they moved to the front in large numbers to question the speaker in detail after each lecture.

"Much of the success of this venture is a result of the devising of an excellent sound system by Raymond Lauver of Goddard's photo branch. Despite the extraneous noises of active demonstrations near by, the audience in the theater could hear the speakers perfectly."

**(See Photos, p. 2)**

# New Designations of NASA Satellites

## GEOPHYSICS AND ASTRONOMY PROGRAMS

| Old Designation | New Designation |
|---|---|
| **Sounding Rockets** | **Sounding Rockets** |
| **Orbiting Solar Observatory** | **OSO** |
| S-16 | OSO-I |
| S-17 | OSO-B |
| S-57 | OSO-C |
| None | OSO-D thru H |
| **Advanced Orbiting Solar Observatory** | **AOSO** |
| None | AOSO-A thru D |
| **Orbiting Astronomical Observatory** | **OAO** |
| S-18 | OAO-A |
| S-58 | OAO-B |
| S-68 | OAO-C |
| S-78 | OAO-D |
| S-88 | OAO-E |
| **Orbiting Geophysical Observatory** | **OGO** |
| S-49 | OGO-A (eccentric) |
| S-49a | OGO-B (eccentric) |
| S-50 | OGO-C (polar) |
| S-50a | OGO-D (polar) |
| S-59 | OGO-E (eccentric) |
| S-60 | OGO-F (polar) |
| S-69 | OGO-G (eccentric) |
| S-70 | OGO-H (polar) |
| S-79 | OGO-I (eccentric) |
| None | OGO-J (polar) |
| None | OGO-K (eccentric) |
| **Explorers** | |
| Energetic Particles Satellite | Energetic Particles Explorers |
| S-3 | Explorer XII |
| S-3a | Explorer XIV |
| S-3b | Explorer XV |
| S-3c | EPE-D |
| Interplanetary Monitoring Platforms | Interplanetary Explorers |
| S-74 | Explorer XVIII |
| S-74a | IMP-B |
| S-74b | IMP-C |
| None | IMP-D thru K |
| Atmospheric Structure Satellite | Atmosphere Explorers |
| S-6 | Explorer XVII |
| S-6a | AI-B |
| **Fixed Frequency Topside Sounder** | **Ionosphere Explorers** |
| S-48 | IE-A |
| S-48a | IE-B |
| **Polar Ionosphere Beacon** | **Beacon Explorers** |
| S-66 | BE-A |
| S-66a | BE-B |
| None (geodetic satellites) | BE-C thru G |
| **Air Density/Injun Explorers** | **Air Density/Injun Explorers** |
| None | AD-A |
| None | AD/I-B |
| None | AD/I-C |
| **Radio Astronomy Satellite** | **Radio Astronomy Explorers** |
| None | RAE-A thru E |
| **Direct Measurements Satellite** | **Direct Measurements Explorer** |
| S-30a | DME-A (Part of ISIS-X) |
| **International Satellites** | |
| United Kingdom #1, #2, & #3 | United Kingdom Satellites |
| S-51 | Ariel I |
| S-51a | (not flown) |
| S-52 | UK-C |
| S-52a | UK-D |
| S-53 | UK-E |
| S-53a | UK-F |
| Swept Frequency Topside Sounder | Alouette |
| S-27 | Alouette I |
| S-27a | Alouette B (Part of ISIS-X) |
| Ionosphere Monitor | ISIS |
| S-27 and S-30a | ISIS-X (Alouette-B & DME-A) |
| None | ISIS-A thru C |
| Italian Satellites | San Marco |
| None | SM-A thru E |
| French VLF Satellites | French Satellites |
| None | FR-A |
| None | FR-B |

## LUNAR AND PLANETARY PROGRAMS

| | |
|---|---|
| **Ranger** | |
| Ranger 6 | Ranger A |
| Ranger 7 | Ranger B |
| Ranger 8 | Ranger C |
| Ranger 9 | Ranger D |
| (The old Block III designation is no longer used) | |
| **Surveyor** | |
| | Block I |
| Surveyor A1-A7 | Surveyor A-J |
| | Block II |
| | Surveyor K-R |
| **Lunar Orbiter** | |
| None | Lunar Orbiter A-E |
| **Mariner** | |
| Mariner C—MC-1 & MC-2 | Mariner 64 C & D |
| Mariner B—MB-1 & MB-2 | Mariner 66 E & F |
| **Pioneer** | |
| PR-1 thru PR-4 | Pioneer A-D |
| **Voyager** | |
| None | Voyager A-E |

## BIOSCIENCE PROGRAMS

| | |
|---|---|
| **Biosatellite** | |
| None | Biosatellite A-F |

## COMMUNICATIONS AND NAVIGATION PROGRAMS

| | |
|---|---|
| **Echo** | |
| Echo A-12 | Echo C |
| **Syncom** | |
| Syncom A-27 | Syncom C |

## METEOROLOGICAL PROGRAMS

| | |
|---|---|
| **TIROS** | |
| TIROS A-52 thru A-56 | TIROS H-K |
| **Nimbus** | |
| A-5 | Nimbus A |
| A-6 | and backup |
| A-7 | Nimbus B |