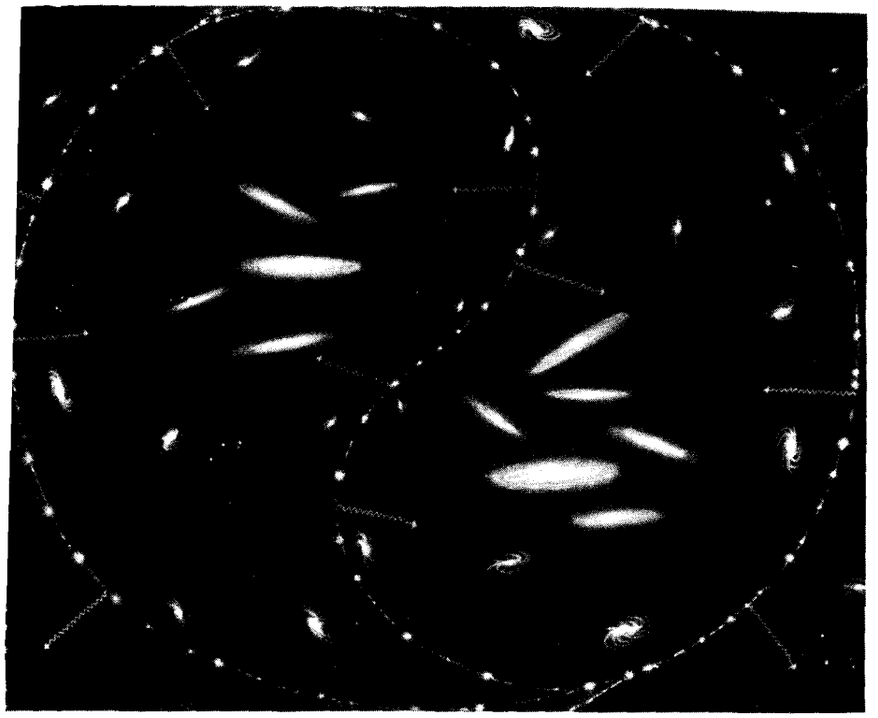


MATTER – ANTIMATTER UNIVERSE. Artist's drawing shows stylized concept of the symmetry of matter and antimatter in the universe. Depicted are two similar enormous clusters of galaxies–one consisting of matter and the other antimatter–along with adjacent matter-antimatter regions. According to Dr. Floyd W. Stecker of Goddard's Laboratory for Space Physics, at the boundaries where matter and antimatter come together, nuclear annihilation occurs resulting ultimately in the production of gamma-rays (symbolized by arrows), a by product of the annihilation process. Measurements of cosmic gamma-rays, particularly those made by Goddard-sponsored gamma-ray experiments on Apollo 15, 16 and 17, reveal the distinctive characteristics predicted by Dr. Stecker's theory and provide key evidence to support the theory that the universe consists of equal amounts of matter and antimatter. If future theoretical and experimental work confirms this evidence, it would establish on a universal scale a principle of symmetry which has become a cornerstone of modern physics. Dr. Stecker, in collaboration with Jean-Loup Puget of the Paris Observatory, has also developed a theory to explain the formation of galaxies based on this matter-antimatter form of the "big-bang" theory of the expanding universe. This theory is based in part on the work of Professor Roland Omnes of the Laboratory for Theoretical and High Energy Physics at Orsay, France. Dr. Stecker reported his gamma-ray data at the International Symposium and Workshop on Gamma-Ray Astrophysics, April 30, at the Goddard Space Flight Center. For this and related stories, see pages 6 and 7.

GODDARD NEWS

May 1973 Vol. 21, No. 2

ZERO IN on Safety Awards

HERMAN E. LAGOW (left), Director of Systems Reliability; receives the Center Directorate ZERO IN on Safety Award from Dr. Michael J. Vaccaro, Goddard Associate Director for Management.

ZERO IN on Safety Awards were recently presented to organizations and individuals that hold the best safety records at Goddard.

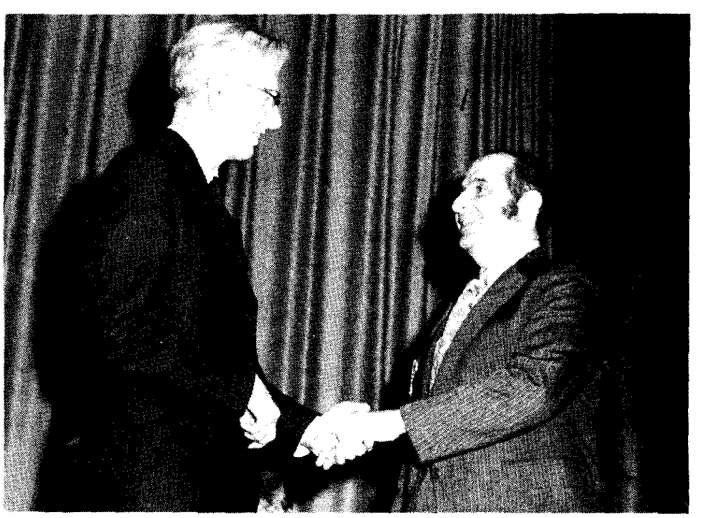
The aim of the ZERO IN Program is to reduce the number of injuries and other losses through a concentrated attack on the causes of accidents at Goddard. The awards are designed to recognize achievement toward the goals of accident reduction and the improvement of center housekeeping.

Systems Reliability won the Center Directorate Award for the April-December 1972 period.

Division awards for the best division within each directorate during the April-December 1972 period went to the Procurement Division, the Quality Assurance Division, the AE Project, the Ad-

(See Page 3)

Goddard Men Honored in Apollo Ceremony



DR. JACOB I. TROMBKA (left) of the Laboratory for Space Physics, receives a NASA Exceptional Scientific Achievement Medal and citation from NASA Administrator Dr. James C. Fletcher during a special Apollo awards ceremony held on April 4.

On April 4, 1973, NASA honored individuals and teams for their outstanding contributions to the success of the nation's Moon exploration program.

At the NASA Headquarters awards ceremony Administrator Dr. James Fletcher said, "It is no exaggeration to state that Apollo has been the greatest scientific and engineering achievement in man's existence." He expressed his personal appreciation to all who contributed to its accomplishment.

Also present for the occasion were Apollo 17 astronauts Eugene Cernan, Ronald E. Evans and Dr. Harrison H. Schmitt.

Receiving awards for Goddard were Goddard Director Dr. John F. Clark who accepted a Group Achievement Award for the Apollo

(See Page 2)

AWARDS . . . From Page 1

GODDARD DIRECTOR Dr. John F. Clark, (left) accepts a NASA Group Achievement Award from Dr. James C. Fletcher, NASA Administrator, for the Goddard Apollo Tracking and Data Acquisition Team. At right is Dr. George M. Low, Deputy NASA Administrator.

Tracking and Data Acquisition Team; Dr. Jacob I. Trombka of the Laboratory for Space Physics who received the NASA Exceptional Scientific Achievement Medal; and Robert L. Owen, Chief of the Network Engineering Division, who received a Presidential Management Improvement Certificate.

Goddard's Apollo Tracking and Data Acquisition Team award was presented "For managerial and technical participation in the design, development and operation of the worldwide tracking and data acquisition complex that linked the Apollo crew and their spacecraft to the Apollo Mission Control Center. This capability not only assured the means to perform these extremely complex missions, but also resulted in the Apollo program exceeding the primary objectives through the quality of the telecommunications functions and allowing the world to witness, and participate in, this historic achievement."

Dr. Trombka's Exceptional Scientific Achievement Medal honored him for "his outstanding contributions to the successful flight of Apollo Lunar Orbital Experiments on Apollo missions 15, 16, and 17. As co-investigator for the Gamma Ray, X-Ray and Alphax Particle Spectrometers, his leadership in providing real-time data display and analysis systems was a major factor in the exceptional results. He also has played a major role in the orbital experiment results, which constitute significant new understanding of the Moon."

Robert Owen received his special presidential award for making major innovational improvements in ground station equipment operating techniques. His citation read, "For excellence in improvement of government operations. The noteworthy efforts and intent dedication required for this achievement exemplifies the high performance needed to keep our country strong."

ROBERT L. OWEN (left), Chief of the Network Engineering Division, receives a Presidential Management Improvement Certificate from Dr. Fletcher.

Robert Amoruso New Manpower Chief

WELCOME TO GODDARD. Robert F. Amoruso, Goddard's New Personnel Chief, sits in his office in Building 16.

On April 30, Robert F. Amoruso came onboard as the new Chief of Goddard's Manpower Utilization Division. He replaces Raymond J. Sumser who became Director of Personnel at NASA Headquarters in January of this year.

Mr. Amoruso will be responsible for the administration of personnel management throughout the Center.

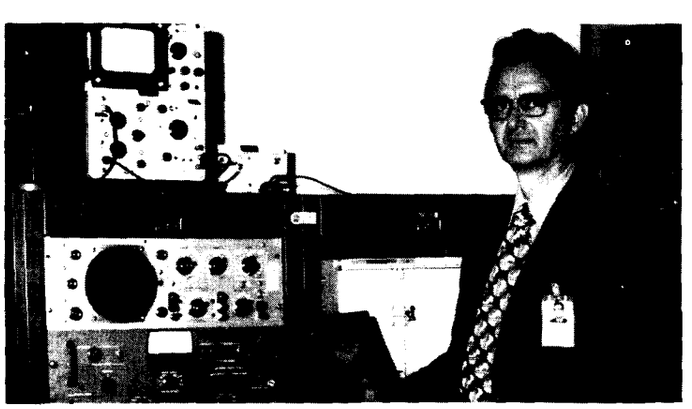
He came here from the Department of Health Education and Welfare where he worked in the Office of Education from 1968 to 73. His NASA career actually began in 1962 at Wallops Island, Virginia, and he was a member of the Goddard staff in 1963 to 64. His experience also includes jobs with the Civil Service Commission and the City of Wilmington, Deleware.

Born in Wilmington, he received his BA degree in Political Science from the University of Delaware in Newark in 1957.

New Receives IES Award

John C. New, Chief of the Test and Evaluation Division, has received the Institute of Environmental Science's 1973 Vigness Award for "his contributions to shock and vibration testing." The award was presented at the IES annual meeting on April 4 at Anaheim, California by G. A. Gallagher president of the Institute.

Mr. New has been active in shock and vibration testing since his early career at the Naval Ordnance Laboratory. He joined the NASA staff in 1959 and has since played a leading role in the ground testing of satellites and spacecraft components before launch.



JOHN C. NEW holds the Vigness Award he received in April from the Institute of Environmental Science.

SAFETY . . . From Page 1

vanced Data Systems Division, the Laboratory for Optical Astronomy, the Mechanical Division, and the Network Operations Division.

Awards for individuals who have done the most to improve the safety records of their directorates went to H. K. Lee of Administration and Management, Adolf Lekebusch of Systems Reliability, Sol H. Genatt of Mission and Data Operations, and Thomas Combs of Networks for the July-September 1972 period. Individuals receiving awards for the October-December 1972 period were Anthony Marshall of Administration and Management, Bryan Pierman of Systems Reliability, Robert L. Feinberg of Mission and Data Operations, and Frank McCluer of Networks.

Division ZERO IN Awards

LEVEN B. GRAY (left), Head of the Health and Safety Engineering Office; congratulates Wilfred E. Scull, Chief of the Mechanical Division; as he receives an award for his division from Robert E. Bourdeau, Director of Space Applications and Technology.

WILLIAM E. MATHIS
Chief of the
Procurement Division

DR. ROBERT J. COATES
Chief of the
Advanced Data Systems Division

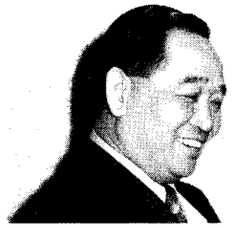
RUSSELL E. DORRELL
Chief of the
Quality Assurance Division

DR. ANNE B. UNDERHILL
Chief of the
Laboratory for Optical Astronomy

DAVID W. GRIMES
Project Manager
AE Project

HOWARD W. SHAFFER
Associate Chief of the
Network Operations Division

Individual ZERO IN Awards



H. K. LEE

ADOLF LEKEBUSCH

ANTHONY MARSHALL

BRYAN PIERMAN

THOMAS COMBS

SOL H. GENATT

FRANK McCLUER

ROBERT L. FEINBERG

System Safety Courses

THREE SYSTEM SAFETY COURSES were recently conducted at Goddard to provide an intensive applied course in all aspects of an aerospace mission that influence system safety including hardware, software, personnel, facilities and environment. The System Safety Management and System Safety Methods and Techniques courses were conducted by Vernon L. Grose, Vice President of the Tustin Institute of Technology. The third course, an Application Workshop, was conducted by George Cranston, President of the Cranston Research, Inc. System Safety training was provided in coordination with the NASA Headquarters Safety Office. Completing the courses were (from left, seated) Joe J. Lopez, W. G. Brown, John Arslanian, Vernon L. Grose, Leven B. Gray, and Morris Gelman. Standing are Thomas Kerr, George W. Morgan, Joseph M. Dalton, Matthew A. Opeka, Robert Lively, Edmund E. Hartzell, Franz W. Hoffmann, John Sween, F. J. Barrett, John Millman, W. S. Logan, Charles P. Wood, Leonard Hardis, Thomas L. Combs, Bryan Pierman, C. J. Archilesi, A. O. Lekebusch, and Gilbert D. Bullock.

Goddard's COSMIC Honor Roll

Computer programs selected for distribution by the Computer Software and Management Information Center (COSMIC) in Atlanta, Georgia, are chosen on the basis of their wide range of potential applications by industry and universities. In the past year, Goddard programs selected by COSMIC have ranged from a unique system for automatically wiring tiny electrical circuits to a mechanistic numerical program "debugging" tool for use with conventional computer languages.

COSMIC, the national clearinghouse for programs by NASA and aerospace contractors, was organized in 1966 and is located at the University of Georgia. It is a joint effort between the university and NASA's Technology Utilization Division. Programs chosen for COSMIC are published as NASA Tech Briefs and included in periodic compilations of abstracts. Since NASA has already paid for developing the programs, organizations that purchase them through COSMIC save up to 90 percent of the cost of developing similar programs.

The following, as described by their authors, are Goddard programs selected by COSMIC in 1972:

The AUTOWIRE system developed by **James B. Billingsley** is designed to automatically interconnect or "wire" complex electronic systems. Initial program operations perform diagnostic tests to detect most common designer introduced errors. Further program operations select optimum paths for circuit interconnection wiring. Wire lengths are kept to a minimum while maintaining uniformity and avoiding wire concentrations in densely interconnected areas. A computer printout is provided for design diagnostics, circuit module placement, and fabrication information. A computer generated card deck is used to drive the wiring machine for circuit interconnection. The AUTOWIRE programs were written FORTRAN IV for use on CDC-3200 and IBM-360 computers.

Isabella Cole has developed the Significance Arithmetic Experimental Package (SIGPAC) to test actual error propagation in numerical calculations. This program provides a fully mechanistic "numerical procedure debugging" tool for users of conventional procedural programming languages.

The System Generation Cross-Reference Index (SGINDEX) by **C. Wrandle Barth**, was written as an operating system debugging aid for systems programmers. During generation of the operating system, a series of job steps are run which assemble and modify linkage-editing and move the many modules of the operating system to tailor it to the needs of the individual installation. The listing of well over 1000 pages is one of the key references of the system programmer when later modifications, corrections, or extensions are written. Finding needed information in this printout was a long and painstaking process of manually paging through the listing. SGINDEX was written to fulfill the need for an easy-to-use but comprehensive cross-reference index for the system generation. The program collects key data, sorts it, and prints a formatted listing of the entries collected. Our most recent system produced an index of well over 5000 entries.

E. G. STASSINOPOULOS (left) and Gilbert Mead, co-authors of "Geometric Field-Line Calculations" which include the ALLMAG and LINTRA subroutines.

The ALLMAG program developed by **E. G. Stassinopoulos** and **Gilbert D. Mead**, is used to calculate the Earth's magnetic field at any point in space. The coefficients for seven recently published field models are contained in the program and the user has the flexibility of choosing any of these models for any time period. No single model is superior to the others at all times and in all regions of space, and ALLMAG is particularly useful in comparing the predictions of different models. An associated program, LINTRA, can trace field lines in space, determine the overall topology of the Earth's magnetic field and calculate conjugate points in two hemispheres connected to the same field line. It uses ALLMAG or any other field model provided by the user. These programs are presently being used in a variety of applications by people in a number of government agencies, academic institutions, and industrial laboratories. They are particularly useful in atmospheric, ionospheric, and magnetospheric studies involving phenomena affected by or controlled by the Earth's magnetic field.

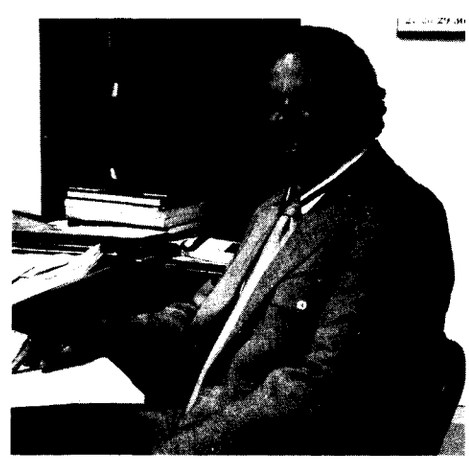
The Interplanetary Trajectories, Enke Method (ITEM) program by **Fred H. Whitlock, Reginald K. Squires** and **Donald S. Woolston** is a general purpose interplanetary trajectory computation program designed to yield maximum accuracy without incurring prohibitive computer time. The classical Enke Method is used in a modified form with the initial position and velocity vectors replacing the conventional P and Q vectors of the Encke scheme. Perturbations considered in the program are the effects of the planets. Also considered are the effects of zonal and tesseral harmonics of the Earth, as well as aerodynamic drag, small corrective thrusts, and radiation pressure including the shadow of the Earth.

Konrad Jager of the Gesellschaft fur Weltraumforshung under contract to Goddard has written a program to analyze and monitor electrical power systems (POSIMO). It has been published as Tech Brief B72-10610.

For more information on COSMIC or to submit a program to the center from Goddard, contact Sidney Alterescu in Goddard's Technology Utilization Office on extension 6242.

SGINDEX author C. Wrandle Barth of the Space and Earth Sciences Computing Center.

SIGPAC author Isabella Cole of the Systems Development and Analysis Branch.



JIM BILLINGSLEY of the Image Processing Branch, author of "Two AUTOWIRE Versions for CDC-3200 and IBM-360."

Small Business Week

May 14-18 has been designated by President Nixon as the week to pay tribute to the small businessman for his contribution to our economic development. The Presidential Proclamation sets this week aside as *National Small Business Week*, in recognition of the more than five million small businesses in the United States who supply much of the goods and services to our communities and provide a variety of job opportunities. Highlights of the week will be a subcontracting workshop and conference and the Small Business Subcontractor of the Year Award. Participating in the conference and awards program are small contractors/subcontractors, government prime contractors, government agencies, and members of Congress. Representing GSFC will be Robert F. Warren, Goddard's Small Business Specialist, and K. J. Kier, his counterpart at Headquarters.

Small Business Week serves to point up the actions taken each week of the year to insure that small and minority business concerns receive a fair proportion of government purchases, contracts and subcontracts. In accomplishing this goal, the Office of the Small Business Specialist at Goddard seeks to aid, counsel, assist and protect the small and minority business seeking participation in Goddard's procurement opportunities. The Staff, composed of Liz Castaldo, Nancy Collins, Doris Ann Fleming, Albert Glorioso and Arthur Wolter, offers aid by setting aside certain procurements solely for small or minority participation. They counsel and assist by placing the businessman in contact with appropriate technical personnel, informing them of the procedures for placement on the Bidder's Mailing List as well as the high standards of quality required of Goddard contractors. In their role as protector of the small businessman, the Staff is available to assist the small or minority firm in understanding policies and procedures affecting Government procurement.

To further the development of socially or economically disadvantaged firms under the National Small Business Program, the Minority-Business Enterprise Program was established by executive order to coordinate the efforts of the Federal Government toward the establishment and development of the minority business enterprise. Its principle objective is to assist minority-owned firms in achieving productive and economic stability in the competitive business environment.

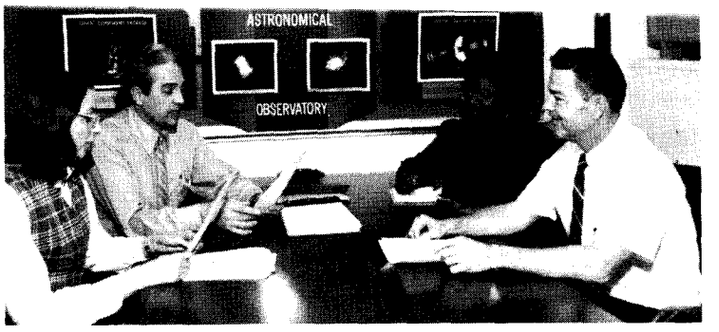
The principal direction of this program has, to date, been accomplished under authority of Section 8(a) of the Small Business Act, which permits Government agencies to contract with the Small Business Administration (SBA) which, in turn, subcontracts non-competitively with suitable minority firms.

This fiscal year has shown substantial growth in the Goddard Minority Business program. We have awarded seven 8(a) contracts for a value of $538,578, and have an additional 10 actions in process at the Small Business Administration. These actions include the reduction, evaluation and graphical presentation of magnetic and electric field data, road rehabilitation and an addition to the Building 5 Maintenance Shop.

To discover how you can participate in achieving Goddard's goal of Center-wide participation in these programs, call the Small Business Specialist on X6871.

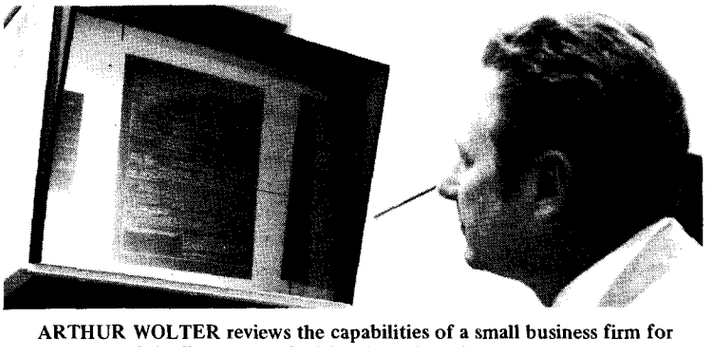
ED CALIGIURI of Facilities and Doris Fleming of the Small Business Office inspect the site of road repair work with Roger Blunt and staff of Tyroc Construction.

DORIS FLEMING (right) goes over an 8(a) proposal with Elizabeth Rice of Koba Associates, Durrell Moore, Tom Skillman and Ron Mentzer of Goddard.



ALBERT GLORIOSO (second from left) discusses a Small Business Set-Aside with Elizabeth Clark and Curt Dennis of the Facilities Support Branch as Joyce Mooten takes notes.

A PRE-CONSTRUCTION CONFERENCE is underway with (from left) C. Colbert of the Colbert Refrigeration Company, Paul Martin of the Facilities Engineering Division (FED), Ramona Hobar of FED, Bill Hardgrove of FED, Tom Donaldson of the Procurement Division, and James Mills, Chief of FED.



ARTHUR WOLTER reviews the capabilities of a small business firm for members of the Electronics Division (not shown).

From Page 1

Gamma-Ray Symposium

Scientists from around the world were at Goddard on April 30 through May 2 for the International Symposium and Workshop on Gamma-Ray Astrophysics held in the Building 3 Auditorium. Chairmen for the three-day affair were Dr. Floyd W. Stecker and Dr. Jacob I. Trombka of the Laboratory for Space Physics.

This was the first symposium ever held on gamma-ray astronomy. Professor Kenneth Greisen of Cornell University, who was Chairman of one symposium session, said "This symposium marks the birth of gamma-ray astronomy."

Symposium topics covered, in part, the changing picture of the universe made possible by experiments aboard Apollos 15, 16, and 17 and by the spark-chamber-telescope aboard the second Small Astronomy Satellite (SAS-2). These experiments have given astrophysicists their first good look at cosmic gamma radiation that may hold new clues to the origin of the universe.

On this and the following pages are stories related to the symposium. The proceedings of the symposium will be published as a NASA SP. A summary will be published in *Nature* and *Physics Today*.

The Stecker Puget Theory of Galaxy Formation

Dr. Floyd W. Stecker of the NASA Goddard Space Flight Center and Jean-Loup Puget of the Paris Observatory have developed a theory of galaxy formation that begins with the assumption of the "big-bang" theory of the expanding universe in which the universe expanded and cooled from an extremely hot, dense state about 15 billion years ago.

They also theorize that the universe consists of equal amounts of matter and antimatter which coalesced into separate regions, perhaps by the mechanism suggested by Dr. Roland Omnes of the Laboratory of Theoretical and High Energy Physics, Orsay, France.

Stecker and Puget then show that these regions could have grown to the mass of galaxy clusters by the time the universe had cooled off enough to go from a plasma state—individual electrically charged particles such as electrons and atomic nuclei—to an atomic gaseous state. At this point, the transition produced two extremely important effects.

When the universe was in a plasma state, it was electromagnetically coupled to a large field of radiation left over from the initial fire-ball stage of the "big-bang." This coupling made the plasma very viscous, i.e., large-scale fluid motions in it tended to be damped out. The coupling also assured that sound pressure waves in the plasma were transmitted at almost the speed of light so that pressure differences could not compress the plasma.

When the universe cooled to its atomic state, it lost almost all of its viscosity and the speed of sound became much smaller than the speed of light in the gas. This allowed fluid motions caused by the matter-antimatter annihilation in the boundary regions to become both turbulent and supersonic. (Turbulent motion is demonstrated in the whirlpool-eddies produced by pushing an oar through the water.)

Cosmologists have long suspected that galaxies were formed out of such turbulent eddies, but the Stecker-Puget theory provides a way for producing the large amounts of energy needed to cause the turbulent motion: matter-antimatter annihilation. In this process, the total mass of atomic particles is converted into energy according to Einstein's theory of relativity; in a hydrogen bomb only a small fraction of the mass is converted. The annihilation process is 100 times more efficient in producing energy than nuclear fission or fusion.

The supersonic turbulence produced causes large density fluctuations in the pregalactic gas because the pressure-waves are moving faster than the speed of sound and sound radiation cannot disperse the density fluctuations caused by the pressure waves. Thus, matter tends to pile up in the waves and the resulting blobs of matter produced eventually condensed under their own self-gravitational forces to produce galaxies.

Stecker and Puget find they can plausibly account for the sizes, mean densities, and rotational speeds of galaxies as a consequence of this theory. It also is consistent with Dr. Stecker's interpretation of the recently observed cosmic gamma-radiation as being the result of matter-antimatter annihilation.

DR. FLOYD STECKER addresses the recent Gamma-ray Astrophysics Symposium here.

Apollo γ-Ray Results

Three experiments flown aboard Apollos 15, 16 and 17 have provided data to support revolutionary theories presented at the recent gamma-ray astrophysics symposium here.

The Gamma-Ray Spectrometers flown in the Service Module of Apollo 15 and 16 were extended on a 7.6 meter boom during transearth coast to gather data on cosmic gamma-rays. (They were also used during the lunar orbits to measure induced gamma radiation from the Moon's surface.) The third Gamma Ray Spectrometer flown on Apollo 17 contained a sodium iodide crystal identical to the ones flown in the other spectrometers. It was kept in the Command Module and retrieved immediately after splashdown so radiation measurements could be conducted to detect induced radiation in the crystal before it faded. The level of induced radiation in the Apollo 17 crystal was then subtracted from the results of the earlier experiments to give a more accurate measure of cosmic gamma radiation.

"The results of the three experiments," says Dr. Jacob I. Trombka, Goddard investigator, "indicate that cosmic gamma radiation originates equally from all points. We are happy to say that all data agree and form a continuum with the higher gamma-ray measurements made by SAS-2." The measurements support the antimatter theories of Dr. Floyd Stecker of Goddard; Roland Omnes of

the Laboratory of Theoretical and High Energy Physics, Orsay, France; and Evry Schatzman and Jean-Loup Puget of the Paris Observatory, all of whom spoke at the symposium.

The success of the Apollo 17 experiment is due in part to the quick work of Richard Schmadebeck of the Theoretical Studies Branch and Dr. Mike Bielefeld of Computer Sciences Corporation here. They were on board the recovery ship Ticonderoga during splashdown to receive the spectrometer crystal as soon as possible. They conducted the first radiation measurements on the ship to detect the level of induced radioactivity before it faded under the influence of the earth's magnetic field. The crystal was then sent to the Oak Ridge National Laboratories for further tests and double checks against a control crystal that had not been flown on Apollo.

SAS-2 Preliminary Results

GODDARD TEAM members who helped develop the digitized spark-chamber now orbiting on SAS-2 are (from left) Dr. Carl Fichtel, SAS Project Scientist; Dr. Robert Hartman, Co-investigator; William Cruickshank, Mechanical Engineer; Dr. Donald Kniffen, Co-investigator; Robert W. Ross, Detector Engineer; and Charles Ehrmann, Electronics Engineer. Not shown are Stephen Derdeyn, experiment manager; and Michael Calabrese, Structural Engineer.

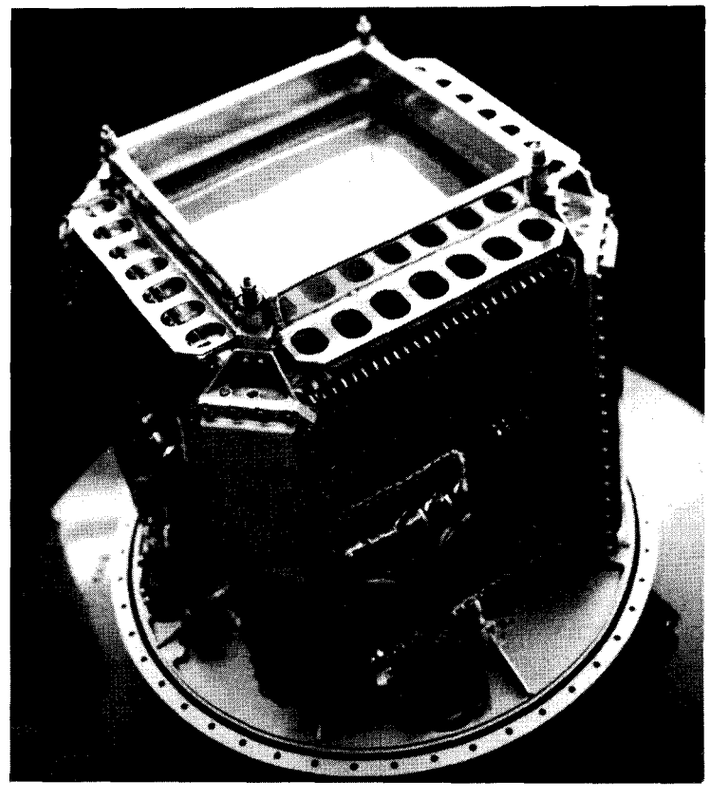
Preliminary results from the second Small Astronomy Satellite (SAS-2) have been presented by Project Scientist Dr. Carl Fichtel at the American Physical Society Meeting in Washington, D.C. on April 26 and by Co-investigator Dr. Donald A. Kniffin at the Gamma-Ray Astrophysics symposium held here on May 1.

SAS-2, launched on November 16, 1972 from the San Marco launch platform in Kenya, carries a unique 32-level digitized spark chamber gamma-ray telescope that was designed and built entirely at Goddard. Still operating well after five months of operation, the telescope is conducting man's first comprehensive survey of celestial gamma radiation.

Dr. Fichtel reports that, "Data now exists for most of the galactic plane, the Crab nebula, Sco X-1, regions off the galactic plane, and most of the stronger X-ray sources. The detection of gamma-rays from the galactic plane is especially interesting since gamma-rays can reveal the distribution of cosmic rays in our galaxy. Cosmic rays represent the most dynamic process in the balance of pressures in the galactic disk."

Other SAS-2 results are:

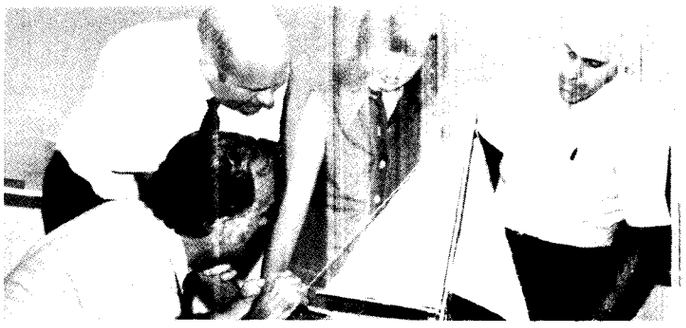
- The detection of high energy gamma radiation from the Crab nebula that will, when data analysis is complete, help provide an energy spectrum and time variation study. Before SAS-2, pulsed radiation from the Crab had been detected in the X-ray and low energy gamma-ray region.



GAMMA-RAY TELESCOPE for SAS-2 was built at Goddard.

- The detection of gamma radiation from the galactic center—SAS-2 has confirmed that the galactic center is unexpectedly rich in gamma-rays. A map of the gamma-ray intensity of the galactic center region is being developed.
- The detection of gamma-rays coming from regions away from the galactic plane. This preliminary study by SAS-2 has included the distribution of the energies of the gamma-rays. Combining this data with the low energy gamma-ray data obtained by Peterson and Trombka on Apollo 15 has revealed a clear excess of diffuse gamma radiation from less than 1 to over 100 Mev in energy. This excess is very possibly of cosmological origin and, if confirmed by the more full analysis of the data, will have a direct relationship to the big-bang theory of the origin of the universe.

RUTH MARSH, a senior data technician, has played a very key role in the analysis of the SAS-2 data reduction. Here she uses the computer display unit to examine selected gamma-ray events. She structures the events as necessary with the light pen and then returns the data to the computer for energy and direction analysis.



SAILING ASSOCIATION INSTRUCTOR Howard Wright (from left), Jerry Barsky, Naomi Barsky and Sol Glicker study the rigging of a model sloop.

Introducing the Goddard Sailing Association

The Goddard Sailing Association was started by Gary Mason in 1971 and became charted as a GEWA activity in 1972. Its objectives include the promotion of interest in sailing, education in sailing, and providing inexpensive sailing facilities, activities and camaraderie.

The only perequisite for membership is an interest in sailing. Some members have boats, while some do not. Yearly membership dues are $5.00 payable to the club treasurer. This year's officers are: Eugene Willingham, Commodore; Gary Mason, Vice-Commodore; Harvy Safren Rear Commodore; Bill Carpenter, Fleet Captain; David Mengers, Secretary; and Wayne Kasprzak, Treasurer.

One of the highlights of the club's 1972 season was a "sail-in picnic" held on Spa Creek in Annapolis. The club is planning two "sail-in" events this season.

In September of 1972, the first Goddard Sailing Association Basic Sailing Series was organized and conducted by instructor Howard Wright. This course in basic sailing techniques is being repeated this spring.

The big event this spring has been the delivery of the association's own boat, a high-quality, 19-foot fiberglass "Flying Scot" sloop. It will be moored in Back Creek, Annapolis. The Fleet Captain Bill Carpenter is in charge of maintaining and renting the boat.

The Second Basic Sailing Series started on April 30. The fee of $30.00 includes three classroom sessions, three water sessions at Annapolis, and one extended (5-hour) sailing trip. The course covers theory, varieties of boats, safety, sailing maneuvers and docking, right-of-way rules, emergency procedures and various situation problems. A separate course in one-degree yacht racing may be offered if enough interest is shown.

Since the May course is over-subcribed, Gene Willingham recommends that you contact him at 5346 or Howard Wright at 4685 to be listed for subsequent courses.

SAILING AWARD. Al Caney (left) of the Procurement Division, receives a prize from Captain George B. Lindgren Commander of the U.S. Naval Academy Sailing Squadron during a recent awards dinner. Mr. Caney received the pewter first place prize for Delta Class in the 1972 U.S.N.A. Sailing Squadron Regatta Annapolis to Oxford race last fall. That same evening, he also received a prize for placing first for the Chesapeake Bay Yacht Racing Association Delta Class in the Tred Avon Yacht Club's Hammond Memorial Race. 1972 was Mr. Caney's first racing season as skipper of his present racing sloop. He came in second in the two races he entered other than the ones mentioned. His sloop, named "Khadine," is not only equipped for racing, it is also Al's comfortable floating home year-around.

CLIP AND SAVE

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

Precious Metals

Gold and silver can be electrodeposited on almost any material for industrial or decorative purposes.

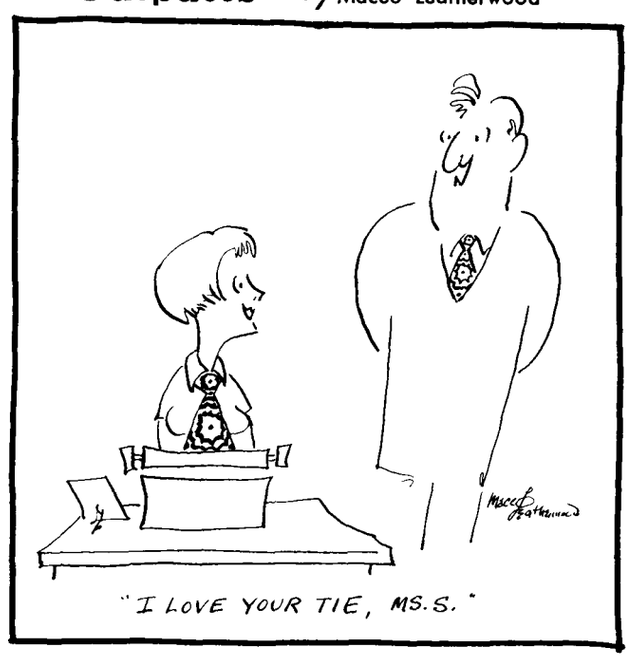
Industrial uses of gold electrodepositions are centered primarily in the field of electronics because of gold's high tarnish resistance, high temperature oxidization resistance, and radiation shielding. The finish can range from matte to bright depending upon the preparation of the base metal. A minimum thickness of 0.1 to 0.2 mils. of gold plating is necessary to prevent the migration of undercoatings into the gold plate. Deposits as heavy as 5 to 10 mils. may be plated depending upon the use. Applications of gold for flight or ground support use must meet military specification Mil-G-45204. Copies are available from Code 282.1

Industrial uses of electrodepositions of silver are high thermal and electrical conductivities, good soldering qualitites, and excellent lubricating characteristics for anti-galling.

The finish can range from white matte to very bright depending upon the preparation prior to and after plating. Applications of silver for flight or ground support use must meet military specification QQ-S-365A, see Code 282.1 Silver Plating may require a coat of clear lacquer to protect against subsequent tarnishing.

Thickness measurements are taken to insure that the specified amount of gold or silver has been deposited.

Outputts by Maceo Leatherwood



May is Savings Bond Month

Goddard's 1973 Savings Bond Campaign opened on May 1 and will continue until June 1. Our goal this year is for 80% of Goddard employees to take part in the Payroll Savings Plan. We can all help our country by helping ourselves by signing up for Bonds or by increasing our present bond allotment.

Dr. John F. Clark, the 1973 Savings Bond Campaign Chairman, is being assisted by representatives from each directorate who will invite all Goddard employees to increase their savings by buying bonds. Campaign Vice-Chairmen from each directorate are: Melvin Donahoo of Administration and Management, Rosemary Hayo of Systems Reliability, David Walden of Projects, Frank Ferrell of Mission and Data Operations, George Abid of Space and Earth Sciences, Robert Bourdeau of Space Applications and Technology, and Robert Morrissey of Networks.

Savings Bonds are one of the safest investments you can make because they are backed by the full faith and credit of the federal government.

There are two kinds of bonds you can buy through the Payroll Saving Plan. The popular Series E Bond is an appreciation-type security that is purchased at a cost of 75% of face value; interest is paid by gradual increase in redemption value. The Series H Bond is a current-income security, purchased at face value; interest is paid by Treasury check every six months following the purchase date.

Series E Bonds are sold to individuals in seven denominations—$25, $50, $75, $100, $200, $500, and $1,000. H Bonds are sold to individuals in three denominations—$500, $1,000 and $5,000.

Some reasons for buying Savings Bonds are:

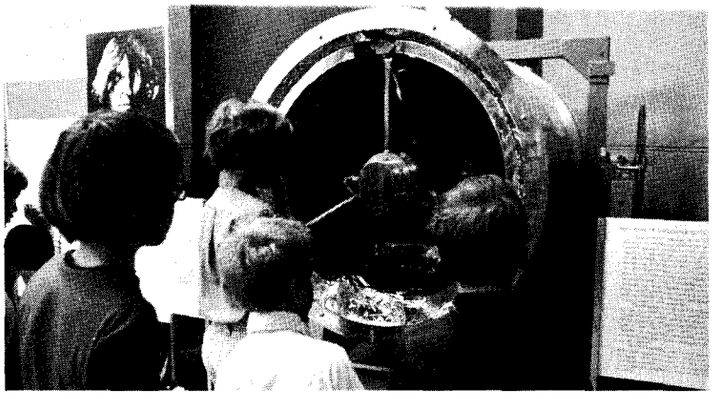
- Interest rates are guaranteed to maturity—you can never get back less than you pay in. Interest may be increased, but not decreased. The present interest rate is 5½% on mature bonds.
- Bonds are liquid assets which may be cashed after a minimal holding period—two months for E Bonds, six months for H Bonds.
- Bonds are "indestructible." Any bond lost, stolen, mutilated, or destroyed will be replaced at no charge. A record of each bond sold is maintained by serial number and name of owner.
- Choice of registration—bonds may be issued in one name only, in the names of two persons as co-owners, or in the name of one person with a second person as beneficiary.
- Bonds are convenient to buy. The Payroll Savings Plan permits Savings Bonds to be purchased on a partial payment plan.
- Tax benefits—interest on Savings Bonds is exempt from all state or local income or personal property taxes. Interest is subject to federal income tax, but the tax on E Bonds interest may be deferred until the E Bonds are cashed or reach final maturity. H Bonds interest, paid semiannually by Treasury check, must be reported annually for federal income tax purposes.

Solar Spectrum Book Ready

The Institute of Environmental Sciences has published a 169-page book entitled *The Extraterrestrial Solar Spectrum* based on the proceedings of a colloquium session held in Los Angeles in April of 1971. Edited by Dr. Matthew P. Thekaekara of Goddard's Thermodynamics Branch, and the late A. J. Drummond of Eppley Laboratory, the book includes updated papers presented at the meeting on such topics as the state of knowledge of the solar constant and solar spectrum.

In addition to acting as co-editor of the book, Dr. Thekaekara is the author of a section on "Extraterrestrial Solar Spectral Irradiance." Dr. Donald F. Heath of Goddard's Laboratory for Meteorology and Earth Sciences is the author of a section on "Observations of the Sun, an Ultraviolet Variable Star."

The book is available from the Institute of Environmental Sciences, 940 E. Northwest Highway, Mt. Prospect, Illinois 60056. The price is $9.00 for members and $12.00 for non-members. An additional charge will be made for shipping and handling if orders are not prepaid.



ORBITING ASTRONOMICAL OBSERVATORY. An engineering model of the Princeton University ultraviolet telescope on board OAO Copernicus was placed on display at the Smithsonian Institution on April 23 in honor of the 500th anniversary of the birth of the "father of modern astronomy." The model is on loan to the Smithsonian by Goddard's OAO Project Office.

Goddard Club to Get Flight Simulator

Members of Goddard's Flying Club had a chance to try out and evaluate an ATC-510 flight simulator during the club's monthly meeting on April 3. The simulator, demonstrated by Patricia C. Hughes of SAFE, Inc., was designed by Analog Training Computers, Inc. It allows a pilot, from a seat on the ground, to perfect the instrument-related maneuvers that are essential to safe flight under conditions of poor visibility and turbulence.

The main purpose of the meeting was to evaluate the suitability of the simulator for instrument training and proficiency of club members. The purchase of an instrument trainer has been approved by the board of directors of the club subject to evaluation of suitable types and the formation of a useage and financing plan.

The Goddard Flying Club is dedicated to provide flight experience for its members and to the discussion of aviation topics. At present aircraft and instruction are available on a rental basis from College Park Airport. Rates are 20% lower than most Washington area prices. The club hopes eventually to offer flying at 50% lower than today's prices by owning and managing the flight equipment. The first move towards this goal is already shaping up with the acquisition of an instrument flight simulator.

HIRAM LOPEZ, Flying Club Training Officer operates a flight simulator during the April 3 meeting. Watching are (from left) Ray Sumerlock, Patricia Hughes, an unidentified guest, Harry St. Aubin, Club Vice President Jim Metzger, Don Fitzpatrick and GEWA Representative Ed Fitch (partly hidden).

Child Center to Open in June

ORGANIZERS of Goddard's Child Development Center are (from left) Hugh Fletcher; Ann Merwarth, Day Care Club President; Robin Hammond (kneeling) of the EEO Office; Lynn Murphy, Equipment Committee; Barbara Wax; Judy Beamon, Staffing Committee; and Gretchen Burton, Secretary.

The Goddard Child Development Center will open its doors to approximately 20 children by June 11th. This new service for on-site Goddard Government and contractor employees has been developed by the Goddard Day Care Club with the assistance of GEWA, the EEO Office and Goddard management.

The Child Development Center will be located in a small two-room brick building (Bldg. 86) on site. The building has been completely renovated. The rooms are decorated in orange and blue with wall to wall carpeting. Child size lockers and toilets have been installed, and a wealth of equipment and toys has been ordered.

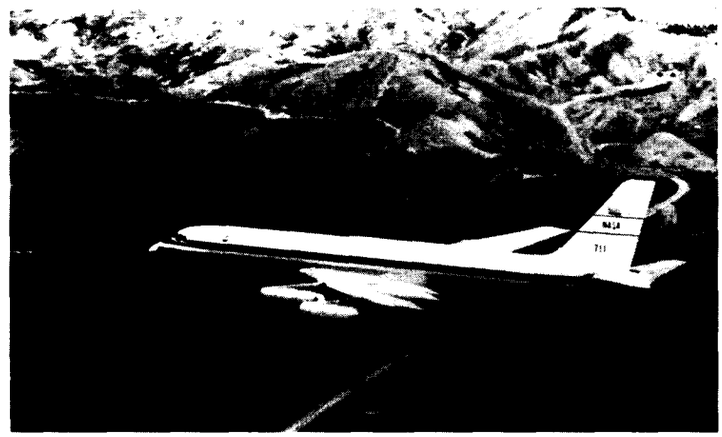
The indoor equipment and toys include a small size kitchen set, large hollow blocks for building large structures, other blocks for assorted ages, riding toys, wagons, an indoor climber, painting easels, trucks, trains, peg boards, etc. Outdoors there will be a blacktop area for bicycle riding and a grassy play ground. Swings, a large dome climber, tables, tunnels, and the nose cone of a spacecraft will provide outdoor recreation for the children.

The education program at the Center will be provided by a highly qualified staff. Our Director, Ms. Virginia King, has a degree in early childhood and post graduate credits. In addition to our teacher aides, students from local universities will participate as part of their student training experience.

The educational program has been carefully developed to prepare children for school, for social activities, and for physical development. The program allows children to learn about the world around them through concrete objects. Math concepts are learned through manipulative toys such as unit blocks. Language development training is inherent in all planned activities. Children will learn to create through a wealth of art and building supplies. They will participate in role playing, puppet shows, musical bands and educational games. Consultation with experts in the field of early childhood education at local universities lead us to believe this will be an outstanding program.

ANN MERWARTH, President of the Goddard Day Care Club receives a $50 check for the Child Development Scholarship Fund from Samuel W. Keller, Director of Administration and Management.

Convair 990 Crash



MOFFETT FIELD, CALIFORNIA. On April 12, 1973, the NASA experimental plane Galileo (Convair 990) was destroyed in a mid-air collision while approaching Moffett Field after a test flight. On board were eleven crew members and scientists. For years, Goddard has utilized the Ames-based Galileo in conjunction with many of its important research projects and has developed a great deal of admiration and respect for all those at Ames associated with the program.

Child Development Scholarship

The Goddard Child Development Scholarship Fund has been organized by the GEWA Day Care Club (GEWA/DCC) to allow low income children to enroll in our Child Development Center. The Scholarship Fund will award scholarships to children of Government employees and on-site contractors, who are in need of financial assistance to attend the Center. The amount of the award is computed according to the 1972 Maryland Schedule For Determining Day Care Fees.

This computation depends upon the number of dependents and the total family income. The scholarship may pay part or all of the $25 per week fee.

The GEWA/DCC Child Development Center is a non-profit organization of a Government instrumentality and all contributions to the Scholarship Fund are tax deductible. Corporations and other business entities having or seeking contractual relationships with NASA will not be accepted. An account has been opened at the Credit Union and donations may be directly placed into this account. Make checks payable to GEWA/DCC–GCD Scholarship Fund," Account #13084-02. All donations will aid disadvantaged children in receiving quality care and education.

Your donations are badly needed as there are no federal funds available for providing care for preschool children.

GODDARD NEWS is published monthly by the Public Affairs Office of the Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md. 20771. Deadline for contributions is the last Thursday in the month.

Editorial Staff

Nancy Mengel Jim Kukowski

Mrs. Patricia Ratkewicz, Ext. 4141