major annual propulsion meetings and 18 specialized meetings.

CPIA is continuing to submit structural formulas for inclusion in the U. S. Army Chemical Information and Data System (CIDS). The CIDS and the "chemical typewriter" program hold great promise as a mechanized, time-saving combination that will improve our ability to provide in-depth indexes, informative abstracts, and retrospective searches to the chemical propulsion industry.

Staff Activities

EVENING COLLEGE PROGRAM AT APL

The University Evening College Center at the Laboratory continued the strong growth it has shown in the past. The number of courses offered has increased from six in academic year 1964-65 to nineteen scheduled for 1967-68.

The new M.S. degree program (with a major in Numerical Science) attracted 102 candidates in its first year. At the same time interest continued in the M.S. program with a major in Electrical Engineering; 72 candidates enrolled for that degree. Two additional M.S. degree programs were approved for 1967-68. One is with a major in Applied Physics and the other is with a major in Space Technology.

The first summer courses in the Evening College were offered at the Laboratory during the summer of 1967 with a total enrollment of 58. It is planned to continue summer sessions because such offerings can materially shorten the length of time required for a degree.

FELLOWSHIP PROGRAMS

Dr. Ernest P. Gray, a physicist on the Principal Professional staff and Chairman of the APL Colloquia, was named to the second William S. Parsons Professorship at the University and Dr. Vivian O'Brien and Mr. John R. Apel were awarded the William S. Parsons Fellowships. These appointments are for the 1967-68 academic year. Five graduate students from the University are working toward the Ph.D. degree on APL Fellowships. It is expected that one of these Fellows will complete his work in September 1967.

Administrative Operations

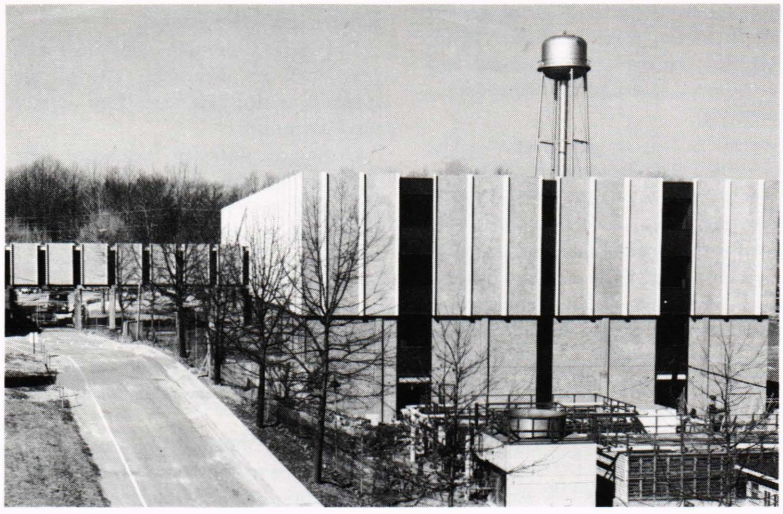
ORGANIZATIONAL CHANGES

There were no significant changes in the administrative organization of the Laboratory during the fiscal year. The Administrative Systems Office, which is under the cognizance of the Administrative Services Manager, continued the task of reviewing administrative procedures with the aim of improving and codifying them. Over the past year a number of procedural manuals have been issued including manuals on Safety, Purchasing, Subcontracting, and Stockroom Operations. To simplify administrative controls, the Teletype Project was transferred from the Office Services Group to the Space Development Department which utilizes approximately 90% of the Project's efforts. Cognizance of the Laboratory's stockrooms was transferred to the Plant Services Group to centralize under one administrative head all of the Laboratory's stockroom activities.

BUILDING PROGRAM

A major laboratory and office building has been under construction as noted in the report for last year. Construction has proceeded on schedule and it is expected that occupancy will begin in late February 1968, and will permit the release of rented space in Silver Spring as well as relieving current overcrowding at the Howard County Laboratory.

R. E. GIBSON
Director



New laboratory and office building (Building 6) that was completed on schedule in February 1968.

APL COLLOQUIA

Jan. 5—"Stimulated Raman Effect," by Nicolaas Bloembergen, Harvard University.

Jan. 12—"Ablation Cooling," by Edward W. Ungar, Battelle Memorial Institute.

Jan. 19—"Biomedical Engineering from Different Viewpoints," by Richard J. Johns, The Johns Hopkins University.

Jan. 26—"The Use of Technology for Solving Urban Problems," by Robert C. Wood, Department of Housing and Urban Development.

Feb. 2—"The Puzzling Radio Signals from Interstellar Hydroxyl Radicals," by Alan H. Barrett, Massachusetts Institute of Technology.

Feb. 16—"Explosive Production of Multi-Megagauss Fields and their Application," by Clarence M. Fowler, Los Alamos Scientific Laboratory.

AWARDS AND APPOINTMENTS

The Johns Hopkins University Applied Physics Laboratory, on January 17, 1968, received the U. S. Navy's "Forty-one for Freedom" award "for its role in the analysis and evaluation of Fleet Ballistic Missile Systems" aboard the 41 Polaris-carrying submarines that have been commissioned. In making the award, Captain Joseph W. Russel of the Navy Special Projects Office commended APL for its role "in enabling the Navy to develop and deploy so capable a deterrent to nuclear war." The award was received for the Laboratory by R. C. Morton, Supervisor of the Polaris Analysis and Evaluation Division.

L. L. Cronvich, Supervisor of the Aerodynamics Group, has been appointed to serve a second year on the Atmospheric Flight Mechanics Committee of the American Institute of Aeronautics and Astronautics.

W. H. Avery, Supervisor of the Aeronautics Division, has been named a Technical Director of the American Institute of Aeronautics and Astronautics.

ADDRESSES

Principal recent addresses made by APL staff members to groups and organizations outside the Laboratory.

T. A. Potemra, A. J. Zmuda, C. R. Haave, and B. W. Shaw, "VLF Phase Perturbations Produced by Solar Protons in the Events of August 28 and September 2, 1966," *International Science Radio Union (URSI),* University of Michigan, Ann Arbor, Michigan, Oct. 16-18, 1967.

A. A. Westenberg, "Application of ESR to Gas Phase Kinetics," *Brookhaven National Laboratory, Seminar in Chemistry,* Upton, Long Island, N.Y., Oct. 25, 1967.

J. R. Apel,"Beam Plasma Instabilities and Plasma Turbulence," *The Johns Hopkins University, Electrical Engineering Seminar,* Baltimore, Md., Dec. 6, 1967.

D. B. Gilmore, "Application of a 'Monte Carlo' Method to the Determination of Mean Time to Failure of Complex Systems," *1968 Reliability Symposium,* Boston, Mass., Jan. 16-18, 1968.

R. M. Fristrom, "Molecular Beams: A Tool for Chemistry," *Boston College, Seminar in Spectroscopy and Quantum Chemistry,* Boston, Mass., Jan. 17, 1968.

H. H. Hart, "Effect of Supersonic Interference on Nonlinear Lateral Stability Characteristics at Large Combined Angles," *AIAA Sixth Aerospace Sciences Meeting,* New York, N. Y., Jan. 22-24, 1968.

The following two addresses were given at the *American Physical Society* meeting, Chicago, Ill., Jan. **29–Feb. 1, 1968:**

K. Moorjani, "Excitonic Transition in Amorphous Boron;"

P. Verzariu, "Determination of Charged Particle Energies by Deflection in an Inhomogeneous Electric Field."

The following two addresses were given at the *National Electronic Packaging and Production Conference,* Jan. 30–Feb. 1, 1968, at Long Beach, Calif:

R. E. Hicks, "Substrates for Large Scale **Arrays;"**

D.D. Zimmerman, "Trends in Techniques for Thin Film Large Scale Hybrid Arrays."

P. M. Iribe, "The Uses of the Moon," *Rotary Club,* Columbia, Md., Jan. 30, 1968.

E. A. Bunt, "Plasma Arc Heating for Hypersonic Flight Simulation," *McMaster University, Mechanical Engineering Dept.,* Hamilton, Ontario, Canada, Feb. 16, 1968.

J. G. Parker, "Vibrational Relaxation in Gases — Theory and Experiment," *Acoustical Society of America,* Washington, D.C., Feb. 26, 1968.

PUBLICATIONS

Compilation of recently published books and technical articles written by APL staff members.

J. D. Baker, "The Weibull Distribution as a Model for Radial Errors," *J. Inst. Navigation* **14,** No. 2, Summer 1967, 179–186.

E. A. Mason (University of Maryland) and L. Monchick (APL), "Methods for the Determination of Intermolecular Forces," *Advances in Chemical Physics,* John Wiley and Sons, New York, 1967, 329–387.

S. Weinbaum (General Electric Space Sciences Laboratory) and Vivian O'Brien (APL), "Exact Navier-Stokes Solutions Including Swirl and Cross Flow," *Phys. Fluids* **10**, No. 7, July 1967, 1438–1447.

J. R. Apel, "Harmonic Generation and Turbulencelike Spectrum in a Beam-Plasma Interaction," *Phys. Rev. Letters* **19**, No. 13, 25 September 1967, 744–746.

M. S. Ojalvo (National Science Foundation), D. K. Anand (APL), and Lt. Cdr. R. P. Dunbar (U. S. Navy),

PUBLICATIONS *(continued)*

"Combined Forced and Free Turbulent Convection in a Vertical Circular Tube with Volume Heat Sources and Constant Wall Heat Addition," *Trans. ASME, J. Heat Transfer, Series C* **89**, No. 4, November 1967, 328–334.

A. A. Westenberg and N. de Haas, "Atom-Molecule Kinetics Using ESR Detection. III. Results for $O + D_2 \rightarrow OD + D$ and Theoretical Comparison with $O + H_2 \rightarrow OH + H$," *J. Chem. Phys.* **47**, No. 10, 15 November 1967, 4241–4246.

V. L. Pisacane, P. P. Pardoe, and B. Joy Hook, "Stabilization System Analysis and Performance of the GEOS-A Gravity-Gradient Satellite (EXPLORER XXIX)," *J. Spacecraft and Rockets* **4**, No. 12, December 1967, 1623–1630.

R. M. Fristrom, "Combustion Suppression," *Fire Research Abstracts and Reviews* **9**, No. 3, 1967, 125.

T. A. Potemra, A. J. Zmuda, C. R. Haave, and B. W. Shaw, "VLF Phase Perturbations Produced by Solar Protons in the Event of February 5, 1965," *J. Geophys. Research* **72**, December 1, 1967, 6077–6089.

F. F. Hiltz and C. T. Pardoe, "On-Line Equipments for Reduction and Analysis of Discrete Bio-electric Epochs Developed by the Applied Physics Laboratory," *Biomedical Sciences Instrumentation* **4**, Plenum Press, New York, 1968, 265–271.

M. L. Hill, "Materials for Small Radius Leading Edges for Hypersonic Vehicles," *J. Spacecraft and Rockets* **5**, No. 1, January 1968, 55–61.

E. P. Cunningham, "Lambda Matrix Terminal Control for Missile Guidance," *J. Spacecraft and Rockets* **5**, No. 1, January 1968, 119–121.

C. Feldman, "Amorphous Boron Films," *Materials Research Bulletin* **3**, February 1968, 95–106.

PATENTS

C. M. Blackburn and R. S. Brashears—*Anti-Suffocation Valve,* Patent No. 3,362,420.

J. E. Kummerer—*Variable Emitter Device,* Patent No. 3,362,467.

T. Wyatt—*Damping Coupler for Satellite Attitude Control,* Patent No. 3,362,656.

C. J. Swet—*Means for Increasing Space Suit Mobility,* Patent No. 3,363,266.

B. E. Tossman, F. F. Mobley, and R. E. Fischell—*Eddy Current Nutation Damper,* Patent No. 3,363,856.

B. D. Dobbins, O. M. Martin, Jr., H. B. Munson, Jr., and H. H. Nall—*Doppler Homing System,* Patent No. 3,363,858.

B. F. Hoffman and R. L. Konigsberg—*Variable Feedback Notch Filter,* Patent No. 3,369,189.

G. B. Bush and F. C. Paddison—*Polarization Control Apparatus,* Patent No. 3,369,234.

E. E. Westerfield, J. R. Norton, L. J. Rueger, M. B. Greenlee—*Navigational Receiver,* Patent No. 3,369,236.

WITH THE AUTHORS

Charles Feldman, co-author of "Amorphous Semiconductors," was born in Baltimore, Maryland. He holds the A.B. and M.A. degrees in physics from The Johns Hopkins University and he received the Ph.D. degree, specializing in physics, from the University of Paris. A specialist in solid state and thin films, he joined the Applied Physics Laboratory as Physicist in January 1967. Prior to that he was a Section Head at the Naval Research Laboratory (NRL) and subsequently a Laboratory Manager at Melpar, Inc., where he conducted research on thin-film microelectronics and basic research on materials and devices. In recognition of his accomplishments, Dr. Feldman was awarded NRL's 1958 Outstanding Young Applied Scientist Award, a Research Society of America (NRL) Applied Science Award, and five Navy Incentive Awards. The holder of about a dozen patents, Dr. Feldman is a member of the Optical Society of America, the American Physical Society, the Philosophical Society of Washington, and the Research Society of America.

K. Moorjani, co-author of "Amorphous Semiconductors," was born in Karachi, Pakistan, and received the B.S. and M.Sc. degrees in physics from Delhi University, India. He then received the Ph.D. in physics from The Catholic University of America in 1964. Dr. Moorjani, a specialist in solid-state physics, statistical mechanics, optical properties of solids, and amorphous semiconductors, joined the Applied Physics Laboratory in September 1967. From 1961 to 1967 Dr. Moorjani was a Consultant in Physics to Melpar, Inc. and from 1964 to 1965 was Consultant to Goddard

Space Flight Center, Optical Systems Branch. From 1964 to 1966, he was at The Catholic University, first as Research Associate and then as an Assistant Research Professor. For the year 1966–67, he was a visiting scientist at the Centre National de la Recherche Scientifique, France. Dr. Moorjani is a member of the American Physical Society and The Society of the Sigma Xi.

L. G. Knowles, co-author of "The FLEXICON—A Medical Display Unit for Digital Data," is a native of Pottsville, Pennsylvania. Before joining the staff of the Laboratory in 1961, he received a B.S. degree in electrical engineering from The Pennsylvania State University. He also received an M.S. degree in electrical engineering from the University of Illinois in 1963. Mr. Knowles is a specialist in digital systems engineering, applications of digital processors to weapon control systems, and generalized digital instrumentation techniques. Since 1966 he has been concerned with the design and development of a prototype digital storage and display system for medical radioisotope scanners in connection with the radioisotope scanning research project. This project is a cooperative program with The Johns Hopkins Hospital, sponsored by the National Institutes of Health. He is Assistant Project Supervisor of Special Projects in the Weapons Direction Group.

W. A. Yates, co-author of "The FLEXICON—A Medical Display Unit for Digital Data," was born in Clairton, Pennsylvania. He received a B.A. degree in philosophy at Mount St. Mary's College in 1938 and has taken additional courses at George Washington University. Before joining the staff of the Applied Physics Laboratory in 1958, Mr. Yates was employed as an Electronics Scientist at the National Bureau of Standards from 1941–1954, and as Engineering Manager of the Avion Division of ACF Industries from 1954 to

1958. He is a specialist in missile electronics, tracking radars, weapon control systems, and industrial instrumentation. At APL he was originally employed as an Engineer in the Bumblebee Guidance Intelligence Group where he performed studies on programming requirements for an Advanced Weapon System, developed a digital tracking programmer for a frequency diversity pulse doppler radar, and coordinated programming requirements for an advanced radar system. From 1960 to 1964 Mr. Yates was Supervisor of the Typhon Weapon Direction Group and since 1964 he has been Supervisor of the Weapons Direction Group in the Fleet Systems Division.