

## Book Notes

**The Scientific Papers of Sir Geoffrey Ingram Taylor, Vol. III: Aerodynamics and the Mechanics of Projectiles and Explosions**, edited by G. K. Batchelor, *Trinity College, Cambridge* (Cambridge University Press, Great Britain, 1963), 559 pp. \$17.50.

**Contents:** 58 papers contributed by different authors on such subjects as the conditions necessary for discontinuous motion in gases, a manometer for use with small Pitot tubes, some cases of flow of compressible fluids, the stagnation temperature in a wake, the limiting ranges of large rockets, the aerodynamics of porous sheets, and effects of compressibility at low Reynolds number.

This volume contains some of Sir Geoffrey Taylor's work on the mechanics of fluids. Although some of the particular problems of engineering research have changed since most of these papers were written, the method of inquiry remains the same. The volume is designed to serve as a model for the investigation of today's problems.

**Analysis and Design of the Gyroscope for Inertial Guidance**, Ira Cochin, *Assistant Director of Engineering and Chief Engineer, Razdow Laboratories, Newark, N. J.* (John Wiley & Sons Inc., New York, 1963), 156 pp. \$8.75.

**Chapters:** 1) Introduction; 2) Review of Elementary Dynamics; 3) Fundamentals of the Gyroscope; 4) Elementary Gyrodynamics; 5) Suspension Schemes for the Rotary Gyroscope; 6) Fundamentals of Gyroscopic Drift; 7) Fundamentals of Gyroscope Drift Testing; 8) Test Equipment and Facilities.

This book provides a background in the theory, design, and techniques of testing of inertial guidance gyroscopes. Only a minimum mathematical background is required, but the material bridges the gap between theory and actual on-the-job cases in industry. It should be of use to graduate engineers and to engineers in industrial training programs.

**Advances in Space Science and Technology, Supplement 1: Space Carrier Vehicles**, Oswald H. Lange and Richard J. Stein, *both with Saturn Systems Office, NASA George C. Marshall Space Flight Center, Huntsville, Ala.* (Academic Press, New York, 1963), 317 pp. \$12.00.

**Chapters:** 1) Introduction; 2) Space Carrier (Launch) Vehicles; 3) Space Exploration in the Future; 4) Aerodynamics and Structures for Large Space Carrier Vehicles; 5) Inertial Guidance and

Control; 6) Development of Rocket Engines; 7) Fabrication; 8) Checkout; 9) Launching Large Space Carrier Vehicles.

The primary aim of this monograph is to outline the principal development trends from which modern, large, rocket-powered launch vehicles have evolved. Enough depth of treatment is provided in the major areas of guidance, control, and propulsion to enable the reader to understand some key hardware developmental problems.

**Random Vibration in Mechanical Systems**, Stephen H. Crandall and William D. Mark, *both with Massachusetts Institute of Technology, Cambridge, Mass.* (Academic Press, New York, 1963), 166 pp. \$6.50.

**Chapters:** 1) Characterization of Random Vibration; 2) Transmission of Random Vibration; 3) Failure Due to Random Vibration. **Appendixes:** 1) Additional Parameter Studies of Mean Square Responses of Two-Degree-of-Freedom System to White Noise Excitation; 2) Further Comparisons of Analog Computer Results with Eq. (2.65); 3) Analog Computer Measurements.

This monograph is an introduction to the fundamental facts and theories of random vibration. It contains the basic concepts required in order to design and test equipment that must withstand a random vibration environment. The treatment is of an introductory nature.

**XIIth International Astronautical Congress, Washington, D. C., 1961, Proceedings**, edited by Robert M. L. Baker Jr. and Maud W. Makemson (Academic Press, New York, 1963), 998 pp. \$44.00 for set of 2 vols.

**Contents:** 84 papers contributed by different authors and divided into 19 major parts. Part 1) Space Propulsion; Part 2) Astrodynamics—Orbit Theory; Part 3) Astrodynamics—Guidance, Control, and Geodesy; Part 4) Astrodynamics—Optimization Theory; Part 5) Astrodynamics—Landing Guidance; Part 6) Energy Conversion; Part 7) Trends in Combustion Research Resulting from Exploration in Space; Parts 8 and 9) Bioastronautics; Part 10) Bioastronautics Round Table; Parts 11 and 12) Exploration of the Solar System by Radar and Radio Astronomy Round Table; Part 13) High-Performance Combustion Systems; Part 14) Space Communications Round Table; Part 15) Vehicles; Part 16) Instrumentation Round Table; Part 17) Structures; Part 18) General Papers; Part 19) Recent Results and Plans in International Astronautics.

These two volumes contain technical papers presented at the Congress of the International Astronautical Federation, held in Washington, D. C., October 1-7, 1961. The papers represent the research efforts of more than 150 internationally distinguished space scientists. This work

should be valuable to scientists and technical workers in the aerospace industry.

**Symposium on Dynamics of Manned Lifting Planetary Entry**, edited by S. M. Scala, *Manager, High Altitude Aerodynamics, Space Sciences Laboratory, General Electric Company*, A. C. Harrison, *Manager, Presentations and Publications, Space Sciences Laboratory, General Electric Company*, and M. Rogers, *Chief, Mechanics Division, Air Force Office of Scientific Research* (John Wiley & Sons Inc., New York, 1963), 980 pp. \$15.00.

**Contents:** 41 papers contributed by different authors and divided into 6 major parts. Part 1) Planetary Atmosphere Models; Part 2) Aerodynamic Plasmas; Part 3) Energy Management; Part 4) Aerothermoelasticity; Part 5) Low-Speed Aerodynamics; Part 6) Hypervelocity Flows.

This symposium, sponsored by the Air Force Office of Scientific Research and the General Electric Space Sciences Laboratory, was held in Philadelphia, Pa., in October 1962. The volume provides source material on the various fundamental aspects of the dynamics of manned lifting planetary entry with the aim of identifying those that require further research and understanding.

**The Mathematical Theory of Viscous Incompressible Flow**, O. A. Ladyzhenskaya, translated from the Russian by Richard A. Silverman (Gordon and Breach Science Publishers, New York, 1963), revised English edition, 184 pp. \$9.50.

**Chapters:** 1) Preliminaries; 2) Linearized Stationary Problem; 3) Theory of Hydrodynamical Potentials; 4) Linear Nonstationary Problem; 5) Nonlinear Stationary Problem; 6) Nonlinear Nonstationary Problem.

This book gives an account of the present status of investigations on the existence, uniqueness, and stability of solution of stationary and nonstationary boundary-value problems for both the linearized and the general nonlinear Navier-Stokes equations. It should be of particular interest to research workers concerned with differential equations, functional analysis, and hydrodynamics.

**Perspectives in Materials Research**, edited by L. Himmel, *Department of Mineral Technology, University of California, Berkeley*, J. J. Harwood, *Manager, Metallurgy Department, Scientific Laboratory, Ford Motor Company*, and W. J. Harris Jr., *Assistant to the Vice President, Battelle Memorial Institute* (U. S. Government Printing Office, Washington, D. C., 1963), *Surveys of Naval Science*, no. 10, February 1963, 771 pp.

**Contents:** 12 parts contributed by different authors. Part 1) Science of Materials; Part 2) Cohesive Properties of Solids; Part 3) Magnetism and Magnetic

The books listed here are those recently received by the AIAA from various publishers who wish to announce their current offerings in the field of astronautics. The order of listings does not necessarily indicate the editors' opinion of their relative importance or competence.

Materials; Part 4) Electrical, Optical, and Thermal Properties of Solids; Part 5) Diffusion and Mass Transport in Solids; Part 6) Phase Transformations in the Solid State; Part 7) Growth, Structure, and Morphology of Crystals; Part 8) Mechanical Behavior of Crystalline Solids; Part 9) Surface Phenomena—Nature and Properties of Solid Surfaces and Interfaces; Part 10) Structure and Properties of Liquids; Part 11) Effects of Radiation on Materials; Part 12) Techniques and Instrumentation.

This book is an attempt to provide perspective to the field of materials sciences and to set forth for a number of topics the degree of understanding which has been achieved and the important problem areas that still plague us. It is designed to be of particular assistance to the new research talent entering into this field of activity.

**Proceedings of the Conference on Optical Instruments and Techniques**, edited by K. J. Habell, *National Physical Laboratory, England* (John Wiley & Sons Inc., New York, 1963), 520 pp. \$21.00.

*Contents:* 37 papers contributed by different authors and divided into 6 major parts. Part 1) Colorimeters, Spectrophotometers, and Spectropolarimeters; Part 2) Optical Design Techniques; Part 3) Image-Forming Systems and Instruments; Part 4) Optical Systems Associated with Rockets and Satellites; Part 5) New Techniques for the Production and Testing of Optical Components; Part 6) New Optical Techniques (Including Optical Application of the Maser Principle).

This conference was held at Imperial College, London, July 11–14, 1961.

More than 250 delegates from 22 countries participated.

**Dynamics of Satellites**, edited by Maurice Roy (Academic Press, New York, and Springer-Verlag, Berlin, 1963), 335 pp. \$15.00.

*Contents:* 25 papers contributed by different authors on such subjects as long-range effects in the motion of artificial satellites, the potential of the earth derived from satellite motions, the determination of atmospheric drag on artificial satellites, some problems of motion of artificial satellites about the center of mass, the libration of a satellite on an elliptic orbit, and the prediction of observed satellite orbits.

These papers, 22 of which are in English, constitute the Proceedings of the International Union of Theoretical and Applied Mechanics Symposium, held in Paris, May 28–30, 1962.

**Interplanetary Dynamical Processes**, E. N. Parker, *Enrico Fermi Institute for Nuclear Studies, and Department of Physics, University of Chicago* (Interscience Division, John Wiley & Sons Inc., New York, 1963), 272 pp. \$12.50.

*Chapters:* 1) Introduction; 2) Observations; 3) Kinetic Properties of Coronal Gas; 4) Hydrostatic Properties of a Coronal Atmosphere; 5) Quiet-Day Coronal Expansion; 6) Hydrodynamical Model of Quiet-Day Corona and Solar Wind; 7) Energy Transport in the Corona; 8) Sudden Expansion of the Corona; 9) Extension of the Solar Wind into Space; 10) Interplanetary Magnetic Fields; 11) Interplanetary Irregularities; 12) Cosmic

Ray Effects; 13) Propagation of Energetic Solar Particles; 14) Generalization and Extension of the Basic Solar Wind Model; 15) Stellar Winds. *Appendixes:* 1) Non-radial Expansion; 2) Particle Diffusion.

This monograph presents a theory of interplanetary dynamics based upon coronal expansion as the source of interplanetary gas motions. The theory is in a rudimentary state and is intended only as an exploration of the possibility that hydrodynamic expansion of the atmosphere of the sun is the origin of interplanetary activity.

**Rarefied Gas Dynamics**, edited by J. A. Laurmann, *Lockheed Missiles and Space Company, Palo Alto, Calif.* (Academic Press, New York, 1963), Supplement 2, Vol. 1, 541 pp. \$16.00.

*Contents:* 28 papers contributed by different authors on such subjects as a new approach to nonequilibrium statistical mechanics of gases, calculation of collision integrals in the moment equation, shock wave structure with rotational and vibrational relaxation, surface erosion in space, studies of normal momentum transfer by molecular beam techniques, and energy transfer during atom recombination on solid surfaces.

This volume contains the Proceedings of the Third International Symposium on Rarefied Gas Dynamics, held at the Palais de L'Unesco, Paris, in 1962. The subjects covered should be of interest to both the fundamental researcher and the applied scientist working in high-altitude aerodynamics and low-density flows. Important specific advances and an over-all view of the current state of knowledge in the field are presented.

## Technical Literature Digest

M. H. Smith, Associate Editor

The James Forrestal Research Center, Princeton University

### Propulsion and Power (Combustion Systems)

**Rocket Exhaust Sampling System for Two Phase Exhaust Flow Systems**, J. I. Schaeffer. Thiokol Chemical Corp., Reaction Motors Div. Rept. RMD 2103-F, Jan. 1963, 30 pp.

**Symposium on Measurement in Unsteady Flow** (Presented at ASME Hydraulic Div. Conference, Worcester, Mass., May 21–23, 1962) (Am. Soc. Mech. Engrs., New York, 1962), 114 pp.

**Comparison of Analytical and Experimental Blade Loadings of a Centrifugal Impeller**, J. L. Dussourd, pp. 22–31.

**Explosive Forming of Closures for**

EDITOR'S NOTE: Contributions from Professors E. R. G. Eckert, E. M. Sparrow, and W. E. Ibele of the Heat Transfer Laboratory, University of Minnesota, are gratefully acknowledged.

**Large Solid Propellant Motor Cases**, A. W. Hall and I. Lieberman. Quart. Progr. Rept., March 17, 1963–April 17, 1963, Aerojet-General Corp., Ordnance Div. Rept. 0665-01 (04) QP, April 30, 1963, 45 pp.

**Influence of Oxygen Atoms in the Upper Atmosphere on the Production of Ions in Rocket Exhaust Afterburning**, A. Fontijn and G. L. Baughman. AeroChem Res. Labs. TP-59, Jan. 1963, 19 pp.

**Temperature Measurements and Heat Transfer Calculations in Rocket Nozzle Throats and Exit Cones**, J. Nanigian. Bur. Naval Weapons NAVWEPS Rept. 8022, Dec. 31, 1962, 27 pp. (Naval Propellant Plant TR 122).

**Seminar on Astronautics, Rome, 1959**, Proceedings, Sponsored by AGARD-NATO, Current Research in Astronautical Sciences, edited by L. Broglio (Pergamon Press, New York, 1961), 535 pp.

**Spacecraft Propulsion**, A. M. Rothrock, pp. 322–372.

### Propulsion and Power (Noncombustion)

**Performance Capability of Single-Cavity Vortex Gaseous Nuclear Rockets**, R. G. Ragsdale. Appendix B: Computer Program, M. B. Eian. NASA TN D-1579, May 1963, 67 pp.

**Charge-Exchange Effects on the Accelerator Impingement of an Electron-Bombardment Ion Rocket**, W. R. Kerslake. NASA TN D-1657, May 1963, 44 pp.

**Numerical Solution of Axially Symmetric Poisson Equation; Theory and Application to Ion-Thruster Analysis**, V. Hamza. Appendix C: IBM 7090 Ion-Thruster Fortran Code and Block Diagram, C. D. Bogart. NASA TN D-1711, May 1963, 58 pp.

**Design and Operational Performance of a 150-Kilowatt Sodium Flash-Vaporization Facility**, L. R. Nichols, C. H. Winzig, S. M. Nosek, and L. J. Goldman. NASA TN D-1661, May 1963, 51 pp.

**Numerical Evaluation of Ion-Thruster**