Book Notes

International Symposium on Nonlinear Differential Equations and Nonlinear Mechanics, edited by Joseph P. LaSalle, *Research Institute of Advanced Studies,* and Solomon Lefschetz, *Research Institute of Advanced Studies and National University of Mexico* (Academic Press, New York, 1963), 505 pp.

Contents: 49 papers contributed by different authors on such subjects as generic properties of differential equations, asymptotic system of a perturbed system, some aspects of quasilinearization, periodic solutions of singular perturbation problems, analysis of the bistability of the parametron, and systems of differential equations without linear terms.

This volume is the official report of a symposium held at the U. S. Air Force Academy, Colorado Springs, Colo., and sponsored by the Air Force Office of Scientific Research and RIAS. The papers reflect the research and practice of pure and applied mathematicians from the United States, France, Germany, Russia, Belgium, Japan, Argentina, and Brazil.

Industrial X-Ray Handbook, Allan Lytel (Howard W. Sams & Company Inc., Indianapolis, Ind., 1962), 286 pp. $7.95.

Chapters: 1) Introduction; 2) Generating Radiation; 3) Detecting Radiation; 4) Basic Principles and Applications; 5) Electronic Equipment and Techniques; 6) Medical Equipment; 7) Industrial and Commercial Uses; 8) Laboratory Uses of Radiation; 9) Health Physics. *Appendixes:* 1) Gamma-Ray Equipment; 2) Gamma Exposure Time Computation; 3) Exposure Factors; 4) Glossary of Terms.

This book offers a discussion of the principles and practices of modern x-ray technology. It contains nearly 100 charts, photographs, and tables showing the construction, circuits, and uses of x-ray equipment. Also included are data on nuclear radiation—its generation, detection, use, and control.

Air, Space, and Instruments, edited by Sidney Lees, *Professor of Engineering, Thayer School of Engineering, Dartmouth College* (McGraw-Hill Book Company Inc., New York, 1963), 516 pp. $15.00.

Contents: 31 chapters contributed by different authors on such subjects as influence of the guidance designer on warfare, satellite interception and rendezvous, time and space navigation, performance aspects of air transport development,

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.

automatic electronic optical pyrometry, rectification of oscillations in fluids, and floated single-degree-of-freedom integrating gyros.

This volume contains a collection of original contributions written in commemoration of the 60th birthday of Charles Stark Draper. The material is designed to be of use and interest to research workers and practicing engineers working in those areas where Draper's contributions have been most outstanding. The authors are Draper's former students, colleagues, and friends.

Nuclear Physics, edited by Luke C. L. Yuan, *Brookhaven National Laboratory,* and Chien-Shiung Wu, *Columbia University* (Academic Press, New York, 1963), Vol. 5, Part B, 886 pp. $22.50.

Contents: 4 chapters contributed by different authors. 1) Methods for the Determination of Fundamental Physical Quantities; 2) Sources of Nuclear Particles and Radiations; 3) Beam Transport Systems; 4) Statistical Fluctuations in Nuclear Processes. *Appendixes:* 1) Evaluation of Measurement, Errors, Statistical Methods, Direct Measurements, Indirect Measurement, Preliminary Estimation, and Errors of Computation; 2) Kinematics; 3) Properties of Elementary Particles and Particle Resonance States.

This work is planned to provide information on the principal methods and their relative merits for the measurements of specific physical quantities in both high- and low-energy nuclear physics. It should be of value to the advanced student, the teacher, and the research scientist.

Guide to the Applications of Laplace Transforms, Gustav Doetsch, *Professor of Mathematics, University of Freiburg im Breisgau,* translation edited by W. McA. Fairbairn, *Department of Mathematics, Manchester College of Science and Technology* (D. Van Nostrand Company Inc., Princeton, N. J., 1963), 255 pp. $9.75.

Chapters: 1) Definition of the Laplace Transformation; 2) Rules for the Calculus of the Laplace Transformation; 3) Ordinary Differential Equations; 4) Difference Equations and Sampled-Data Systems; 5) Partial Differential Equations; 6) Integral Equations and Integral Relations; 7) Calculation of the Original Function from the Image Function; 8) The Asymptotic Behavior of Functions and the Question of Stability. *Appendix:* Table of Laplace Transforms.

This book furnishes the information needed by electrical and mechanical engineers and engineering students who wish to use the Laplace transformation in the solution of practical engineering problems. The relation between the Laplace transformation and the spectral description used by engineers is given particular consideration.

Heat Transfer—Houston, edited by Louis Bernath (American Institute of Chemical Engineers, New York, 1963), Chemical Engineering Progress Symposium Series, Vol. 59, no. 41, 229 pp. $3.50 A.I.Ch.E. members, $15.00 nonmembers.

Contents: 25 papers contributed by different authors on such subjects as cooling devices for a thermoelectric generator, entrance region heat transfer coefficients, heat transfer in porous media containing a volatile liquid, heat and mass transfer in rotary dryers, and heat transfer to superheated steam in a thin annulus.

This volume contains the papers presented at the Fifth National Heat Transfer Conference, Houston, Texas, August 5-8, 1962. The papers illustrate the evolutionary nature of heat transfer research and application to engineering.

Biotechnology: Concepts and Applications, Lawrence J. Fogel, *Senior Staff Scientist, General Dynamics/Astronautics* (Prentice-Hall Inc., Englewood Cliffs, N. J., 1963), 826 pp. $22.00.

Chapters: 1) Mathematical Models and Scientific Method; 2) Some Useful Mathematical Models; 3) Visual Channel; 4) Auditory Channel; 5) Position- and Motor-Sensing Channel; 6) Somatic Channel; 7) Taste and Smell Channels; 8) Summary of the Sensory Channels; 9) Manual Tracking Decision; 10) Decision-Making by Automata; 11) Human Decision-Making; 12) Intended Human Output Information; 13) Extracted Human Output Information; 14) Personal Equipment Design; 15) Design of the Immediate Environment; 16) Consoles and Cockpits; 17) The Future Cockpit; 18) Man-Machine Task Allocation and System Design; 19) Evaluation and Simulation; 20) The Structure of Biotechnology.

This book aims to provide a background of knowledge from which present systems may be improved and future systems conceived, designed, and produced in a safe, efficient, and effective manner. It is intended to be of use to a wide diversity of scientific personnel, ranging from the practical design engineer to the theoretical researcher.

Cosmic Rays, A. W. Wolfendale, *Senior Lecturer in Physics, Durham Colleges in the University of Durham* (Philosophical Library Inc., New York, 1963), 222 pp. $10.00.

Chapters: 1) Historical Background; 2) Some Basic Ideas of Nuclear Physics; 3) Electromagnetic Interactions; 4) Nuclear Interactions; 5) Cosmic Ray Detectors; 6) Primary Cosmic Rays; 7) Interaction of Cosmic Rays; 8) Cosmic Rays in the Atmosphere and at Sea Level; 9) Cosmic Rays Underground; 10) Time Variations of Cosmic Rays; 11) Radiation Belts; 12) Extensive Showers; 13) Origin

of Cosmic Rays. *Appendixes:* 1) Properties of the Elementary Particles; 2) The Standard Atmosphere; 3) Composition of the Primary Radiation; 4) Physical Quantities and Formulas.

This book is planned to give the background necessary for understanding the subject and to enable the reader to follow some of the original papers and more advanced texts dealing with it. It should be of help to students and to scientists working in other fields.

Digital Processes for Sampled Data Systems, Alfred J. Monroe, *Member of the Technical Staff, Space Technology Laboratories Inc.* (John Wiley & Sons Inc., New York, 1962), 490 pp. $12.50.

Chapters: 1) General Considerations; 2) Mathematical Preliminaries; 3) Elementary Principles of Digital Computers; 4) The Digital Differential Analyzer (DDA); 5) Synthesis Criteria; 6) The Sampling Process; 7) Analysis of Samplers; 8) Linearity Constraints; 9) Synthesis of Linear, Finite-Memory Digital Programs; 10) Synthesis of Linear, Infinite-Memory Digital Programs; 11) Synthesis of Closed-Loop Discrete Filters; 12) Composite Synthesis Criteria for the Design of Finite-Memory Digital Programs; 13) Treatment of Random Input Signals; 14) Deterministic Inputs in Closed-Loop Systems; 15) Random Inputs in Closed-Loop Systems; 16) Open-Loop Digital-to-Analog Converters; 17) Closed-Loop Digital-to-Analog Converters; 18) Smoothing of Nonlinear Processes; 19) Nonlinear Filters; 20) Polynomial Approximations; 21) Computer Word Length Requirements; 22) Error Analysis of Incremental Computers; 23) Introduction to the Second Method of Lyapunov; 24) Applications of the Second Method of Lyapunov; 25) Programming a Z-Transform.

This book may be used as a self-teaching aid. Emphasis is placed on analytical synthesis rather than on analysis. The book is written especially for the practicing engineer who is faced with the problem of designing a system containing a digital computer.

Flight Performance Handbook for Orbital Operations, edited by Raymond W. Wolverton, *Staff Engineer, Systems Analysis Department, Space Technology Laboratories Inc.* (John Wiley and Sons Inc., New York, 1963), 1445 pp. $25.00.

Contents: 6 chapters contributed by different authors. 1) Introduction; 2) The Parking Orbit; 3) Transfer Maneuvers; 4) The Rendezvous Maneuver; 5) The Operational Orbit; 6) Operational Orbit Control. *Appendixes:* 1) Glossary and Units; 2) Astrodynamic Constants; 3) Coordinate Systems and Orbital Geometry; 4) Powered Flight Trajectories; 5) Special Derivations; 6) Computational Procedures and Special Techniques; 7) Elements of Lunar and Escape Trajectory Analysis.

This handbook was designed to fill the need for an engineering and scientific encyclopedia dealing with spacecraft designed to operate from near-earth to cislunar space and beyond and from injection to planetary entry. Brief instruc-

tions for the use of the handbook are contained in the first chapter. The book was planned especially for preliminary designers and mission analysts.

Applications of Plastic Materials in Aerospace, edited by Donald J. Simkin, *North American Aviation Inc.* (American Institute of Chemical Engineers, New York, 1963), Chemical Engineering Progress Symposium Series, Vol. 59, no. 40, 119 pp.

Contents: 10 papers contributed by different authors. 1) Historical Background of Reinforced Plastics in Aerospace Vehicles; 2) Applications for Plastics in Aerospace Re-Entry Vehicles; 3) Behavior of Pure and Reinforced Charring Polymers during Ablation under Hypervelocity Re-Entry Conditions; 4) Ablative Characteristics of Reinforced Plastics in Nozzles and Thrust Chambers for Varying Environments; 5) Ablative Thrust Chambers for Space Application; 6) Reinforced Plastics as Structural Materials; 7) Status of Fire Research on Structural Plastics; 8) Laboratory Techniques for Studying Thermally Ablative Plastics; 9) Effects of Space Environment upon Plastics and Elastomers; 10) Considerations on the Evaporation of Materials in Vacuum.

This volume represents a brief summary of current applications of plastic materials for high-temperature applications, especially in the aerospace industry. The papers fall into the categories of historical background, re-entry applications, rocket engine applications, structural applications, laboratory techniques, and effect of the space environment.

Supersonic Engineering, edited by J. T. Henshaw, *Principal Lecturer in Aeronautical Engineering, Royal College of Advanced Technology, Salford* (John Wiley & Sons Inc., New York, 1963), 264 pp. $12.50.

Contents: 11 papers contributed by different authors. 1) The General Problem; 2) Safety and Airworthiness Aspects; 3) The Noise Problem; 4) Power Plants; 5) Basic Aerodynamics; 6) Stability and Control; 7) Aerodynamics of Power-Plant Installations; 8) Economics and Operation; 9) Systems Engineering; 10) Structural Aspects; 11) Materials and Processes.

This volume contains the proceedings of a symposium held at the Royal College of Advanced Technology, Salford, in May 1961. Each subject covered in the volume is dealt with at a level that should be understandable to the student or engineer with a reasonable knowledge of subsonic aircraft.

A Treatise on Radiative Transfer, V. V. Sobolev, translated by S. I. Gaposchkin, *Astronomer, Harvard College Observatory* (D. Van Nostrand Company Inc., Princeton, N. J., 1963), 319 pp. $9.75.

Chapters: 1) Formulation of the Problem; 2) Methods of Solution; 3) Method of Addition of Layers; 4) Linear Integral Equations for Brightness Coefficients; 5) Scattering of Polarized Light; 6) Probability of Quantum Exit from the Medium;

7) Luminescence of a Medium Limited by a Reflecting Surface; 8) Radiation Diffusion with a Redistribution of Frequency; 9) Nonstationary Radiation Field; 10) Approximate Solution of the Basic Problem. *Appendixes:* 1) Diffusion of Radiation in a Semi-Infinite Medium; 2) Radiation Diffusion in a Plane Layer.

This translation from the Russian proposes several new methods in the theory of radiative transfer and indicates their application to the solution of various astrophysical problems. In several chapters the author has included some results of his own original research.

Fluid Dynamics and Applied Mathematics, edited by J. B. Diaz and S. I. Pai, *both with the Institute for Fluid Dynamics and Applied Mathematics, University of Maryland* (Gordon and Breach Science Publishers, New York, 1963), 207 pp. $8.00.

Contents: 10 papers contributed by different authors. 1) Nonlinear Buckling of Thin Shells; 2) The Structure of Turbulence; 3) Singular Partial Differential Equations and Their Applications; 4) Differential Equations of Symmetric Type; 5) Singular Partial Differential Equations; 6) Landau Damping in a Fully Ionized Plasma and Its Combination with Collision; 7) Some Statistical Properties of the Product of a Turbulent First-Order Reaction; 8) The Shock Tube and Chemical Kinetics; 9) Existence and Uniqueness Theorems for Systems of Partial Differential Equations; 10) Some Aspects of Kinetic Theory.

This volume contains the proceedings of a symposium sponsored by the Institute for Fluid Dynamics and Applied Mathematics, University of Maryland, April 28–29, 1961. The purpose of the symposium was to encourage the exchange of views and information on new ideas and recent work in fluid dynamics and other aspects of applied mathematics.

Dynamics and Thermodynamics of Planetary Entry, W. H. T. Loh, *Manager, Re-Entry Systems and Radiation Physics, Aerospace Corporation* (Prentice-Hall Inc., Englewood Cliffs, N. J., 1963), 268 pp. $12.00.

Chapters: 1) Dynamics and Thermodynamics of Planetary Entry in General; 2) Fundamental Equations of Entry Dynamics; 3) Unified Solution of Entry Dynamics; 4) Second-Order Solution of Entry Dynamics; 5) First-Order Planetary Entry Solutions; 6) Variable (L/D) Flight Solutions; 7) Some Exact Analytical Solutions of Planetary Entry; 8) Minor Circle Flight Solutions; 9) Entry Corridor; 10) Generalized Aerodynamic Heating Analysis; 11) Ablation Shield Analysis; 12) Dynamics of Spinning Ballistic Missiles; 13) Basic Equations for Orbital Mechanics.

This book was written to present recent developments on re-entry and planetary entry. It can serve as an introductory text on the subject and as a reference work for more advanced research. It is written in such a way that it may be adopted as a regular textbook for a one-semester senior or graduate course on the subject.

Experimental Techniques in Shock and Vibration, edited by Will J. Worley, *University of Illinois* (American Society of Mechanical Engineers, New York, 1962), 139 pp. $8.00.

Contents: 10 papers contributed by different authors. 1) Transient Loading Technique for Mechanical Impedance Measurement; 2) Detection and Measurement of Stress Waves; 3) Dynamic Photoelasticity; 4) Role of Dynamic Models in Launch Vehicle Development; 5) Instrumentation for Shock and Vibration Measurements; 6) Dynamic Tests of Buildings and Special Structures; 7) Techniques for Simulation and Analysis of Shock and Vibration Environments of Space Flight Systems; 8) Review of Missile Shock and Vibration Problems; 9) Measurement of Physical Effects from Nuclear Explosions; 10) Specification Vibration Testing.

This volume contains the papers presented at a colloquium on Experimental Techniques in Shock and Vibration at the Winter Annual Meeting of the American Society of Mechanical Engineers, New York, November 27, 1962. It is intended to serve primarily as a review of current unclassified methods.

Physiology of Man in Space, edited by J. H. U. Brown, *Division of General Medical Sciences, Department of Health, Education, and Welfare, Public Health Service, National Institute of Health, Bethesda, Md.* (Academic Press, New York, 1963), 348 pp. $13.00.

Contents: 8 chapters contributed by different authors. 1) Neuromuscular Aspects of Space Travel; 2) Acceleration; 3) Stress; 4) Human Tolerances; 5) Psychological Aspects of Space Flight; 6) Biomedical Capsules; 7) Space Flight Dynamics—Weightlessness; 8) Ecological Systems.

The primary aim of this book is to present recent data regarding the physiological activity of man in space. It summarizes the results of experimentation on both human and animal subjects in many aspects of physiology as related to aviation and space exploration.

Problems of Cybernetics, edited by A. A. Lyapunov, translation edited by Richard Goodman, translated by G. R. Kiss (Pergamon Press Ltd., Oxford, 1963), Vol. IV, pp. 1135–1428.

Contents: 14 papers contributed by different authors and divided into 7 major parts. Part 1) General Problems; Part 2) Theory of Control Systems; Part 3) Theory of Information; Part 4) Programming; Part 5) Computers; Part 6) Control Processes in Living Organisms; Part 7) Problems of Mathematical Linguists.

Most of the papers appearing in this volume were written between four and five years ago, but this, in the majority of cases, has not lessened their value. The reader should find much material of interest.

Vertical Take-Off and Landing (VTOL) Aircraft, consulting editor, I. B. Laskowitz (New York Academy of Sciences, New York, 1963), Vol. 107, Art. 1, pp. 1–469.

Contents: 27 papers contributed by different authors on such subjects as flight testing of drone helicopters, proposed VTOL flight requirements, design and development of the shaft-driven fan-in-wing VTOL aircraft, design and development of jet VTOL aircraft, gas turbine design consideration for VTOL applications, and the history of flight.

This series of papers is the result of a conference held by the New York Academy of Sciences, December 10–12, 1962. The volume is designed to stimulate scientists and engineers to new and advanced effort and accomplishment.

ABC's of Lasers and Masers, Allan Lytel (Howard W. Sams & Company Inc., Indianapolis, Ind., 1963), 95 pp. $1.95.

Chapters: 1) Lasers and Masers; 2) Quantum Electronics; 3) Laser Modulators and Detectors; 4) Laser Power Supplies; 5) Laser Communications; 6) Laser Applications.

This book introduces the reader to the various devices used to produce microwave and light radiation. The background of microwave communication is covered in order to create a basic understanding of laser technology as an eventual replacement for present microwave communication systems.

Probabilities and Life, Emile Borel, translated from the French by Maurice Baudin (Dover Publications Inc., New York, 1962, orig. publ. 1943), 87 pp. Paperback reprint, $1.00.

Theory of Ship Motions, S. N. Blagoveshchensky, translated from the Russian by Theodor and Leonilla Strelkoff (Dover Publications Inc., New York, 1962, orig. publ. 1954), paperback reprint in two volumes. Vol. 1, 355 pp., $2.00. Vol. 2, 293 pp., $2.00.

An Introduction to Mathematical Probability, Julian Lowell Coolidge (Dover Publications, Inc., New York, 1962, orig. publ. 1925), 214 pp. Paperback reprint, $1.35.

An Elementary Introduction to the Theory of Probability, B. V. Gnedenko and A. Ya. Khinchin, translated from the Russian by Leo F. Boron (Dover Publications Inc., New York, 1962, orig. publ. 1961), 5th ed., 130 pp. Paperback reprint, $1.45.

Methods in Exterior Ballistics, Forest Ray Moulton (Dover Publications Inc., New York, 1962, orig. publ. 1926), 258 pp. Paperback reprint, $1.75.

The Principles of Electromagnetism Applied to Electrical Machines, B. Hague (Dover Publications Inc., New York, 1962, orig. publ. 1929), 359 pp. Paperback reprint, $2.25.

Technical Literature Digest

Propulsion and Power (Combustion Systems)

Zero Secondary Flow Ejector-Diffuser Performance Using Annular Nozzles, R. C. German, J. H. Panesci, and H. K. Clark. Arnold Eng. Dev. Center Rept. AEDC-TDR-62-196, Jan. 1963, 48 pp.

Development of Expulsion and Orientation Systems for Advanced Liquid-Rocket Propulsion Systems, Phase I. Bell Aerosystems Co., Progr. Rept., Air Force Space Systems Div., SSD-TDR-62-172, Nov. 1963, 308 pp.

The Design and Development of a Short-Duration Constant Pressure Combustor for Use in Rocket Base Heating Investigations, C. Matthis, R. Muench, and W. Richard. Cornell Aeronaut. Lab. Rept. HM-1510-Y-2, Dec. 1962, 41 pp.

Optimization Techniques with Applications to Aerospace Systems, edited by G. Leitmann (Academic Press, New York, 1962), 453 pp.

Propulsive Efficiency of Rockets, G. Leitmann, pp. 377–387.

Propulsion and Power (Noncombustion)

Acceleration of Plasma by Inductively Generated Electro-magnetic Fields, D. B. Miller. Michigan Univ., Dept. Elec. Eng. Rept. 02836-10-F, April 1961, 220 pp., 99 refs. (AFCRL-462). Ph.D. Thesis.

Magnetohydrodynamic Power Generation—Its Principles and Problems, W. C.