REVIEWS

Methods of Celestial Mechanics. By Dirk Brouwer and Gerald M. Clemence. (Academic Press, New York and London), 1961. Pp. 593. Price $15.50.

The book under review consists of seventeen chapters with the following titles: Elliptic Motion, Expansions in Elliptic Motion, Gravitational Attraction between Bodies of Finite Dimensions, Calculus of Finite Differences, Numerical Integration of Orbits, Aberration. Comparison of Observation and Theory, The Method of Least Squares, The Differential Correction of Orbits, General Integrals: Equilibrium Solutions, Variation of Arbitrary Constants, Lunar Theory, Perturbations of the Co-ordinates, Hansen's Method, The Disturbing Function, Secular Perturbations, Canonical Variables.

The first nine chapters deal in the usual manner with the fundamentals of classical celestial mechanics leading to the numerical computation of orbits. The remaining chapters deal with more recent work and contain much of the material that still exists in the original research papers. The treatment of Delaunay transformation and the motion of artificial satellite is novel and masterly.

The book has been written by two outstanding workers in the field. This fact is reflected in the clear, lucid and logical presentation of this rather difficult subject. If one ignores the briefness of the treatment of the numerical analysis, for which a number of good books is available, the book under review is an excellent contribution to the subject and every serious student or worker in the field will be benefited by its study.

P. L. BHATNAGAR.

Analysis of Deformation, Vol. 4. — *Waves and Vibrations.* By K. Swainger. (Chapman & Hall, Ltd., London), 1959, Pp. 370. Price 70 *sh.*

This book is the fourth of a five-volume treatise by the author on the continuum approach to deformation. The author presented an original theory of finite deformation in Vol. 1. In the second volume, the applications of the above theory were discussed. The third in the series dealt with Fluidity. The present volume follows in presentation and originality the first three volumes.

The formulation of the author's theory on deformation presented in the first volume is applied in this volume to the propagation of stress through, and on the surface of substances possessing different physical properties like elasticity, plasticity, fluidity and combinations of these effects. The book contains ten chapters and seven appendices. A selected list of references is given at the end. After introducing the fundamental concepts and equations for stress, strain, strain-velocity relationships, etc., in the first chapter, the author treats classical mathematical theories to analyse continua in the second chapter. The next seven chapters deal in detail several problems and their solutions regarding waves through fluids, plastic solids and visco-elastic solids and on elastic solids, fluids and visco-elastic solids. In chapter ten, entitled 'Geophysics', are treated topics on possible causes and origin of volcanoes and earthquakes and on the formation of mountains.

The seven appendices contain mathematical information on vector analysis, wave equations and their solutions, transcendental functions, potential theory, harmonic analysis and Lagrange's equations of motion. These are included to help the reader in following the book easily. Throughout the book, vector and dyadic notations are used and in spite of the several appendices, the complicated and unfamiliar symbolism makes the book difficult to study. But this will not come in the way of the usefulness of the book for all those interested in continuum mechanics.

K. T. S.

A Course of Mathematics for Engineers and Scientists. By Brian H. Chirgwin and Charles Plumpton. (Pergamon Press, Oxford, London), 1961. Vol. I: Pp. vi + 326. Price 25 *sh.*; Vol. II: Pp. vi + 382. Price 30 *sh.*

The books under review are the first two of a projected seven volume work aiming to cover the mathematics for science and engineering courses at British and Commonwealth Universities. Recognizing that the scientist engineer requires *answers* and wishes to employ mathematics to actual problems, the authors include all the basic material in the analytical processes of the calculus, provide enough exercises for gaining manipulative skill and introduce

problems illustrating the use of the analytical techniques in different fields like geometry and mechanics.

The first volume gives the techniques of differentiation and integration of functions of one variable, geometrical applications in two dimensions and has also a chapter on complex numbers. The six chapters of the second volume deal with the integration of ordinary differential equations, solutions of systems of linear algebraic equations using determinants, vector algebra, analytical solid geometry, partial differentiation and multiple integrals. Rigorous proofs have been avoided, but every basic result is fully clothed with a precise mention of the underlying assumptions. A particularly praiseworthy feature of the volumes is the inclusion of a large number of well-arranged and well-graded exercises which often supplement the contents. There is more coverage of matter in the two volumes than meets the reader's eye in a casual glance.

The presentation has a pleasing style, marked for the clarity and conciseness of statements. The present volumes are to be heartily welcomed by all who have concern with instruction in mathematics to first degree courses in science/engineering/technology. One should eagerly look forward for the further volumes of the proposed project. S. K. L.

Introduction to Thermodynamics of Irreversible Processes. By I. Prigogine. (2nd Edition), (John Wiley and Sons, Inc., Interscience Division, 440, Park Avenue South, New York 16, N.Y.), 1962. Pp. xi + 119. Price $ 5.00.

The laws of classical thermodynamics and their application to physico-chemical processes on a macroscopic scale, are essentially based on concepts of "reversible processes" and "true equilibrium states". However, it is increasingly recognized now that true thermodynamic equilibrium is only attained in exceptional conditions.

Radioactive tracer techniques have shown that nucleic acids contained in living cells continuously exchange matter with their surroundings. Again, on a larger scale, the steady flow of energy originating from the sun and the stars prevents the atmosphere of the earth or stars from reaching a state of thermodynamic equilibrium.

These examples show that there exist a large number of phenomena in biology, meteorology, and astrophysics which are essentially irreversible processes.

The first edition of this book which appeared in 1955 was a timely publication which gave an outline of the thermodynamics of irreversible processes, and introduced the reader to the latest developments in this field. The popularity of the book has demanded a reprint. The only change in the second edition are (*i*) the addition of a section to Chapter V dealing with "continuous systems", (ii) Non-linear Problems which was included in the first edition as an appendix, appears in the present edition as Chapter VII.

Retardation of Evaporation by Monolayers—Transport Processes. Edited by V. K. La Mer. (Academic Press, New York, London ; India : Asia Publishing House, Bombay-1), 1962. Pp. xx + 277. Price $ 10.00.

The problem of conserving water in lakes and reservoirs by suppressing the rate of evaporation is of great practical importance, especially in the tropical and arid zone countries.

Large cities are faced with what has come to be a perennial problem, namely, the supply of water, adequate in amount and safe in quality, to their constantly growing populations. Many of the advanced cities, side by side with their plans for increasing the reservoir capacity of storage water, have shown an awareness for using scientific methods for preventing loss of the stored water by evaporation.

The idea that the rate of evaporation of water could be suppressed by applying a film of an oily substance is a very old one, but the cost of applying a film thick enough to be effective on a large body of water precluded serious consideration for a long time. The discovery that some substances spread spontaneously on water to produce a film only one molecule thick, *i.e.*, a monomolecular layer or monolayer, furnished a new impetus to the subject. Early theoretical work on the study of monomolecular layers was largely due to Langmuir and Rideal.

Two long chain alcohols which have received considerable attention in studies of reduction of evaporation from reservoir surfaces are hexadecanol, abbreviated by the symbol C (16) OH, and octadecanol, C (18) OH.

There are various problems connected with the use of chemical surface layers for suppression of evaporation. The transport of respiratory and toxic gases through monolayers is a matter of great importance for the maintenance of aquatic life, both plant and animal. Again, bacterial activity in the monolayer films used

may affect the efficiency of suppression of evaporation.

The volume under review contains 18 papers presented at the symposium held by the American Chemical Society in New York, September 15, 1960. They touch on various aspects of the physics and chemistry of monolayers with special reference to their use in suppression and retardation of evaporation leading to water conservation on a large scale.

The papers in the first half of the volume deal with theoretical aspects of the subject, while the later papers are practical in nature and describe the results achieved in the field by the use of different methods.

There is no doubt that the book will be of interest not only to scientists working in this discipline but also to administrators and engineers who have to do with water resources and water supply.

A. S. G.

Solid State Physics (Vol. XI)—Advances in Research and Applications. Edited by F. Seitz and D. Turnbull. (Academic Press, New York and London; India: Asia Publishing House, Bombay-1), 1960. Pp. xvi + 438. Price $ 12.50.

Among the new branches of physical research that have come to the fore within the last two decades, physics of the solid state seems to be the most profitable line of research in that the results obtained here are commensurate with the efforts put in. That this is so is apparent not only from the contents of the volumes in this series but also from the rapidity with which these volumes are being issued. Nuclear physics is a keen competitor in the field, but then the centres of activity are not so numerous and so widely distributed as in the case of solid state research. One reason for the lively activity in solid state physics is that it is immediately connected with almost every branch of physics, *e.g.*, high pressure, low temperature, conductivity super- and semi-, spectroscopy, NMR and EPR, neutron diffraction, etc.

The present volume contains five articles reviewing the latest developments in the fields concerned. They are (1) Semiconducting Properties of Gray Tin by G. A. Busch and R. Kern, (2) Physics at High Pressure by C. A. Swenson, (3) The Effects of Elastic Deformation on the Electrical Conductivity of Semiconductors by R. W. Keyes, (4) Imperfection Ionization Energies in CdS-type Materials by R. H. Bube, and (5) Cyclotron resonance by B. Lax and J. G. Mavroides.

The major article in this volume is the one on Cyclotron Resonance which occupies nearly a third of the book. The basic idea in the phenomenon, namely, the principle of the cyclotron, is well known. An electron in a dc magnetic field traces out a helical path with axis along the direction of the magnetic field, and with the cyclotron frequency $\omega = eH/mc$. If an alternating electric field of frequency ω, is impressed transverse to H, then in addition to the rotational frequency ω_c, the electron (or charged particle) will oscillate simultaneously at the frequency ω as well. If further, $\omega = \omega_c$, the particle will gain energy resonantly from the alternating electric field, with the results that its orbit will be a spiral of an ever-increasing radius. This will continue till the charged particle collides with a neutral atom.

Though the cyclotron resonance phenomenon has been known for some time and its manifestations in ionized gases have been extensively investigated, it is only recently that its application to solid state physics began, and already dramatic results have been obtained. Now this technique has proved to be a most sophisticated and valuable tool for studying the basic electronic properties of charged carriers in solids. The article gives an up-to-date survey of the progress made so far in this field and also indicates some of its practical applications that may be realized in the future.

The article on Physics at High Pressure describes recent developments in high-pressure techniques, with special reference to applications in the low temperature region, and gives many new experiments in which these improved techniques have been used. The results obtained in the various fields of study are given in detail and discussed.

The change of resistivity of a solid as a result of the introduction of an elastic strain is a well-known phenomenon. It has been recently found that this piezoresistance effect is quite large in many semiconductors. These large effects can be interpreted in terms of parameters of the electronic wave functions of the semiconductor and their study provides a useful tool for the investigation of various features of the electronic structure in semiconductors. The article deals in detail with this aspect of the subject.

Volume XI of Solid State Physics maintains the high standard of the previous volumes in this series. At the end of the present volume there is a cumulative subject index for volumes I to X.

A. S. G.

Vocabulary of Mechanics (*in five languages*). (Pergamon Press Ltd., London), 1962. Pp. vii + 190. Price £ 5 or $ 15.00.

In the *Vocabulary of Mechanics* about 1,000 important and fundamental terms involved in Mechanics are listed in the five languages, English, German, French, Polish and Russian. The plan adopted is to give the term first in English followed by a concise but clear definition of the term, also in English. Then are entered the equivalents of the term respectively in German, French, Polish and Russian.

The vocabulary is divided analytically into two groups, namely, theoretical mechanics and strength of materials. The vocabulary is authoritative in that it conforms to the terminology recommended by competent scientific Boards of Terminology of the countries concerned.

A third of the book is devoted to five separate indexes in the five languages concerned which will facilitate easy references.

This will be a useful reference book for those engaged in mechanics whose work entails German, French, Polish and Russian translations.

The Action of Insulin on Cells. By M. E. Krahl. (Academic Press, Publishers, New York and London), 1961. Pp. ix + 202. Price $ 7.50.

An account of the current investigations on the mechanism of insulin action has been given in the book under review in a clear and concise measure. The book is divided into ten chapters, the first of which is of an introductory nature emphasizing the importance of the studies on the effect of insulin upon carbohydrate, lipid and nitrogen metabolism. The next four chapters deal essentially with the principal insulin responsive tissues such as muscle, adipose tissue and liver. Detailed effects of insulin on these tissues are elegantly described. The sixth chapter is devoted to the effects of insulin on cell permeability. The influence of insulin on the transport of glucose and natural l-amino-acids and on the anabolic events like the formation of glycogen and incorporation of amino-acids into proteins are briefly outlined.

The relation of insulin to the products of the anterior pituitary and adrenal glands form the subject-matter of the seventh chapter. In the eighth, the author deals with the interactions of insulin with substances of biological interest. It is shown, how insulin can counteract the inhibitions of phosphoglucomutase, phosphorylase and muscle hexokinase by Zn^{++}, protamine and lipoproteins respectively. The possible relation of these interactions to the biological action of insulin has also been considered. The important aspect of any biologically active protein namely, the relation between structure and activity is treated in the next chapter, which also deals with the factors governing the three-dimensional structure of insulin in solution and about the substances interacting with insulin.

There is a concluding chapter in which the author sets down his speculations on insulin action. He has proposed a mechanism which he claims as a general one to include all the known effects of insulin. However, he admits the weakness in his general speculative scheme due to the difficulty in securing experimental data to support the same. A pleasing feature of this concise volume is the provision at the end of each chapter of a brief summary and a list of valuable references for supplementary study. Taken as a whole, the volume should prove of considerable value to research workers in physiology and biochemistry interested in the action of insulin and other hormones.

P. S. Sarma.

Pharmaceutical Analysis. Edited by T. Higuchi and E. Brochmann-Hanssen. (Interscience Publishers, New York and London), 1961. Pp. 854. Price $ 25.50.

Analytical chemists in the pharmaceutical industry, as well as in those chemical industries that produce pharmaceutical raw materials have to be conversant with techniques for accurately determining small amounts of potent drugs in bulk, particularly in the presence of their degradation products and/or interfering drugs and excipients. While general principles of analysis are outlined in many publications, they are not very helpful in developing new methods for specific needs of this rapidly advancing industry.

This volume presents selected methods currently used by some of the leading pharmaceutical firms in America and the rationale behind these techniques.

The scope of the book is confined to essentially organic pharmaceuticals with only short sections devoted to drugs containing heavy metals.

The analytical methods available for the following groups of compounds have been critically discussed. Hydroxybenzoic acids and their derivatives, carbohydrates and glycosides, steroids, sulfonamides and sulfones, derivatives of carbamic acid and urea, amino-acids, alkaloids and other basic nitrogenous compounds, the

antipyretic analgesics, antibiotics and vitamins. The metal containing organic compounds detailed include organo mercurials and organic compounds containing gold, silver, zinc, lead, manganese, magnesium, aluminium and iron.

The relative merits and demerits of the analytical procedures have been evaluated and an effort has been made to present the basic underlying principles of the techniques adopted. The inclusion of the theoretical review of the physical-chemical factors involved in non-aqueous titration is a special feature of the presentation.

M. SIRSI.

Science Progress. (Edward Arnold Publishers Ltd., 41 Maddox Street, London W. 1), Price 15 *sh.*

The current issue of *Science Progress*, Vol. 50, No. 199, July 1962, contains the following articles: "On the biology of sand-dwelling ciliates" by Dr. Jean Dragesco; "Cerenkov radiation" by R. E. Jennings; "Recent advances in the investigation of meteorites" by M. H. Briggs; and "Some ice electrification processes" by J. Latham. There are the usual items on Recent advances in science, and Book Reviews.

Books Received

The Wealth of India—Raw Materials (Vol. VI) L-M. (Council of Scientific and Industrial Research, New Delhi), 1962. Pp. xxx + 483. Price Rs. 40 or 80 *sh*

Fluctuation Relaxation and Resonance in Magnetic Systems. Edited by D. ter HAAR. (Oliver & Boyd, London W-1), 1962. Pp. viii + 320. Price 63 *sh.*

A Laboratory Manual—Ionization Constants of Acids and Bases. By Adrien Albert, E. P. Serjeant. (Methuen & Co. Ltd., 36 Essex St., Strand, London W.C. 2), 1962. Pp. xii + 179. Price 21 *sh.*

Low Temperature Physics (5th Edition). By L. C. Jackson. (Methuen & Co., London W.C. 2), 1962. Pp. vii + 158. Price 18 *sh.*

Laboratory Organization and Administration. By K. Guy. (Macmillan & Co., London), 1962. Pp. xiv + 386. Price 50 *sh.*

Graft Incompatibility Fruit Trees. By Barbara Mcrse. (Commonwealth Agricultural Bureaux, Farnham House, Nr. Slough, Bucks), 1962. Pp. vi + 36. Price 7 *sh.* 6 *d.*

An Introduction to Dimensional Method. By E. W. Jupp. (Cleaver-Hume Press Ltd., London W. 1), 1962. Pp. 89. Price 12 *sh.* 6 *d.*

Science and Civilisation in China (Vol. IV), No. 1. By Joseph Needham. (Cambridge University Press, London N.W. 1), Pp. xxxiv + 434. Price 84 *sh.*

A Text-book of Zoology (Vol. II), 2nd Edition. By T. J. Parker and W. A. Haswell. (Macmillan & Co. Ltd., London W.C. 2), 1962. Pp. xxiii + 952. Price 70 *sh.*

Report of the Rothamsted Experimental Station for 1961. (Rothamsted Experimental Station, Harpenden, Herts), 1962. Pp. 296.

Functions of a Complex Variable and Some of Their Applications. By B. A. Fuchs and V. I. Levin. (Addison-Wesley Pub. Co., Reading, Mass., U.S.A.), Pp. x + 286. Price $ 7.00.

Calculus Variations. By L. E. Elsgolc. (Addison-Wesley Pub. Co., Reading, Mass., U.S.A.), 1962. Pp. 178. Price $ 4.50.

The Physical Chemistry of Metallurgical Processes. By A. K. Biswas and G. Reginald Bashforth. (Chapman & Hall, London W.C. 2), 1962. Pp. xi +336. Price 50 *sh.*

International Review of Cytology (Vol. 13). Edited by G. H. Bourne and J. F. Danielli. (Academic Press, Inc., New York), 1962. Pp. v + 393. Price $ 15.00.

Introduction to Set Theory and Topology. By K. Kuratowski. (Addison-Wesley Pub. Co., Reading, Mass., U.S.A.), 1962. Pp. 283. Price $ 6.50.

Introduction to Calculus. By K. Kuratowski. (Addison-Wesley Pub. Co., Reading, Mass., U.S.A.), 1962. Pp. 315. Price $ 5.00.

Line Telegraphy. By P. N. Das. (Modern Book Agency, Calcutta-12), Pp. 179. Price Rs. 7·50.

Curvature and Homology. By Samuel I. Goldberg. (Academic Press Inc., New York-3), 1962, Pp. xvii + 315. Price $ 8.50.

Horizons in Biochemistry—Albert Szent Gyorgyi Dedicatory Volume. By Aichael Bernard Pullman. (Academic Press, N.Y.), 1962, Pp. xiv + 604. Price $ 16.00.