

REVIEWS

Physics of Meteor Flight in the Atmosphere.

By Ernst J. Opik. (*Interscience Tracts on Physics and Astronomy*, No. 6; Interscience Publishers, Inc., New York 1), 1958. Pp. viii + 174. Price: Paper Bound \$ 1.95; Hard Bound \$ 3.85.

This booklet is mainly a theoretical tract dealing with the many problems associated with the flight of meteors through the upper atmosphere of the earth. The physical approach to the problems consists in predicting the variation of mass, velocity, luminosity, and ionization along the meteor trajectory.

The major part of the book is devoted to collisions, energy transfer, ablation and meteor radiation. The radiation and ablation of meteors take place in proper altitudes prescribed by a kind of 'natural selection' depending on size and velocity.

For the purpose of treating the processes occurring in collisions, meteors are divided into two classes, (i) when the free path of the air molecules is smaller than the linear dimension of the meteor, in which case the collision is preceded by the formation of a hydrodynamic cushion, or air-cap, in front of the meteor, thus impeding the heat transfer, and (ii) when the free path is greater than the radius of the meteor, in which case no air-cap is formed and the impact momentum and energy are transmitted to the nucleus of the meteor by direct hits of the air molecules.

Meteor sizes vary from .03 to 10 cm. The velocity range of visible meteors is between 20 and 70 km./sec. Micrometeors with radii often between 10^{-3} and 10^{-4} cm. offer a special problem. They are too small to be observed with optical means but, are however, rendered "observable" by their direct impact on receivers sent up in rockets. They form the bulk of the zodiacal-light cloud and their mass per volume of space greatly exceeds that of all other meteors taken together. Entering the atmosphere at a low speed of 12 km./sec. which is only slightly in excess of the escape velocity 11.2 km./sec., they undergo very little evaporation, and are eventually collected from the deep-sea clay as the well-known cosmic spherules.

The author who is well known for his special studies and contributions in meteor theory has encompassed in this little tract a good deal

of theoretical as well as practical information which will provide a basis and a background for further research in the physics of meteors.

A. S. G.

Scientific Uses of Earth Satellites. Edited by James A. Van Allen. (The University of Michigan Press, Ann Arbor), 1956. Pp. x + 316. Price \$ 10.00.

This volume is a compilation of 33 papers presented by leading scientists in the field of planetary physics, at a meeting of the Upper Atmosphere Rocket Research Panel (U.S.A.) in 1956. These describe the advances that have been so far made and the possible contributions artificial satellites can make to our knowledge of the Universe.

The authors in their respective papers have described the nature of the experiments that are likely to be conducted in the particular field.

The usefulness of an earth satellite in studying the meteorology of the earth is reviewed. A single geiger tube or scintillator carried in the satellite will make possible the study of the cosmic intensity above the atmosphere. The possibilities of exploring the atmosphere with a satellite-borne magnetometer and measurement of earth's magnetic field from a satellite vehicle are discussed in detail. A method for measuring the influx of meteoric particles into earth's atmosphere, based on the detection of the acoustical energy generated upon impacts, is described.

The volume under review presents current thinking of leading scientific experts on satellites and describes rapid advances that were made in the science of artificial earth satellites.

S. B.

Electroanalytical Chemistry. By James J. Lingane. Second Edition. (Interscience Publishers, Inc., New York 1), 1958. Pp. xiv + 669. Price \$ 14.50.

The first edition of this book was published in 1953. During the five years the applications of electroanalytical technique have expanded in its different aspects and to cope with this expansion the present edition has been revised and considerably enlarged. The new chapters added are (i) Chapter II on electrical measure-

ments which, though of an elementary nature, makes the book self-sufficient by providing the necessary background for the understanding, by beginners, of the specialised instruments described in individual chapters; (ii) Chapter XI on polarographic analysis which was omitted in the first edition for the obvious reason that the author himself, along with I. M. Kolthoff has written a standard and exhaustive monograph on this most fruitful branch of electroanalytical chemistry. In this chapter the essential principles of polarographic analysis are given leaving the details to references in the bibliography. (iii) Chapter XII on amperometric titrations and (iv) Chapter XXII on chrono-potentiometry which discusses the technique of obtaining and using the potential-time curve for analytical purposes.

The subject of coulometric titration has been dealt with, in the present edition, in two separate chapters, one on instruments and technique, and the other on its many applications. Coulometric titration has two main advantages, viz., that it can more easily be automatised than the ordinary volumetric titration, and that it eliminates the need for standard titrant solutions.

Standard potentials of important half-reactions of the elements and their compounds which are very often needed in electroanalytical processes are given in the 13 pages of the Appendix.

This revised and enlarged edition makes the book a comprehensive monograph on the subject and there is no doubt that it will be of great use to graduate students and those who are to be initiated in the special branch of electroanalytical chemistry. The printing and get-up of the book are of the high standard characteristic of Interscience Publications.

A. S. G.

Radioisotopes in the Service of Man. By Fernand Lot. (UNESCO, Place de Fontenoy, Paris-7). 1959. Pp. 82. Price \$ 1.00.

The applications of artificial radioactive elements are becoming increasingly wider and often spectacular and the present time may be truly called the era of radioisotopes. In this little book under review which forms the sixteenth in the series of information pamphlets issued by the UNESCO, up-to-date information is given on the various aspects of radioisotopes in the service of man. It traces the discovery of natural and artificial radioactivity, the production of radioactive isotopes and the methods of detecting the radiations given off by them. Then follow chapters on applications of radio-

isotopes in medicine, industry, science and technology; their use in the improvement of soils, plants and animals and in technical developments, as for example, in metallurgy and petroleum industry.

The discovery of radio cobalt (Co 60) and the comparatively easy method of producing it in atomic piles, has made radiotherapy not a luxury treatment but available at reasonable cost to all who need it. The new technique in the control of radiation from radiocobalt in what is come to be known as the cobalt "bomb" has enabled its use as a source for gamma radiation at a distance, and the cobalt teletherapy apparatus for treatment of various types of tumours is finding increasing use and has become almost a routine equipment in anti-cancer clinics.

The pamphlet is written in simple language is profusely illustrated and provides informative reading.

Metabolic Factors in Cardiac Contractility.

By F. N. Furness, M. Selzer and M. M. Gertler, Editors. (New York Academy of Sciences), 1959. Pp. 171. \$ 3.75.

This volume which contains a series of papers presented at a conference held on March 18 and 19, 1958, is another tribute to the policy of the New York Academy of Sciences in selecting controversial subjects for their symposia.

The papers are selected on the working hypothesis that "one of the principal and final causes of congestive heart failure is in essence a failure of the available chemical energy to be transformed and utilized as mechanical energy by the heart". This energy is required not only for maintaining the muscular activity of the heart but also for maintenance of intracellular volume since in heart diseases we find that the tissues cannot keep out water and become swollen. The bulk of the papers in this volume, therefore, deals with oxidative phosphorylation associated with carbohydrate metabolism and the physiological effect of ions in regulating cell volume. There is also one paper on the concentration of ions other than sodium and potassium in heart diseases. The papers are presented by clinicians, physiologists, biochemists, biophysicists and physicists so that persons of one discipline can gain from the knowledge of others.

The controversial nature of the problem of the role of energy in the normal working of the heart can be realised from a recent paper (*Nature*, 1959, 183, 997) where it has been shown

that swelling of mitochondria takes place under conditions favourable to oxidative phosphorylation. The authors have, therefore, not drawn any definite conclusions about the actual reasons for congenital heart failure. Nevertheless, a wealth of information has been presented on different aspects of the problem by masters in the field like E. Racker, M. F. Utter, S. Grisolia, T. P. Singer, G. W. E. Plaut, R. J. Podolsky and others. This volume is an important contribution to our knowledge of cardiac contractility.

T. RAMAKRISHNA.

British Medical Bulletin—Haematology, Vol. 15, No. 1. (Published by the Medical Department. The British Council, London, W. 1; India: Oxford University Press), 1959. Pp. 83. Price 20 sh.

The application of the newer techniques of chromatography, electrophoresis, immunochemistry, tissue culture and radio isotopes, in elucidating the many, still unsolved problems of hæmatology, has yielded interesting results.

Some aspects of these studies, in this Bulletin, particularly those pertaining to the metabolic studies of the hæmatics, Iron, Folic acid and Vitamin B₁₂; Biosynthesis, chemistry and inheritance of human hæmoglobins; origin and life-history of the cellular constituents of the blood and bone marrow and the hæmatology pathogenesis and treatment of hæmolytic syndromes are highly informative.

The new concept of 'molecular disease' as applicable to hæmoglobinopathies and the chemistry of abnormal hæmoglobins has given valuable insight into the action of genes and the fine control exercised by them. The lucid presentation of this theme has definitely enhanced the value of this volume to all research workers engaged in the study of the pathogenesis of diseases in general and blood dyscrasias in particular.

M. SIRSI.

Endocrine Control in Crustaceans. (Cambridge Monographs in Experimental Biology. No. 10.) By D. B. Carlisle and Sir Francis Knowles. (Cambridge University Press, London.) Pp. 120. Price 21 sh.

Although the terms 'internal secretions' and 'chemical messengers' had been introduced to physiology in the XIX century by Claude Bernard, and Brown-Sequard and d'Arsonval respectively, the concept of a chemical co-ordination of functions in the animal body was developed much later (1904) by Bayliss and

Starling, in whose laboratory the name 'hormone' was invented, and the first recognisable hormone, *secretin*, was discovered. Ever since, the study of vertebrate hormones has made phenomenal progress, but there was no clear proof of the existence of a hormone in invertebrates until 1928, when Koller showed that the contraction of the chromatophores of the shrimp is caused by a substance in its eye stalk. Thus, invertebrate endocrinology, in particular crustacean endocrinology, started.

The book under review is an authoritative and accurate account of the progress of crustacean endocrinology during the last thirty years, written by authors, who themselves have made very significant contributions to the development of the subject.

Crustacean endocrinology, as described in this book, shows three phases of development. During the first phase (1929-39), the presence of chromactivating hormones was demonstrated and the sinus gland was suggested as the source of these substances. During the second phase (1939-50) it was shown that there were several distinct chromactivating substances and that various aspects of metabolism, growth and development were under hormonal control. It was during this phase that suspicion also arose that the sources of hormones were within the nervous system. During the third phase of crustacean endocrinology (1951—) it has been shown that the endocrine systems in Crustacea are neurosecretory, and that the hormones are produced in modified neurones and transferred along the axons to the sites of release into the blood.

What about the future lines of investigation? The unravelling of the structure of the neurosecretory cells under the electron microscope and the biochemistry of their hormones will be the main lines. These lines have been already started, and it has been shown that the chromactivating hormones are peptide in nature, whereas the ovary-inhibiting hormone is a steroidal substance. Then there are also the lower crustacea to be investigated. Further progress in crustacean endocrinology may be expected to throw some light on the significance of neurosecreting mechanisms in the animal kingdom and also on the comparative evolution of the nervous and chemical co-ordinating mechanisms.

The book is written with scientific insight and includes over 250 original references. It will be useful not only to students of crustacean endocrinology but to all interested in a physiological approach in biology.

The format of the book is good, and the illustrations, which are clear and instructive, add to the scientific value of the book.

R. V. SESHAYYA.

Mechanical Cultivation in India. By Dr. D. A. Gadkary. (The Manager, Publications, Civil Lines, Delhi), 1957. Pp. vii + 147. Price Rs. 7-25.

This is a monograph published by the Indian Council of Agricultural Research with a Foreword by the Minister of Food & Agriculture and a Preface by the Vice-President of the Council. The book contains all the information collected from various States on subjects, like the scope for mechanical cultivation in the country, farm machinery and its use in different areas, maintenance of machinery and organisational problems. The subject-matter is divided into four chapters with an extensive set of appendices and a short bibliography.

Mechanisation in its wide sense is usually taken to include not only power-driven equipment like tractors, but also improved agricultural implements worked by hand and bullock power. The present publication, however, deals only with the former. Mechanisation for particular types of work is now accepted as an essential element in increasing crop production in the country. It is also accepted that mechanical cultivation would be feasible only if farmers group themselves into co-operative societies and have a central pool of machines for cultivation.

The limitations and the scope for mechanical cultivation is sufficiently explained in Chapter I. Some idea has also been given of the minimum acreage that would be required for the economic employment of tractors. There is enough evidence to show that conducting agricultural operations with power-driven machines has by itself no advantage in respect of yield though it does give a better tillage and more uniform depth of ploughing. The main feature, however, is that the use of tractor enables agricultural operations to be conducted in a more timely manner. There is also no conclusive data to show that the cost of agricultural operations per acre by tractors is cheaper than cultivation by bullocks. But with large holdings, a combination of tractors and bullocks might become more economical.

Various farm machinery and power-driven implements, like ploughs, harrows, drills, harvesters, etc., are described in Chapter II and the functions of different implements are also

given. In Chapter III which deals with the selection and maintenance of equipment, the conditions under which the different types of tractors that should be used and the functions and detailed structure of different machines is given. The organisational aspects are described in great detail in Chapter IV. This chapter deals with the ideal set up of the organisation, how the organisation should be split up into units and the details of the equipment necessary for each unit. Information is also provided of the staff required, methods of collecting data and utilising such data.

While points that should be taken into consideration in selecting a suitable machine are discussed, it is still unrealistic to expect Indian farmers to do the testing before final choice is made of the particular type required. This has to be done only by the Government department and although information on the suitability of machines for particular types of work is already available, as for instance work involved in soil conservation, it cannot be said that we have still data to recommend to the farmers as to what particular type of machine he should purchase with reference to his soil and cropping conditions. The book can be of great value to technicians rather than to farmers.

K. R.

British Medical Bulletin—Causation of Cancer. Vol. 14, No. 2. (Medical Department, the British Council, 65, Davies Street, London W. 1). May 1958. Pp. 73-196. Price 25 sh.

This special number comprises of 21 papers by 27 leading research workers of Great Britain and the Commonwealth. The subject-matter may be broadly divided under four headings:

(i) Chemical Carcinogenesis, (ii) Occupational Carcinogenesis, (iii) Radiation Carcinogenesis and (iv) The Dynamic Aspects of Carcinogenesis.

(i) *Chemical Carcinogenesis.*—Prof. A. Haddow in his introduction has first outlined general progress of work on the causation of cancer during last eleven years and then authoritatively surveyed the subject of chemical carcinogenesis of hydrocarbons, azo compounds and aromatic amines. Although the field of cancer in general is too full with theories and working hypothesis, Prof. Haddow's critical appraisal of some of the current concepts of carcinogenesis facilitates much clearer understanding of the problem.

Dr. Boyland has critically examined biological aspect of carcinogen testing.

Dr. Orr in his short paper on irreversible changes in chemical carcinogenesis has presented his views on the latent period in chemical induction of skin cancer. Salaman has reviewed work on co-carcinogenesis since 1947 and has discussed the present position of the multistep theory. Peacock, himself an active investigator in the field of avian carcinogenesis, has traced the development of our knowledge in this field since the first successful experimental induction of sarcoma by Rous in 1911.

Bielschowsky and Horning have carefully discussed the mechanism of carcinogenesis in various tumours of endocrine organs as pituitary, ovary, adrenal, testes, etc., as well as in the disease of other tissues as kidney, bone, liver, leukæmia, etc., indirectly controlled by hormonal imbalance.

(ii) *Occupational Carcinogenesis*.—In occupational carcinogenesis exogenous factors responsible for the causation of lung cancer have been reviewed by Kennaway and Lindsey. This paper covers chemical investigations on tobacco, tobacco smoke and town air in relation to the incidence of cancer of the lung and respiratory tract. Lately mineral oil carcinogenesis and azo compounds and aromatic amines of dyestuff industry have been attracting considerable attention and this has been covered by Cook, Carruthers and Woodhouse and also by Walpole and Williams.

(iii) *Radiation Carcinogenesis*.—In radiation carcinogenesis, valuable data of Court-Brown on incidence of leukæmia among the survivors of atomic explosions and on patients irradiated for diagnostic or therapeutic purposes should be of great interest, because of increasing awareness of radiation hazards. Glucksman reports the yield of skin tumours induced by irradiation in varying doses and compares them with carcinogen induced skin tumour and its induction period. The work of Doniach in experimental induction of thyroid tumours can be applied to that of hyperthyroid patients treated with I^{131} and role of pituitary for the secretion of thyroid-stimulating-hormone (TSH) is further stressed.

(iv) *Dynamic Aspects of Carcinogenesis*.—Dynamic aspects of chemical carcinogenesis in relation to metabolism and excretion of carcinogens, their growth inhibiting and enzyme inhibiting action and tissue metabolism are discussed by Elson.

Prof. Green has elaborated his concept of immunological basis of carcinogenesis in the light of relevant literature. The origin of this theory is in the tumour-inhibiting (TI) action

of carcinogenic polycyclic hydrocarbons on some transplantable tumours. The hypothesis of protein binding nature of carcinogen—confirmed by several other workers—is taken as the basis and this binding is presumed to change protein complexes of the cell and with it a certain degree of isoantigenic loss, because of which the new race of cells does not recognize growth-regulating mechanism—the condition ultimately leading to uncontrolled neoplastic growth. The hypothesis now appears much more acceptable and thought-provoking.

The material on various aspects of 'Causation of Cancer' so neatly arranged, is a valuable reading for every worker in the field of Cancer Research, for proper understanding of the newer concepts of the problem of carcinogenesis.

KAMAL J. RANADIVE.

Books Received

- Nuclear Reactor Physics—A Practical Text and Guide for Design Analysis of Nuclear Reactors.* By R. L. Murray. (Macmillan & Co., London W.C. 2), 1959. Pp. xi + 317. Price 30 sh.
- Differential Thermal Analysis as Applied to Building Science.* By V. S. Ramachandran and S. P. Garg. (Central Building Research Institute, Roorkee). Pp. vii + 182.
- Fallacies in Mathematics.* By E. A. Maxwell. (Cambridge University Press, London N.W. 1), 1959. Pp. 95. Price 13 sh. 6 d.
- Modern Fishing Gear of the World.* By H. Kristjonsson. (Fishing News Books Ltd., 110, Fleet Street, London E.C. 4), 1959. Pp. xxxi + 607.
- Synthesis of β -Amino, α - β -Unsaturated and Bis-(Aminoaryl) Sulphones.* By M. Balasubramanian. (The Registrar, Annamalai University, Annamalaiagar). Pp. iv + 89.
- Solvent Extraction of Vegetable Oils.* By H. V. Parekh. (The Secretary, Indian Central Oilseeds Committee, Hyderabad-1-Dn.), 1958. Pp. xi + 210.
- The Varaspathi Industry.* By Gopal. S. Hattiangdi. (The Secretary, Indian Central Oilseeds Committee, Hyderabad-1-Dn.), 1958. Pp. v + 100.
- Bacteriophages.* By M. H. Adams. (Interscience Pub., Inc., New York-1), 1959. Pp. xvii + 592. Price \$ 15.00.
- The Chemistry of Natural Products, Vol. II. Mono and Sesquiterpenoids.* 1959. Pp. vii + 320. Price \$ 7.50; Vol. III. *The Higher Terpenoids.* By P. De Mayo. Pp. vii + 239. Price \$ 6.00. (Interscience Pub., New York-1).