

REVIEWS

Infrared and Raman Spectra of Polyatomic Molecules. By Gerhard Herzberg. (D. Van Nostrand Company Inc., New York), 1946. Pp. xiv + 632. Price 50 sh.

Prof. Herzberg, whose investigations in the field of molecular spectra are well known, has planned a trilogy dealing with the entire field, and the present book is the second in the series, the first being *Molecular Spectra and Molecular Structure I: Diatomic Molecules* (Prentice Hall, New York, 1939). A further volume on *Electronic Spectra and Electronic Structure of Polyatomic Molecules* is promised. When added to his *Atomic Spectra and Atomic Structure* (Dover Publications, New York, 1944), the series will form an exhaustive source of information on atomic and molecular spectra.

The subject is dealt with in an authoritative and detailed manner characteristic of German scholarship at its best, and the presentation is lucid and illuminating, with numerous illustrations in the best American tradition. The appearance of the book is most opportune since the subject of the spectra of polyatomic molecules is just at that stage where after much spadework by pioneers, a rapid development is being achieved by an increasing army of workers. There is a dearth of completely satisfactory accounts of the field and Prof. Herzberg's books supply the want in an eminently suitable manner. An enthusiastic welcome is, therefore, certain to be received. We can only add that such a welcome is highly deserved. His book on the spectra of diatomic molecules has already become the standard text in the field, and there is no doubt that the present book will take a similar place. We shall, therefore, give an indication of the contents of this work.

After a preliminary chapter dealing with symmetry elements and symmetry operations, the book begins with the theory of rotation spectra taking linear, symmetric top, spherical top and asymmetric top molecules in turn. The next chapter deals with the classical and wave-mechanical treatment of normal vibrations, anharmonicity and isotope effect in great detail. The theory is illustrated by the consideration of infra-red and Raman vibration spectra in the next chapter which also includes a detailed discussion of the spectra of particular molecules. Rotation-vibration spectra, dealt with in the fourth chapter, are particularly well illustrated with photographs, this field being illuminated by the researches of the author and his co-workers. A final chapter on applications includes sections on the calculation of thermodynamic quantities and the nature of liquid and solid states. The discussion in this last section is so inviting that one regrets that Prof. Herzberg has not added his critical appraisal of a number of researches whose results were somewhat of a controversial character; but possibly a book is not the best place to deal with controversial matters.

Although there are some very good books dealing with Raman Spectra, the author's pre-

sentation gains in value by the sure touch of a teacher's instinct with which Prof. Herzberg has chosen the best treatment and the thorough manner in which classical theory and its wave-mechanical modification and improvement are consistently blended from the beginning to the end of the book. The number of diagrams and tables is large—we may say lavish—even by American standards. The immense material surveyed, digested and critically served up for the reader's edification can be gauged by the list of 29 books and 1,055 original papers given in the bibliography, and the subject index running to 65 pages makes all this material available for selection at a moment's notice. The book thus provides immense help and counsel to anyone who wants to get acquainted with this rather intricate and difficult field. The appreciation here attempted is a result of a sense of having had an urgent want well supplied and a conviction that a similar sense of thankfulness is bound to arise in the mind of every reader who turns to this book for instruction and guidance. Prof. Herzberg can very well have the satisfaction of having completed a particularly useful and difficult task in a manner calculated to earn the gratitude of a large number of readers. The fame of the publishers is a guarantee to the excellence of the typography and binding, although the present reprint has had to eschew the use of the best paper on account of war economy. The book is an indispensable addition and ornament to the library of every spectroscopist and an inexhaustible mine of information to every research worker in this subject. We extend to it a hearty welcome and eagerly look forward to the promised volume which is to complete the trilogy.

T. S. SUBBARAYA.

Fundamental Principles and Applications of Induction Heating. "Heat Treater", (Chapman and Hall, Ltd.), 1947. Pp. 145. 10s. 6d.

High frequency induction furnaces have from their inception rendered important assistance to scientific investigators handling high purity metallic products at temperatures beyond the reach of more conventional furnaces. Commercially, high frequency induction melting has been used to a limited extent in the production of valuable materials such as permalloy and nickel-chromium alloys. During the past few years, however, much attention has been directed, to the use of high frequency induction (or eddy) currents for the heat-treatment of fabricated or partly fabricated products.

In his book, *Fundamental Principles and Applications of Induction Heating*, the author is concerned mainly with the thermal treatment of solid materials. Ordinary melting operations are outside the scope of this book although some processes are described in which localised melting is conducted under strictly controlled conditions. After a very brief histori-

cal introduction to the subject of high frequency induction heating, reference is made to some of its modern applications which are quickly, cheaply, conveniently conducted and result in a better product. The distinction is drawn between induction and dielectric heating. The author emphasises that a full mathematical treatment is omitted and that the simplified formulæ given in the book should only be used as a basis for coil design. It is evident to the reviewer that caution is necessary in the use of the equation (page 28) which indicates that the power dissipated in the surface layers of a specimen—varies as the square root of the resistivity. In the extreme case this leads to the absurdity that the maximum amount of heat would be generated by induction in an insulating or semi-insulating material. Further, the formula ignores the reactance of the eddy current circuit. Mathematical treatment is difficult because electrical resistivity, thermal conductivity, specific heat and possibly magnetic permeability change during the process of heating. It is, therefore, not surprising that the author states that final details for a particular heating operation are invariably determined by trial and error.

Many interesting drawings are given, depicting single and multi-turn inductor coils intended for heating special zones of variously shaped metallic specimens. The process can be applied to the interior surfaces of hollow samples. The choice of frequency (for the current in the inductor coil) is discussed, and although not critical, due regard must be given to the size of the sample and the desired thickness (or penetration) of the heated zone. This is followed by a brief review of the three types of generators commonly in use—namely, motor generators, spark gap generators and thermionic valve oscillators.

It is considered by the reviewer that a little attention should be given to this section of the book in order to bring the whole work to a uniformly excellent standard. For example an ordinary commercial step-up transformer cannot be used in the spark gap generator, as stated by the author (page 52), unless chokes are provided. Again in Fig. 34 the secondary winding of the step-up transformer is shown metallically connected to the heating coil. It is easy and customary to isolate the heating or operating coil from high voltages at mains frequency by interposing condenser units. The function of the induction coil in this diagram is mysterious. What is probably intended is some form of step-down transformer intended to feed the operating coil with heavy currents at low voltage.

Regarding valve oscillators, the two sample oscillators shown in Figs. 37 and 38 are hardly suitable for commercial operation since in both cases the magnitude of the oscillations depend greatly on the loading of the operating coil. Thus, it is possible in some instances to completely suppress the oscillations by inserting ferromagnetic material into the field of the oscillating coil. One remedy is to construct an oscillator comprising a master oscillator driving the power valve which supplies the energy for the operating coil.

The largest section of the book is devoted to the hardening of steel by induction heating

and quenching. Often quite localised hardening is required, and this must be done with the minimum distortion to the specimen. Induction heating, owing to its ease of control, is peculiarly suited for this operation. Further, it is claimed that harder wearing surfaces are obtained by inductive heating and quenching than by other methods. Of the many examples given, two may be mentioned. A localised hard bearing surface can readily be produced on the inside cylindrical surface of motor car wheel hub. Gear wheel teeth can be surface-hardened leaving the interior of the teeth and the body of the wheel in a moderately soft and tough condition. Induction heating is not only suitable for repetition work involving surface-hardening but can also be applied economically to welding (including carbide tips on tools) brazing and soldering processes. Notable among the miscellaneous applications is the flowing of electro-deposited tin coatings. This permits a saving in tin since a more uniform and less porous layer of tin is produced. It is impossible in a few words to do justice to the latter portion of the book which presents in a convenient form a mass of information much of which has appeared from time to time—scattered—in various recent publications.

The writer is undoubtedly an expert in the practical application of induction heating and his authoritative book is indispensable to anyone interested in this rapidly expanding art.

FRANK ADCOCK.

The Chemical Constitution of Natural Fats.

By T. P. Hilditch. (Chapman and Hall, Ltd., London), 1947. Second Edition. Pp. 554. Price 45 sh. net.

Fats form a very important class of organic compounds both from industrial and nutritional point of view. A systematic examination of their chemical composition may be said to have begun with the present century. On account of the complexity of composition of fats, the chemist at one time was content with the determination of a few constants. It is only as a result of painstaking work and new techniques evolved during the last decade it has been possible to determine the detailed composition of such a complex group of substances with relative ease, thus enabling us not only to study them but also predict their composition with a reasonable degree of accuracy having known their origin. This achievement is in no small measure due to the inspiring and untiring work of Prof. T. P. Hilditch and his colleagues at the University of Liverpool, which has now become an international centre for research on fats and allied subjects.

The second edition of the book under review has appeared within a period of seven years, and considering the present conditions in Great Britain, under which this must have been compiled, the author and the publishers deserve to be congratulated. The book is a unique contribution to our knowledge of chemistry of natural fats, and all the more valuable as it is written by one who has made the study of fats his life-work. This new edition, like its predecessor, has been divided into eleven chapters, and almost every page has been revised to bring

our knowledge up to date. The book contains extensive bibliography and is well indexed. The law of even distribution of fatty acids in glyceride molecules has been explained in detail and applied with success to predict the composition of fats of the same group. Notable new additions include composition of the body-fats of marine teleostid fish; component acids of depot fats of rats on low and high fat diets; composition of depot glycerides of Indian ox and buffalo and the effect of climatic conditions; composition of the body-fats of lion, puma, tiger, cat, baboon and man; component acids of blood lipids. The chapter on milk fats has been revised to include data on the effect of food, season and species on its composition. Further data on different seed fats, detailed description of the technique for the separation of mixed fatty acids by crystallisation at low temperatures, and computation of proportion of the chief component glycerides of a fat from its fatty acid composition, have also been added.

Throughout the book the position of the unsaturated linkage has been denoted by reference to the first C atom, instead of both (i.e., oleic acid as C⁹ instead of C⁹10) as is the usual practice to-day. This conveys the required meaning without any ambiguity, saves space and is more pleasant to read. One minor correction may be pointed out. On page 112 the Reichert Value has been described as Reichert-Meissl Value in spite of the recommendation in the B.S.S. No. 769-1938. The range of variation of the Reichert Value of cow butter-fat should be more appropriately 23-36.

NOSHIR N. DASTUR.

The First Brochure of the Chronicle of the World Health Organisation, Geneva, 1947 (Vol. 1, No. 1).

The Journal under review is one that deals with the aims, the constitution and functions of the Organisation.

This Organisation though of recent inception has taken upon itself a very laudable but supremely tremendous task of viewing health problems from international standpoint. It is very rightly stated that 'disease knows no frontiers, and anything less than world action may not only deprive one nation of the benefits of the Organisation, but may endanger the health of all member States'.

The activities of the Organisation are 'various, widespread and complex'. 'They affect not only governments and public health administrators but practitioners in many fields of medicine and hence certain aspects of the lives of individual citizens. The declaration contained in the preamble to its constitution, viz., 'the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being' is its ultimate goal. The concept of health is wide and comprehensive. The Organisation rightly holds that 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. Besides it holds that 'the health of all peoples is fundamental to the attainment of peace and security'. (Both these, alas! being totally shattered by the Great War and its aftermath.)

The Organisation proposes to achieve its object by (1) co-operation, (2) co-ordination, (3) propaganda, (4) dissemination of comparative statistical records, discussions, suggestions and topics of interest by publication of leaflets and brochures apart from the *Chronicle of W.H.O.*, (5) research work, (6) financial aid, (7) conventions and (8) expert advice.

To us particularly, in Independent India, this effort ought to be very welcome indeed. For, too long have we suffered from ill-health, misery and bondage, too long have the poor rate-payers' moneys gone elsewhere and utilised for purposes other than the amelioration of living conditions of the mass of people, too long have we borne patiently all these, and now free India should certainly brace up and consider the health of the people of the nation as its first charge. In this connection the World Health Organisation is bound to be of immeasurable help. It is to be earnestly hoped that India will wholeheartedly co-operate and reap the full benefit. At present the offices of the Organisation are at 350, Fifth Avenue, New York.

K. R. RAMASWAMY.

The Relation of Diseases in the Lower Animals to Human Welfare. (*Annals of the New York Academy of Sciences*, Vol. 48), 1947. Pp. 226.

This is a symposium which embodies nine excellent papers presented at a conference on the subject, held by the Section of Biology of the New York Academy of Sciences, on March 15 and 16, 1946. The subjects dealt with, viz., rabies, equine encephalomyelitis, psittacosis, brucellosis, plague, tuberculosis, anthrax, *Erysipelothrix rhusiopathiae* infection and animal parasites transmissible to man vitally concern human welfare and have been handled by experts who have devoted considerable study and thought to the respective branch of study. Up-to-date information has been given on each subject, with a masterly historical perspective. The volume is heralded with an apt introduction by Dr. W. A. Hagan who attempted to bring home to the public the enormous loss caused by various parasites in the United States of America and indicated the manner in which these could be transmitted from lower animals to man. The publication of this number has fulfilled a long-felt want of collated information on several important subjects, and it will be useful to the people belonging to the medical profession, to veterinarians, public health workers and students of biology in general.

G. D. BHALERAO.

PUBLICATIONS RECEIVED

1. *All Necessary Water can be Synthesized within the Plants*. By Nandlal Sharma, Ex-Principal and Research Scholar, P.O. Khamgaon (Berar).

2. *Bihar's Mineral Wealth and Industries*. By W. D. West. (A popular lecture delivered on the occasion of the First Anniversary of the Geology Department, Patna University, on April 25, 1947.)

Carnegie Institution of Washington—Year-Book, No. 45, 1945-46.