

lightning discharges are produced in this frequency range. These two topics, united by the theory of radio-wave propagation between the earth and the ionosphere, brought together two distinct groups of experimental scientists to discuss their problems. The book is the collection of the papers presented at the seventh meeting of the AGARD ionospheric research committee in Munich in 1962.

It was a difficult task for the editor to arrange the papers, and to some extent the sequence and group classification must remain arbitrary. In the first chapter the properties of the lower ionosphere, and in the second the D-layer irregularities, are considered. The third chapter, on lower ionospheric layers and on low-frequency propagation, presents data obtained from the LOFTI satellite experiment. Oblique incidence measurements and radio noise below 300 kc/s are considered in the next two chapters. In Section 6 very-low-frequency propagation and recordings of radio transmission during the nuclear test on Johnson Island in 1962 are dealt with. The seventh chapter considers extremely low-frequency transmission (10-20 kc/s), and in the last section investigations on resonances of the earth-ionosphere cavity are presented.

In this book there is a good balance between theory and experiment, and for the first time experimental data are compared and explained by mode theory. These proceedings are an excellent reference for workers in the field or those engaged in related research. It is a reference book of the state of the art, and many valuable data are presented.

Advances in Catalysis and Related Subjects, Volume 14. D. D. Eley, Herman Pines, and Paul B. Weisz, eds. 522 pp. Academic, New York, 1963. \$16.00.
Reviewed by H. Wise, Stanford Research Institute.

To the physicist the most recent developments in research on heterogeneous catalysis should prove of interest because of the emphasis placed on the physical properties of the solid surface. No longer is the field of catalysis the happy hunting ground of the chemist who, in the past, cen-

tered his entire attention on the chemical distribution of product molecules. Four of the six contributions to this volume of *Advances in Catalysis* reflect to a major extent this shift from catalytic chemistry to catalytic physics. The chapter by G. Ehrlich on Modern Methods in Surface Kinetics represents a comprehensive review of the experimental techniques developed for the study of elementary processes occurring on solid surfaces. The availability of ultrahigh vacuum techniques, field-electron and field-ion microscopy, and flash-desorption experiments, has led to new insights on gas-solid interactions during the initial stages of surface coverage.

The chapter "Catalytic Oxidation of Hydrocarbons" by L. Ya. Margolis reviews the catalytic activity of various metals, metal-oxide semiconductors, and spinels for hydrocarbon oxidation, a most important process in the chemical industry. It is of interest that the interpretation of the catalytic properties is attempted in terms of the electronic properties of the catalyst and its modification by the presence of adsorbates. An apparent correlation is noted between chemical parameters, including rate and selectivity, and the electron work function.

Another interesting physical tool in the study of solid catalysts is to be found in optical absorption spectroscopy. In a chapter by H. P. Leftin and M. C. Hobson on Application of Spectrophotometry to the Study of Catalytic Systems some recent observations are described on the identification of chemisorbed reaction intermediates. During the last ten years these optical measurements have shed new light on some of the chemical species present on the surface of the solid and their role during catalytic reaction. It has been questioned whether the species observed in the absence of catalytic surface reaction bear any relationship to those present during catalysis. The authors of this chapter give some good evidence to demonstrate the existence of such relationships. The brief, but stimulating, chapter on Quantum Conversion in Chloroplasts by M. Calvin deals with an interpretation of photo-

physical effects of biological systems in terms of a model reminiscent of solid-state semiconductor theory. With new experimental tools for the study of solid surfaces at various stages of development, the next decade promises to be an exciting one to the scientists engaged in research on gas-solid reactions.

L'Effet Mössbauer et ses Applications à l'Etude des Champs internes. By A. Abragam. 70 pp. Gordon and Breach, New York, 1964. Cloth \$3.95; paper \$1.95.
Reviewed by G. K. Wertheim, Bell Telephone Laboratories.

The following quoted from the editors' preface to the new series *Documents on Modern Physics* is largely applicable to the present state of Mössbauer effect research.

Today the dramatic phase of a new branch of physics spans less than a decade and subsides before the definitive treatise is published. Moreover, modern physics is an extremely interconnected discipline and the busy practitioner of one of its branches must be kept aware of breakthroughs in other areas. An expository literature which is clear and timely is needed to relieve him of the burden of wading through tentative and hastily written papers scattered in many journals.

In the spirit, we are given *L'Effet Mössbauer et ses Applications à l'Etude des Champs internes*. The manuscript has been well known to scientists active in Mössbauer research since 1961 when it was first circulated by its author. Many students have found it useful and the editors and publishers are doing a service by making it generally available.

The volume under review reproduces the original version with only minor corrections. No attempt has been made to update the volume or to include references to work published since the early part of 1961. As a result, the chief value of this book is to be found in the clear and concise treatment of fundamentals. The references cited do not give an adequate picture of the scope of Mössbauer research as it bears on the study of internal fields today.

About one-third of the book is devoted to the theory of the Mössbauer effect and the rest to its application