two American texts mentioned have appeared. This year the literature has been expanded by the addition of two notable books, in French, *Accélérateurs Circulaires de Particules* by H. Bruck, and the other, the English translation of the work by Kolomensky and Lebedev that is the subject of the present review.

Kolomensky and Lebedev succeed in making an extremely elegant and rigorous presentation of accelerator theory. They adhere strongly to the Hamiltonian formulation and insist on great generality before proceeding to specific cases. In overall structure, the main body of the book is devoted to quite general treatments and in the final chapter particular examples of accelerators are examined. This is in contrast with more standard presentations wherein the reader is steered first through some simple examples and then is subjected to successively greater complexities relating to the realities of current accelerator problems. Within each chapter the general treatment is often briefly illustrated by specific examples while more complicated and special cases are offset in smaller print to indicate that they may be skipped in a superficial reading.

This exposition of accelerator theory achieves a remarkable fluidity in the steady and orderly progress of equations and ideas. Frequently the passage from one equation to the next is far from obvious but the authors consistently follow up each of the more difficult expressions with a paragraph highlighting the basic physical content and sign-posting those terms that turn out to be most important. Thus the reader is led in a compelling and, indeed, almost narrative fashion, through the development of the fundamental concepts.

The initial chapter provides an excellent introduction to the basic variety of cyclic accelerators. The following two chapters describe the behavior of particles in ideal and in nonideal magnetic fields: first, an excellent description is included of the closed orbit problem and the general case of stability criteria; second, the complications encountered in the real case, are discussed, namely closed-orbit deviations and nonlinearities. Chapter 4 is devoted to a treatment of synchrotron oscillations and contains a splendid treatment of the coupling between the betatron and synchrotron oscillations and of the passage through the transition energy. The special problems of radiation effects and quantum fluctuations are treated in chapter 5. Gas scattering and beam loss are examined in the succeeding chapter. The last chapter, also the longest one, is devoted to specific applications of the general theory to the peculiarities of accelerators of different types.

In the logic and elegance of their development, the authors succeed remarkably well, yet there are several topics that an accelerator physicist today would wish to see included, such as a discussion of long straight sections, beam extraction, space-charge effects, collective instabilities and alternative injection systems. Most of these, however, are quite recent developments and their omission can be blamed, not on the authors, but on the passage of time since their edition in Russian first appeared.

Barbier is to be congratulated on his translation. It contains some minor imperfections, but in general adds a certain color that is in keeping with the descriptive flow of the authors' style. If one worries about the need for more frequent use of the definite article or is stopped for longer than a moment by reference to "Hirnshaw's" theorem, he is being pedantic. At all times, the translation meets the fundamental criterion of clarity.

° ° °

Denis Keefe is an experimentalist in elementary-particle physics at the Lawrence Radiation Laboratory at Berkeley. During the last three years he has been involved with design problems of the future 200 GeV accelerator.

Unsolved problems, undeveloped theory

THEORY OF THERMALLY INDUCED GAS PHASE REACTIONS. By E. E. Nikitin. Trans. from Russian by Scripta Technica, Inc. 155 pp. Indiana University Press, Bloomington, Indiana, 1966. $5.00

by Kurt E. Shuler

E. E. Nikitin, who is a member of the Institute of Chemical Physics of the Academy of Sciences of the USSR in Moscow, has been an active worker in and contributor to a number of topics in the field of chemical kinetics. In particular, he has carried out some interesting theoretical work on the clarification of "macroscopic" chemical kinetics from the underlying microscopic molecular basis. This book is a review in which he discusses and summarizes the current status (up to 1964, the date of appearance of the original Russian version) of theoretical work in unimolecular reactions and the thermal decomposition of diatomic molecules. In line with Nikitin's interest it is written from the point of view that the macroscopic results on rate coefficients in a thermal ensemble should be related to and explained on the basis of the molecular interactions, both dynamical and statistical, underlying the overall rate process. This is a point of view with which the majority of chemical physicists, including this reviewer, are in hearty accord.

Within the limits of the 150 pages of this monograph, Nikitin has done a competent and welcome job. He has presented objectively and clearly the various approaches, models and theories that have been developed. Moreover, and much to his credit, he has managed to present the gist of the theories and arguments without getting the reader bogged down in unnecessary details. The latter can be obtained by the interested reader from the original papers that are well referenced in the book. If the reader is left somewhat unhappy and confused after reading this book, it is not the fault of the author, but of all the workers in the field (including the reviewer) who have not yet managed to develop a really predictive theory free of floating fudge factors of one sort or another. One of the salutary effects of this book is the demonstration that there are still many unsolved problems and that at present a theoretical chemical kineticist can always explain the magnitude and temperature dependence of a rate coefficient *after* the data are at hand but in most cases cannot yet calculate too well these quantities a priori.

This book can be recommended as a valuable introduction and summary to graduate students and to research workers planning to enter this field. The translation is well done, the printing large and clear and the book as a whole is well produced.

° ° °

The reviewer is a visiting professor of chemistry at the University of California, San Diego in La Jolla on leave as a senior research fellow from the National Bureau of Standards. He says he "has contributed to the confusion in this field through his own publications."

Emission, propagation, etc.

SOLAR RADIO ASTRONOMY. By Mukul R. Kundu. 660 pp. Wiley, New York, 1965. $19.75

by H. J. Hagger

During the last 20 years an enormous amount of research has been done in radio astronomy, and particularly in solar radio astronomy. The author has attempted to review and coördinate the observations, interpretations and associations of the sun's radio emissions in this book, as he states in his preface. With the exception of chapter 16 this book is a revised edition of a report of the University of Michigan's Radio Astronomy Laboratory where the author was affiliated before becoming an associate professor at Cornell University.

The book starts with a classification of solar radio emissions and an outline of the subject of research, the active sun. In chapter 3 the propagation and generation of radio waves in the solar atmosphere is discussed and bremsstrahlung, gyro-synchrotron radiation and Cerenkov radiation are considered as principal mechanisms of emission. In chapter 4 the author describes the basic techniques applied to solar radio astronomy. He then discusses the quiet-sun radiation at different wavelengths and also the radiation intensity distribution of the solar disk, that is, the background component of radiation. The second component considered is the slowly varying one that is correlated to sunspot regions. Systematic studies of the radio bursts at centimeter wavelengths that are superimposed on the two quiet-sun radiation components, have been made during the IGY. These bursts are classified and characterized in chapter 7. Comparison is made with flare areas and