clay, and Burton cover observations made during sledge journeys. The first part provides a description of the environment and factual information on snow accumulation measurements. This covers the accepted methods of stake and pit measurements, with a discussion of seasonal and daily variations. Recordings of the wind profile immediately above the ice shelf and measurement of the actual temperature of the ice shelf are also included in the first part.

The second part, a review of sledge journeys made by MacDowell, Barclay, and Burton on the ice shelf, describes snow accumulation, ice-hill investigations, and surface features. This is followed by a short, attractively illustrated paper, "Snow surface studies" by Tribble.

Space does not permit details on other parts of the appendix. With a few exceptions, these are largely operational or logistic in nature and provide an additional valuable record of personal experience and initiative in antarctic research.

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Radiation Chemistry

Introduction to Radiation Chemistry. I. V. Vereshchinskii and A. K. Pikaev. Translated from the Russian (Moscow, 1963) by J. Schmorak. Gabriel Stein, Scientific Editor. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1964. viii + 335 pp. Illus. $15.25.

This is a good, well-written book that covers the literature of all radiation chemistry, rather lucidly and selectively, through 1960. There are several references to 1961 publications and, surprisingly, an occasional reference to a 1962 publication. But the abrupt advances of the last 4 years are not discussed—despite the false impression, created by the publisher of the translation, that this is a 1964 book. Furthermore, the price seems extraordinarily high for a book printed by photooffset (even for a book so well printed as this one). However, the important fact is that every serious worker in radiation chemistry should be aware of this book and its utility.

Vereshchinskii and Pikaev appear to have worked separately on chapters

close to their particular areas of specialization, but, very likely because of the excellent work of the translator and particularly of the scientific editor, Gabriel Stein, the style and manner of presentation are consistently smooth.

I do not pretend that this book is without minor inaccuracies, irritations, inelegancies, or confusions. They are there—but only to a minimal degree. The figures are adequate. The word "obviously" (the flag of danger ahead) appears too often, "recombination" is employed when "combination" is clearly meant (a misusage common among kineticists), the words "reverse reaction" are used when the more inclusive "back reaction" is intended, and there is no author index. The treatment of the radiation chemistry of water and aqueous solutions seems to be complete (as of the time that the book was written), and the theory is well handled. However, in this volume, as in the other treatments of the radiolysis of water, the subject (even with present knowledge of the solvated electron) is so involved that one cannot expect to learn a lot in hasty reading. On the other hand, meaning, in any portion of this book, is rarely obscure.

Introduction to Radiation Chemistry, like other publications from the U.S.S.R., reveals that the Russians remain consistently aware of the problems created by the existence of chemical effects of high-energy radiation (as in nuclear power technology) and of the technological possibilities of radiation chemistry (as in polymers and organic synthesis).

A beginner in radiation chemistry can read this book, learn the fundamentals, and not be led astray. He also will obtain valuable information on dosimetry which is not otherwise available in such a succinct or informative collection. An advanced worker will find a good review and comparison of different points of view regarding both theory and experiment, well-documented and very useful tables and charts, and an extraordinary bibliography of information (particularly on the Russian literature). An investigator entering a new field in radiation chemistry is well advised to consult the pertinent portions of this book first. I recommend it highly, and I congratulate all those involved in this exceptionally well-done job.

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International School of Physics

Advanced Plasma Theory. M. N. Rosenbluth, Ed. Academic Press, New York, 1964. xiv + 266 pp. Illus. $9.75 (contributors: W. B. Thompson, Russel Kulsrud, G. Ecker, M. N. Rosenbluth, H. P. Furth, P. A. Sturrock, C. Mercier, B. Bertotti, and M. Kruskal).

This book is Course 25 in the Proceedings of the International School of Physics, "Enrico Fermi," sponsored by the Italian Physical Society. It covers the principal series of lectures given at Varenna during July 1962. The director of the course was Marshall Rosenbluth of the United States. The main emphasis of the book is on the plasma theory that has been developed in connection with controlled thermonuclear research, and the faculty was drawn primarily from the controlled fusion laboratories of the United States and Western Europe.

Although each chapter is written by an independent author, the arrangement is good in that the more basic and more fully developed subjects appear at the beginning and are followed by several shorter chapters on newer areas of research or special problems.

The first chapter is devoted to plasma kinetic theory. The author emphasizes the physical processes involved rather than seeking the most general formulation of kinetic theory. Transport processes in the presence of a magnetic field are discussed, and methods of obtaining the transport coefficients are given. This section contains a useful list of the important relations and coefficients. The Fokker-Planck equation for a plasma in a magnetic field is discussed in detail. There has been considerable research in this field in recent years, and an important feature of this chapter is that these results are brought into perspective.

In the second chapter three energy principles for the stability of static equilibria are derived. These correspond to three models that are useful in describing a plasma. The first is the set of magnetohydrodynamic equations for one fluid with a scalar pressure and infinite conductivity. The second is the collisionless limit described by the Vlasov equations, and the third is the infinite conductivity fluid theory, but with a tensor pressure. The derivation of comparison theorems between the energy principles adds to the value of this chapter. The

detailed application of the energy principle to specific configurations is omitted, but references are given to such results in the literature. I believe the extra space required for some applications would certainly have been justified.

There are shorter chapters on finite-conductivity instabilities, microinstabilities, toroidal equilibria and stability, nonlinear theory of electrostatic waves, and gas discharge theory. In addition, there are some interesting applications of asymptotic methods in differential equations to boundary layer problems and adiabatic invariants of charged particle motion.

Quite a number of new books on plasma physics have been published during the past few years, but most of them have been of an introductory nature, suitable for a first course. The few exceptions have concentrated on special topics such as plasma waves. There has been a real need for a book to bridge the gap between the introductory treatments and the ever increasing number of research papers

in plasma theory. Such an undertaking is rather risky because of the rapid development of the field. By concentrating on the problems of high-temperature plasmas in the presence of magnetic fields, primarily the stability question, this course succeeds in preparing the reader to delve into the current literature. This is a remarkable achievement because the lectures were given nearly 3 years ago. Surveys can easily be out of date by the time they are published. The success of this book is due to the selection of topics and to the fact that the lecturers are authorities. The theories presented have stood the test of time and in fact are now the basis for current research. For example, in the past 2 years there has been substantial progress in the search for stable confinement geometries, and the calculations accompanying these developments depend on theory derived in this book.

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Applied Mathematics: Physics, Astronomy, Engineering

Math and Aftermath. Robert Hooke and Douglas Shaffer. Walker, New York, 1965. xii + 233 pp. Illus. $5.95.

Math and Aftermath by Robert Hooke and Douglas Shaffer is a well-written account of elementary applied mathematics. The reader whose background includes only high school mathematics will find the book accessible and informative if he skims many of the formulas, but he cannot skip them all. A reader with some traditional college mathematics can, especially with the help of the appendix, read the book in detail.

The subject is research in physics, astronomy, and engineering, and, although research in applied mathematics is hinted at, research in pure mathematics is gently disparaged in these words: " . . . steps that need to be made before mathematics is anything more than self-contained logical exercise" (p. 16). The authors examine separately two modes in the application of mathematics: (i) the formulation of theories with deductions from them to be tested by observation and (ii) the statistical treatment of data from the processing of which structure can be observed and predictions made.

The choice of examples is well suited to illustrate these modes, and they appear to be consistently of about the same standard of difficulty.

The book has a refreshing flavor of honesty about it, revealing that the authors are experienced and at the same time humble about the power of mathematics in view of its limitations. A respect is clearly shown for the successes in classical mechanics which have now been sorted out and evaluated by history, and a rather cautious wait-and-see attitude is evident with respect to the newer statistical methods and the computing machinery that, it is observed, gives promise to them. The reader comes away with a sober enthusiasm for applied mathematics and a realization that mathematicians in this area are essential, and that their sense of humor is somewhat dry but not above whimsey in the selection of chapter titles. This volume should be in every high school library. It should be read by lay people who are concerned about engineering in the broad sense, but it cannot be expected to illustrate 20th century mathematics per se.

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Applications and Techniques

Fundamentals of Vacuum Science and Technology. Gerhard Lewin. Mc-Graw-Hill, New York, 1965. xiv + 248 pp. Illus. $11.50.

This volume is addressed to persons with scientific training who must use vacuum technique in their research work, but who are not vacuum experts. Lewin attempts to treat all important aspects of the subject. This is done in a concise way that will often send the reader to other references for more details. A good bibliography is provided for this purpose.

The first two chapters are brief statements of important formulas from the kinetic theory of gases. This material is well known, but is presented here in a convenient form in a space of 20 pages. The third chapter, "Surface effects," is the longest in the book, which is appropriate because of the importance and complexity of such effects, especially in the ultrahigh-vacuum range. This chapter contains many useful graphs and tables and is a generally well-organized summary of a difficult field. The chapter on vacuum measurements contains brief descriptions of the most common total-pressure gauges and of various types of mass spectrometers used for partial pressure measurement. Curiously, no mention is made of the Schuemann suppressor gauge, which has important applications in the ultrahigh-vacuum range. There is also a brief discussion of the measurement of pumping speed and conductance. The remaining chapters treat pumps, components such as flanges and valves, materials and methods of preparation and joining, and several examples of complete vacuum systems.

The author has been directly involved in the development and application of new techniques in the Plasma Physics Laboratory at Princeton University, and the fruits of this experience, which are dispersed throughout the text, constitute what is distinctively new in this book. In this respect, the book will interest even the expert in this field.

The question of the temperature requirements for bake-out to reach ultrahigh vacuum could have been discussed more fully. There is firm evidence that temperatures near 200°C, rather than 400°C, are adequate. This has important consequences for system design and choice of materials.