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 Surveys can easily be out of date by the time they are published.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. McGraw-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.