

### Finite Markov Chains

By Prof. John G. Kemeny and Prof. J. Laurie Snell. (The University Series in Undergraduate Mathematics.) Pp. viii + 210. (Princeton, N.J.: D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1960.) 37s. 6d.

THIS book presents an undergraduate course on finite Markov chains by using mathematics no more complicated than elementary matrix algebra. The authors provide a lucid summary in Chapter 1 of the mathematical prerequisites needed so that a conscientious non-mathematician may also make use of the book. The theory is developed in Chapters 2-6 and applications are discussed in the final (seventh) chapter. Throughout there is adequate use of numerical examples to illustrate the line of the argument. The gain in conciseness which results from the ruthless use of matrices is so great that it seems scarcely just to protest that it has not been put to better use. However, the following omissions cannot be left unremarked: no solutions are given to the exercises given at the end of Chapters 2-6; no comparison is made between the matrix methods used here and other methods of investigating Markov chains; the references given to other work are inadequate. This last fault is the most serious, particularly in view of the two audiences to whom the book is addressed. Some of the virtues of the book have already been mentioned. To these, I would add style and presentation, coherence and, finally, a special commendation for the last chapter which gives a much broader picture of the application of finite Markov chains than the usual questions about queues and cosmic rays.

ALISON DOTG

### Introduction to Space Dynamics

By Prof. William Tyrroll Thomson. Pp. xiv + 317. (New York and London: John Wiley and Sons, Inc., 1961.) 87s.

ALTHOUGH several specialized books on the dynamics of space vehicles have appeared in recent years, there has been no suitable introductory text-book for university students. This deficiency Prof. Thomson has now made good. He begins with 40 pages on the fundamentals—vectors, kinematics, transformations of axes. Then, after a long chapter on particle dynamics and satellite orbits, come discussions of the rotational movements of rigid bodies and the dynamics of gyroscopic instruments. Chapter 7 deals with the motions of space vehicles, particularly in rotation, including such topics as the 'de-spinning' of satellites by means of weights flung out on unwinding strings. Chapter 8 outlines the methods for optimizing the performance of multi-stage rockets, and the subject of the last chapter is generalized theories of mechanics, as typified by Lagrange's equations. The text is generously interspersed with worked examples and problems, which have the virtue of being more realistic than those found in most text-books.

The book is sound, well written and easy to follow. The topics are, on the whole, well chosen, but, as is inevitable in a book in which the explanations are so full and the examples so numerous, some subjects are dismissed too cursorily (for example, Earth-satellite orbits) and others go unmentioned. The omitted topics could with advantage have been outlined, so that students would realize that the book, although an excellent introduction, is an incomplete one.

D. G. KING-HELE

### General Microbiology

By Prof. William G. Walter and Prof. Richard H. McBee. Second edition. Pp. ix + 405. (Princeton, N.J.: D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1962.) 54s. 6d.

DESIGNED for use with elementary students, the second edition of this introduction to microbiology needs little commendation. The launching seven years ago was quickly followed by three re-printings and now the authors have grasped the opportunity presented by a second issue to make a thorough revision of the whole work.

The historical chapter has been omitted, and relevant historical details have been included with the topic under discussion. Additional sections deal with lyophilization, the preservation of cultures by freeze-drying techniques, etc. In the chapter on the microbiology of foods, the authors discuss preservation by irradiation and the use of food additives. The overall production is such that Profs. Walter and McBee can fairly claim that they have succeeded not only in providing a well-balanced and scientific introduction to microbiology but also in relating this study of micro-organisms to the everyday life of the student. The detailed excellence of the line-drawings shows up the fuzzy inadequacies of many of the photographs.

T. H. HAWKINS

### Systematic Qualitative Analysis

An Introduction. By Dr. G. A. Morrison. Pp. ix + 198. (London: Butterworth and Co. (Publishers), Ltd., 1961.) 25s.

ALTHOUGH qualitative analysis has a well-established place in school and university courses, there is some difference of opinion as to its relative merits in chemical education. It can serve to develop powers of observation and deduction, skill in certain laboratory techniques and practice, and an appreciation of certain physico-chemical principles because it is the study at first-hand of numerous chemical reactions. On the other hand, as Dr. Morrison is well aware, analysis can be performed almost entirely "in an automatic way without mental effort".

*Systematic Qualitative Analysis* is based on the experience of teaching inorganic analysis to first-year university students, and is clearly designed for their use. The opening sections offer an outline of the scope of the book, a rather unsatisfactory treatment of dissociation constants, buffered solutions and solubility constants, some descriptions of the usual semi-micro techniques, and details of preliminary tests. A section then deals with the semi-quantitative application of solubility product theory to group separations. The next section gives details for effecting the separation of cations into groups, and then the analysis of each group is treated fully in separate sections. Finally, there are two sections elaborating the analysis and confirmation of anions, an appendix of useful reagents, and a good index.

Using Dr. Morrison's book it may still be possible to perform analyses in an automatic way. However, some mental effort will be needed if only to interpret his 'running nomenclature'. This labels each stage of the analysis systematically and quite unambiguously, but its extensive use in the text results in such statements as: "If  $\text{HBSL}^{\text{A}}\text{S}$  is Se it should be red, and if  $\text{HBSL}^{\text{A}}\text{S}$  is Te it should be black" (p. 113). The book is compact, well bound and presented, but it may seem somewhat expensive at 25s.

MICHAEL C. COX