what a Lie algebra is and how it is related to a Lie group, or an undergraduate would like to begin the study of homology, or a crystallographer is interested in Fedorov groups, or an engineer in probability, or a scientist in computing machines, he will find here a connected, lucid account."

This three-volume work was originally the result of three of the best-known Russian mathematicians, in a systematic collaboration with others. Their goal was "to acquaint a sufficiently wide circle of Soviet intelligentsia with the various mathematical disciplines, their content and methods, the foundations on which they are based, and the paths along which they have developed." This they were able to accomplish so well that it seemed appropriate for the American Mathematical Society to spend considerable time and energy in preparing a thoroughly well-done and precise translation. The present set is the result; it was originally published by the Society, but now is made readily available, in its new format, by the M.I.T. Press.

The Russian writers undertook a difficult job, and fortunately were able to carry out their self-assignment with great success. As the Editor of Translations for the Society, S. H. Gould, says in the foreword, "In recent years many popular books about mathematics have appeared . . . but for the most part they have contained little serious mathematical instruction, and many of them have neglected the twentieth century, the undisputed 'golden age' of mathematics. They have not undertaken the ultimate task of mathematical exposition, namely, the large-scale organization of modern mathematics, in such a way that the reader is constantly delighted by the obvious economizing of his own time and effort. Anyone who reads through some of the chapters in the present book will realize how well this task has been carried out." I would agree completely.

The work is a mathematics work, not volumes about mathematics. They assume little more than some acquaintance with the differential and integral calculus to read the early chapters, but complete understanding of all volumes will require not only further reading in other books, but also the use of the exceptionally well-chosen and uniformly good references listed at the end of each chapter, together with a relatively good mathematical background.

The topics covered are (i) analysis including differential equations, calculus of variations, real and complex variables, and functional analysis, (ii) geometry including differential, non-Euclidean, and projective, as well as topology, and (iii) algebra covering linear algebra, number systems and prime numbers, and groups and other algebraic systems, as well as (iv) the theory of probability, approximation methods, and computing machines and techniques.

This edition presents a well-balanced and unified view of mathematics today, and it will prove to be a most useful reference source for good undergraduate and graduate students in all fields, as well as for mathematical specialists.

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Kinetics

Experimental Methods in Gas Reactions. Sir Harry Melville and B. G. Gowenlock. Macmillan, London; St. Martin's Press, New York, 1964. viii + 464 pp. Illus. $17.

It has been more than 25 years since the first edition of this book, by Farkas and Melville, appeared, and it has been out of print since shortly after World War II. During that period the *field* of kinetics has made substantial progress, at least as regards the realization of the high quality of data now demanded for developing and testing theory. The advent of new techniques and the improvement of old ones make this revised edition extremely useful to all workers in the field. Every research student beginning work in kinetics should study it carefully, and experienced workers in the field will find it invaluable as a reference and an aid to memory.

The first chapter, "Kinetic theory of gases," gives an excellent summary of facts and equations which we wish we could remember but never quite do. It will be extremely useful to the person trying to write papers.

The second chapter, "Apparatus for control of pressure," covers pumps, valves, seals, pressure gauges, and various kinds of manometers. Although the research man often finds that he must either devise his own methods or revise old ones, the chapter will serve as a very useful guide to the various types of apparatus. The same may be said for the chapter on the measurement and control of temperature.

Chapter 4, "Preparation of gases and volatile compounds," and chapter 5, "Analysis of gases," give a large amount of useful information, much of it about methods unknown 25 years ago. The section on chromatographic methods is particularly valuable.

Chapter 6, "Photochemical techniques," is perhaps not as good as some of the others, although it will be extremely useful to the beginner in the field. This chapter might lead one to infer, for example, that Beer's Law is very useful, without special care, in the gas phase. In fact, for most photochemical systems, truly monochromatic light is unattainable, so that not only is Beer's Law not obeyed but the character of the principal absorption may change with pressure. The pitfalls encountered here and in mixtures of two absorbing gases could well have been discussed more fully.

The last chapter, "Further features of apparatus assembly and techniques in gas reactions," contains a lot of useful hints and is well worth reading.

This little book is, therefore, an extremely useful addition to the field of reaction kinetics. I can only express the regret in retrospect that something equally good for its day was not available when I began work in the field.

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Protozoology

Protozoa: The Simplest of All Animals. Richard P. Hall. Holt, Rinehart, and Winston, New York, 1964. 122 pp. Illus. Paper, $1.28; cloth, $2.50.

This book, which is directed primarily at high school students, is divided into four main chapters: "Structure of protozoa," "How protozoa live," "How protozoa reproduce," and "Protozoa as members of communities." To these chapters, an outline of classification is appended. The running text is easy to read and informative. The section on nutrition of protozoa includes some interesting and rather recent findings apparently not other-

wise available in boiled-down versions, so there may be some useful material here for certain college courses. The illustrations (all of them line drawings) are for the most part clear and well chosen, but I am disappointed that there are no photographs of living protozoa nor any electron photomicrographs. A few of the latter would have greatly enriched the chapter dealing with structure.

I do not care for the subtitle, partly because it is too emphatic. The protozoa represent a highly diversified assemblage of plant-like and animal-like organisms, some of them far less simple than others. Hall does, in fact, explain this quite nicely. I wish he had not treated the protozoa as a phylum. However, he has done no worse than the Committee on Taxonomy and Taxonomic Problems of the Society of Protozoologists. His outline of classification follows that in some of the early drafts prepared by the committee. This is perhaps fortunate, because, at least with respect to the classification of ciliates, the published version (1964) is stiffer than some of the dry runs. All this classification is heavy stuff anyway, and cannot be of much use unless it is very complete and thoroughly illustrated. In any case, I hope impressionable young readers will not lay the book down with the idea that microsporidians and ciliates are related.

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Analytical Chemistry

Organic Complexing Reagents: Structure, Behavior, and Application to Inorganic Analysis. D. D. Perrin. Interscience (Wiley), New York, 1964. xii + 365 pp. Illus. $12.

The object of this book is "to discuss the principles involved in analytical chemical methods so that the matter may be placed securely upon a modern theoretical foundation." Or, to quote again from the introduction, "The aim . . . is to present a coherent account, based on modern theoretical inorganic chemistry, that will enable the reader to understand the choosing of reagents for particular determinations and the kinds of conditions under which the reactions can be carried out."

Actually the volume is a survey of organic compounds that have been used in various ways for the determination of the metals and anions. The coverage in this respect is extensive. The array and variety of organic compounds that have been used in the chemical analyses of the metals is formidable indeed, and in this book Perrin attempts to cover the entire bag of tricks employed by the analytical chemist: the effects of complex formation on oxidation-reduction potential, kinetics and equilibria in the formation of complexes, surface phenomena, ultraviolet-absorption spectrophotometry, solubility, and extraction into immiscible solvents. A brief treatment is given of the principal reagents and their characteristics for each of the metals.

A few chapters are devoted entirely to theoretical aspects. These are so brief and sketchy that they provide little more than an introduction to some new terminology and some guideposts to other fields of knowledge.

References are given at the end of each chapter, and the lists are quite impressive, as one might expect in a volume that reviews one of the fields of chemistry that has been most active in the last two decades. No names are mentioned in the text, however, and the results of whole papers are condensed to single sentences or phrases. This gives the volume an authoritarian, jumpy style. Results and explanations are put forth as gospel, without immediate hint about the original author or about Perrin's evaluation of his contribution. A fair amount of trivial material finds its way even into scientific journals, and an unconscionable amount of current publication is given over to correcting incomplete and careless work. It is the duty of the author of a monograph to start the sorting-out process. No hint is given in this book about the real value of any of the analytical reagents mentioned. Yet the mere size of the current literature on any particular analytical reagent gives an immediate measure of its importance; bathophenanthroline and calcein, for example, treated in most cursory fashion in this book, have been the subject of no less than 50 papers each in the last decade.

The present position of chemistry on its exponential growth curve makes it evident that no book can possibly cover, except in a superficial fashion, so broad a field of chemistry as that attempted here. Certainly anyone who thumbs through this volume will pick up some new ideas, for there is now a vast literature in this field. Those analysts who have been out of school for a few years, however, are in for some shocks. In the 42 lines devoted to a survey of the reagents for zinc, the following statement is made: "Because there is no ligand-field stabilization energy involved in zinc complex formation (zinc having a filled *d* shell), ligands that also permit back-double-bonding probably form the most stable zinc complexes." The words used are changing, but whether this will help in tomorrow's problem of determining zinc in a urine sample is problematical.

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Philosophy of Science

Philosophical Problems of Space and Time. Adolf Grünbaum. Knopf, New York, 1963. xii + 408 pp. Illus. $10.75.

Although spatial and temporal concepts have always occupied a central position in physical theory, 20th-century physics has demonstrated the need for a thorough reexamination of them. Physicists and philosophers alike, realizing that conceptual clarity in this area is prerequisite to an understanding of modern physics, have devoted considerable energy to attempts to explicate these notions. A large and important post-relativity literature has grown up, but the roots of many of the most significant and puzzling problems antedate Einstein by far, in some cases reaching back even to antiquity. *Philosophical Problems of Space and Time* provides a comprehensive and detailed treatment of this whole range of problems.

Grünbaum's book is divided into three major parts. Part 1, Philosophical Problems of the Metric of Space and Time, deals mainly with problems arising from the 19th-century development of non-Euclidean geometries. Given a variety of formally self-consistent geometries, we naturally ask about the choice of a geometry to de-