WHITELAW, T. A., *An Introduction to Abstract Algebra* (Blackie, 1978), ix+166 pp., £4·95 (paper covers).

This book sets out to provide a first major course in abstract algebra, assuming no previous knowledge, but taking the reader far enough to savour the subject and its ways of thinking, and to prove some interesting results.

The first four chapters provide the essential vocabulary, definitions and results of basic topics including sets, mappings and equivalence relations. The author rightly believes that, without an adequate understanding of these, later parts of the subject become unnecessarily difficult. Most parts of these first four chapters are detailed and straightforward, and should present few problems to the serious reader, but the sections on congruence classes of integers modulo m need careful attention.

The remaining five chapters deal with semigroups, groups and rings. Groups are taken as far as quotient groups and the first isomorphism theorem. The chapter on rings deals with ideals and factor rings, and ends with some results on polynomial rings. These chapters naturally call for closer attention from the reader—and for pencil and paper to check understanding on the way.

Each chapter ends with a set of exercises, and the book includes an appendix to these exercises, giving hints and partial answers. This feature should help the reader who is doubtful about his attempts at the exercises and may need a little help, or a boost to confidence when in doubt about the correctness of his efforts.

The author's style throughout is helpful to the beginner, with outline explanations of the purpose of the work amplifying the definitions and proofs in appropriate cases. The book will be a useful text for students studying abstract algebra at this level, and should whet the appetite for more.

H. G. ANDERSON

CLARKSON, B. L., HOLMES, P. J., and KISTNER, A. (eds.), *Stochastic Problems in Dynamics* (Pitman, 1977), 566 pp., £12.

The IUTAM Symposium on Stochastic Problems in Dynamics (Southampton 1976) brought together some well-known applied mathematicians and engineers for a discussion on those aspects of stochastic processes which engineers find most useful in the study of dynamical systems, in control theory and in time series analysis. The book consists mostly of the thirty contributed papers, but there are brief summaries of the discussions following the papers. The main areas covered which are most likely to interest mathematicians are in the fields of stochastic differential equations (eight papers), first passage or failure problems (four papers), and identification, spectral analysis or time series problems generally (twelve papers). In the first mentioned area, the averaging methods of Stratonovich and Khasminski are very evident, as are Itô differential equations. Here the most lasting memory of the book is the ease with which Professor Ariaratnam was able, in discussion, to apply these methods to obtain the results in other people's papers, as well as in his own paper. Unfortunately our reading of some of the papers in this section was made difficult by the low standard of translation into English. Nevertheless, anyone interested in the stability of dynamical systems subject to stochastic disturbances will find the articles by F. Kozin (on empirical problems), J. L. Willems (on white and coloured noise systems), S. T. Ariaratnam (on coupled linear systems under combined and harmonic excitation), at least of general interest even if the mathematical techniques employed here, and in other related papers, are "well known". Similar remarks apply to the papers in the spectral analysis/system identification section, although from such noted authors as J. S. Bendat, H. Akaike, and S. H. Crandall, we might have expected something a little more novel. Indeed anyone familiar with the recent literature emanating from these and other writers might have been able to predict their respective contributions. From the small section on failure and first passage times, the reviewer found the paper by R. F. Drenick (on non-robust problems in the seismic resistance of structures) to be that mixture of good sense and well tried mathematics which we expect from engineers.

The book is likely to be of limited use to active workers in this area, partly because the subjects are so far ranging, and partly because the material has already appeared or will soon appear in the relevant journals.

Students wishing to start in this area would be well advised to stick to established texts, or, at the expense of a few postcards to selected authors, obtain pre-prints on their chosen subject.

R. J. HENERY

CSASZAR, A., *General topology* (Adam Hilger, 1978), 488 pp., £20·50.

This comprehensive treatise on general topology is heavily influenced by the book "Topological spaces", by E. Čech, assisted by Z. Frolíc and M. Katětov (Interscience, 1966), and so it is natural to compare the two works. The scope of the present work is clear from the chapter headings: 1. Introduction, 2. Topological spaces, 3. Proximity and uniform spaces, 4. Completely regular spaces, 5. Complete and compact spaces, 6. Extensions of spaces, 7. Product and quotient spaces, 8. Paracompact spaces, 9. Baire spaces, 10. Connected spaces, 11. Topological groups. A novel feature of the book is the early introduction of proximities and uniformities. In contrast to Čech's book, the language is less formal and consequently the present work is much more readable. There are many examples in the text and numerous exercises at the end of each section. This is not an introductory text on topology. However the wealth of material presented should prove invaluable to the research worker in topology and related disciplines.

H. R. DOWSON

ANDRÁSFAI, BÉLA, *Introductory Graph Theory* (Adam Hilger, 1977), 268 pp., £8·00.

This is a translation by András Recski of a book which first appeared in Hungary in 1969. It was another Hungarian author, Dénes König (written in German), who gave the world the first book on graph theory in 1936, and for many years *Theorie der endlichen und unendlichen Graphen* had no competitors. However, in recent years there has been no shortage of publications, about a dozen of them in English, so it is natural to ask if this translation is really necessary. I consider the answer to be: perhaps not necessary, but certainly valuable.

The justification of this book lies in its method of communication. The author passionately believes that graph theory is an excellent means of developing problem-solving ability, where advanced knowledge is not necessary, but where ingenuity and deep consideration are often called for. The book is therefore written around problems: "The results are presented *in statu nascendi*, following the procedure of discovery, solution of sub-statements, definition of new concepts which prove to be useful, and determination of the possibilities of generalisation for the solution of practical problems. Exercises, problems and their solutions are given throughout, with suggestions of new problems, simplification of complicated statements, and, above all, stimulation of readers." The result is a book which is different; it reads more like a mathematical detective story than a book of theorems, and it is accordingly more suited to private reading than to prescription as a text for a course of lectures.

The choice of material, too, differs from the norm for an introductory text. There is no mention at all of "topological" graph theory, so Euler's formula and the four colour theorem are not dealt with. The seven chapters deal with: (1) basic ideas, (2) trees and forests (including spanning trees and the circuit space of a graph), (3) routes following the edges of a graph (Eulerian graphs), (4) routes covering the vertices of a graph (Hamiltonian circuits, including the theorems of Dirac and Pósa), (5) matchings (of bipartite graphs, using alternative paths, and the König max-min theorem), (6) extremal graph theory (including some Ramsey theory), (7) solutions to exercises.

Although the ideas develop from simple problems, this is by no means an easy book. Some of the arguments, particularly in chapters 5 and 6, are quite involved, and the reader who perseveres will undoubtedly emerge with wits sharpened and a greater respect for proof by contradiction. It is in chapter 6 in particular that the Hungarian school of graph theory, carefully nurtured by Erdös, is most evident. The "extremal" graph theory here can be illustrated by the following simple example: if a graph with n vertices and e edges has no triangles, then $e \leqslant [n^2/4]$, equality occurring only for specified extremal graphs. A generalisation of this result has a nice application due to Erdös: if we have $3s$ points in the plane ($s \geqslant 2$), such that the distance between any two is at most 1, then at most $3s^2$ of the distances between points are greater than $1/\sqrt{2}$.

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