Idiosyncratic Bibliographical Remarks by a Bibliomaniac★

Each of these notes has been written as if its writer were sitting in a book shop (such as hardly exists anymore) glancing through a volume that, prima facie, looked potentially interesting and was thinking of buying or recommending it, although some of these notes go a little beyond that.

Occurrence of a book in this column does not mean that, in special cases, a longer, more discursive review will not appear later in this journal. Nor vice-versa.

Ralph P. Boas, Jr.: *A Primer of Real Functions*, Carus Math. Monographs 13 (3rd edn), Math. Assoc. of America, 1981, 323 (small) pp., £10.

This volume from the justly-famous Carus Math. Monographs series of the MAA is now in its third edition, which is indicative of either a book that is selling well or of unreasonably pessimistic estimates by its publisher. (It is a pity that the highly informative Russian custom of stating somewhere the number of copies printed is not more widely followed.) There are two parts to this delightful little volume: Sets and Functions. The first one culminates with Baire's theorem and especially how to apply it; the last one finishes with infinitely differentiable functions and their Taylor series and all the things that can go right (and wrong) with them. Mostly, the book is aimed at displaying the amazing varieties of functions which exist; that is, in establishing that real analysis (even of one variable) is, what has been called, a dirty subject (to teach). Or, if you are a clearer-minded thinker, it shows how rich the phenomena are.

It is not a bad rule to stay away from books which have the word 'primer' included in the title. In this case that would be a mistake.

P. M. Cohn: *Algebra*, Vol. 1 (2nd edn), John Wiley, Chichester, 1982, 410 pp., £9.95 (paperback).

One thing this century has seen (in mathematics) is the rise of algebra and the increasing power of algebraic techniques in virtually all parts of mathematics (including analysis,

★ Here a fairly mild form - I hope - of this highly contagious disorder is intended. Not like, e.g., Antoine Boulard (*circa* 1800) who bought books by the case, cartload and collection, and on his death left six or eight hundred thousand books in five (full) houses, mostly unpacked, greatly upsetting the antiquarian book market.

These notes owe something to conversations with other people, notably Dr. R. D. Gill and Dr. B. Hoogenboom of the CWI (Centre for Mathematics and Computer Science, Amsterdam).

geometry and topology). With the (coincidental?) rise of computer science, algebra could well become more important than analysis in the college curricula. So a real need for high-level textbooks, written by masters in their craft, will develop. This seems to be such a book, though its contents seem fairly standard (sets and mappings, integers and rational numbers, groups, vector spaces and linear mappings, linear equations, rings and fields, determinants, quadratic forms, further group theory, rings and modules, normal forms of matrices), and little attempt is made to show what algebra is good for.

K. H. Kim and F. W. Roush: *Applied Abstract Algebra*, Ellis Horwood, Chichester, 1983, 265 pp., £25.

This book does make a serious attempt to show what algebra is good for. This is not apparent from the list of chapters (sets and binary relations, semi-groups and groups, vector spaces, rings, group representations, field theory). But in these various chapters there occur such topics as Arrow impossibility theorems, finite state machines, recognition of formal languages by machines, flows and networks and the marriage theorem, kinship systems, coding theory, block designs). The attempt is certainly worthwhile and the book has some merits. It is, however, also seriously flawed. Consider, e.g., the following sentences: 'A character of a representation assigns a complex number to each element of the representation'; 'A group is imprimitive if it moves the elements in sets such that each set is always sent into another set' (besides being obscure I never knew imprimitivity to be a property of the abstract group itself); 'Coding theory is concerned with methods of symbolizing data such that most errors can be detected. This is done because correctly coded messages have a certain form'. These and several more I found in about half an hour of glancing through the book. There are likely to be many more. From this sample estimate I must say that I definitely cannot recommend the result, though I laud the attempt to write it. Indeed by publishing a book (for undergraduates) which has sentences like the above in it, a serious disservice is done to the scientific community; all the more so in this case because the conception was nice.

N. Burghes, I. Huntley and J. McDonald: *Applying Mathematics: A Course in Mathematical Modelling*, Ellis Horwood, Chichester, 1982, 194 pp., £16.50 (£6.50 paperback).

Another area of mathematics which is increasing fast in importance and popularity is mathematical modelling. Though, of course, in one form or another this is a very old field. This is definitely an introduction to the subject aimed at convincing young students that – usually very simple and small – mathematical models help to analyze and understand questions and problems. Mathematics seems very practical in these 33 modelling vignettes and 26 modelling problems. A nice guide to 'How to construct your own models', and heartily recommended.

Paul J. Lewi: *Multivariate Data Analysis in Industrial Practice*, Research Studies Press 1982, 244 pp., £13.75.

Factor analysis is a somewhat old-fashioned technique from psychometrics. It can, of course, be tried out in other contexts, e.g., in pharmaceutics, as the present author has done. Besides new names, there seems to be little new or of interest in the present book.

H. Exton: *q-Hypergeometric Functions and Applications*, Ellis Horwood, Chichester, 1983, 347 pp., £22.50.

q-Hypergeometric functions, also called basic hypergeometric functions, arise basically by replacing in the formula for the hypergeometric function ${}_2F_1$ the numbers $a+n$ etc. by the 'basic numbers' $(1-q)^{-1}$ $(1-q^{a+n})$ where q is a (formal) parameter. The limit as $q \to 1$ of such a basic number is $a+n$ and, thus, the q-hypergeometric function can be viewed as a highly nontrivial deformation of the usual one and can thus be used to unscramble some of the mysteries of the hypergeometric function itself. This would follow the quite pervasive trend in modern mathematics of studying an object also in terms of its possible deformations; not only for such obvious reasons as taking care of uncertainties and inaccuracies, but also studying the singular object itself; for instance, in order to define all kinds of invariants in cases where (due to the singular nature of the object being studied) the usual definitions do not make much sense. This is not, however, the tack taken in the present book.

Many (some would say almost all, or all of the important ones) of the (special) functions of mathematical physics can be obtained (by specialization) from the hypergeometric function. Thus, the art comes into being of finding q-analogues of all the special functions and of all the innumerable formulas involving these. This has also been called the q-disease and, like bibliomania, it is highly infectious, though in both cases the sufferers tend to be quite normal, cheerful people with only a few odd quirks, like working a bit too hard and in the strangest circumstances.

An enormous number of q-analogues have been found and this book is an abundant testimony to the fact. It simply crawls with formulas and thus can be expected to be of considerable use to the q-specialists.

Perhaps rather surprisingly, q-special functions are also important in applications and, indeed, the present book contains almost a hundred pages in which applications to number theory, combinatorics, statistics, various parts of physics, and astronomy are described. Here 'described' is the operative word: we are told the problem, in which q-functions play a role and which relations are used. But we are told very little, or nothing at all, about *why* q-series play a role or can be expected to be useful. Here the material is presented along the lines of 'What they are, we do not know, where they come from, we do not know, but such marvellous gifts must be used'. Quite possibly this is true in some cases, certainly not in all (such as the hard-hexagon model of lattice statistical mechanics, where there is certainly a good suspicion of why the Rogers-

Ramanujam identities should play an important role, even though this is far from completely worked out).

Still, these 100 pages of descriptions of lots of applications are a valuable part of the book and convincingly show that what at first sight looks like playing games with beautiful formulas, is after all uncommonly useful. One thing I do not know. Which came first in this case? Playing godforsaken games with basic numbers or real applications?

One more thing: writing the computer programs in BASIC must have been difficult to resist when dealing with *basic* hypergeometric functions. Still for the sake of scientific computing and, especially, experimental mathematics, one wishes that the author had chosen a more powerful and better language for the purpose.

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