functions. There follows a treatment of the function ${}_pF_q$ for $p \leqq q+1$. There are three cases: for $p<q$, ${}_pF_q$ can be regarded as of Bessel type, while $p=q$ and $p=q+1$ give Confluent and Gauss types respectively. Representations as Poisson integrals, formulae of Rodrigues type and representations in terms of Meijer's G-function are obtained.

In the final chapter, there are further extensions involving Fox's H-functions. Whereas most of the earlier theory is developed relative to spaces of continuous or differentiable functions, we now meet weighted L^p-spaces and the Mellin transform. The chapter concludes with brief references to a variety of topics including fractional finite differences and fractal dimension.

An appendix, running to 46 pages, contains all the properties of special functions necessary to make the book self-contained.

Although a lot of the material is technical and symbols, subscripts and superscripts abound, the author's presentation is admirable and the quality of English is exceptionally good. With so many formulae around, the author has devised a numbering system which, although largely standard, contains a few idiosyncrasies. For example, formulae (1.1.18) and (1.1.19) are squashed between (1.1.h) and (1.1.j). This makes the occasional cross-reference hard to find. The number of misprints is remarkably small and the overall appearance pleasing, thanks to the use of TEX.

As indicated earlier, the huge list of references almost justifies the book alone, but there is much else for the general reader and expert alike. The author is to be congratulated for her labours in producing a work of scholarship.

A. C. McBRIDE

NEUMANN, P. M., STOY, G. A. and THOMPSON, E. C. *Groups and geometry* (Oxford University Press, Oxford 1994), x+254 pp., hardback 0 19 853452 3, £40; paper 0 19 853451 5, £19.50.

The reviewer of this text is immediately faced with an awkward and potentially embarrassing dilemma. The first two authors, Neumann and Stoy, explicitly affirm in the preface that the work may be idiosyncratic and, subsequently, they give a generous and touching eulogy to the deceased third author, Thompson. In this situation a reviewer is compelled to speculate on two questions, namely on whether to endorse their affirmation and whether, on the principle of the Latin tag *nil nisi bonum*, to refrain from criticism? An analysis of the text does allow both questions to be answered with some decorum.

The preface states that the work really consists of two books; of the 19 chapters, Chapters 1–10 on group theory and Chapter 19 on Rubik's magic cube have been written by Neumann and Stoy, who saw the book through the press, and Chapters 11–18 on geometry have been written by Thompson. Stylistically the two parts of the text cohere quite well although the later chapters have a tendency to be wordy in comparison with the earlier chapters. Some of the idiosyncrasy shows up in the unconventional titles of the chapters, titles such as "A menagerie of groups" and "A garden of G-spaces", and in the exotic choice of colours for the sides of Rubik's cube even if this choice is amusingly marred by a flaw in the proof-reading. Throughout the book there are interesting historical asides whose presence appears to reflect in particular the influence of Thompson.

The chapters on group theory are clearly written and emphasize aspects which will be relevant to the geometric applications. The group theory is itself developed from its very beginnings but throughout there is a presumption that the reader has some familiarity with the topics under discussion; in consequence, proofs are sometimes omitted or merely sketched. On the other hand the authors do not simply establish results but take pains to convey ideas; thus for example two different proofs of Sylow's Theorems are given so that the reader may better appreciate uses to which permutation groups may be put. Permutation groups do constitute a significant part of the group theory, concepts associated with groups acting on sets receiving an extensive treatment. Affine and linear groups are considered for their later applications in geometry. The counting

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theorem that is commonly, but apparently erroneously, attributed to Burnside makes its expected appearance and is applied, as usual, to the enumeration of the colourings of geometric objects. Specimen solutions to a variety of instructive exercises are provided but it might have been thought that a layout could have been devised that did not entail the repetition of each of these exercises. The last chapter of the text is an excursion into the group theory of Rubik's cube.

The chapters on geometry embrace the axiomatization of geometry, affine geometry, projective geometry, Euclidean geometry, inversive geometry, quaternions (which receive a fairly lengthy treatment), the Platonic solids, and finally a chapter on topological considerations. None of these chapters is deep, the aim seemingly being to give a flavour of a large number of topics, and to show how group theory may be applied to their understanding. There are many nice touches presenting the reader with novel points of view. Exercises of very mixed difficulty are provided but without solutions.

How should the questions posed at the beginning of this review be answered? The book, which, as mentioned above, is in effect two books, is indeed somewhat idiosyncratic but the authors' approach to their topics is frequently refreshing and instructive. It could not be easily usable as a text-book since it can only be properly appreciated by students who have previously encountered the material in some form, but for those who have met the material it could be an unusual and thought-provoking experience. Triple authorship would seem to have something to recommend it.

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