analysis, for example the behaviour as $\lambda \to 0$ of the semigroup with perturbed generator $\lambda^{-1}Z+A$. The later sections of this chapter form perhaps the most technical part of the book. Chapter 7 deals with the notions of positivity and irreducibility for semigroups acting on (for simplicity) $L^p$-spaces and $C(X)$. Finally, Chapter 8 covers the theory of spectral subspaces for an (unbounded) Hermitian operator $H$ on a Banach space ($iH$ is the generator of a one-parameter group of isometries), culminating in the important result that $H$ is uniquely determined by its family of spectral subspaces.

This book should be much appreciated by anyone wishing to work steadily through a systematic exposition. Proofs are kept reasonably short which has the two-fold advantage of encouraging the reader and then providing the beneficial but not over-taxing task of filling in some details. One criticism here is that results from earlier sections are frequently used without mention. This is fine for someone who is working through the book but may cause difficulty for the casual reader. The same applies to the sudden reintroduction of earlier notation (see, for example, the reappearance of $P_1$ on p. 128 after its use on p. 84). Occasionally the treatment is a little too abrupt: for example, "spectral radius" is defined without even a passing reference to the spectrum, and the term "dissipative" is introduced with no reference to the heat equation or any other physical example which would explain why this particular adjective is chosen.

The text contains several problems, mainly on the general theory, and many concrete examples. The former are for the most part straightforward while the latter require something of a change of gear. Filling in the details may provide a lengthy but rewarding tussle, involving techniques in integration, differentiation, and Fourier theory. Notes at the end of each chapter indicate original sources, and show that much of the material in the later chapters comes from the last decade and appears in book form for the first time. Some of the notes might have been better placed in the preceding text (e.g. the reference for Polya's criterion on p. 94 would be more helpful if it came on p. 85), and there are one or two other places where better sign-posting would help. For instance, when discussing relative boundedness in Chapter 3 it would have been very helpful to give a forward reference to the illuminating Example 4.21. However, these are minor points and do not affect the general conclusion that this is a most valuable addition to the literature in this field.

R. J. ARCHBOLD

ASCHBACHER, MICHAEL, *The Finite Simple Groups and Their Classification* (Yale Mathematical Monographs 7, Yale University Press, 1980) ix + 61 pp., £4.40.

The complexity of the problem of classifying the finite simple groups has fascinated many mathematicians and the quantity of the work carried out has necessitated the production of a number of surveys. These range from Daniel Gorenstein's book, *Finite Simple Groups* (Harper & Row, 1968), which can be regarded as the finite simple group theorist's bible, to the most recent comprehensive survey "The classification of finite simple groups", also by Daniel Gorenstein, part I of which appeared in Bull. American Math. Soc. (New Series) 1 (1979), 43–199 and the remainder of which has still to appear. However, most of the surveys have been for the use of experts and there has been a distinct lack of exposition suitable for the wide range of mathematicians who are interested in the subject.

I was therefore pleased to read that Michael Aschbacher's book, which is based on four special lectures delivered at Yale, is "intended for a general mathematical audience". Unfortunately this intention has not been carried out. The author has not thought carefully enough about the existing knowledge of his reader. The result is a rather uneven set of assumptions. Thus the reader finds that he is told more than once the definitions of the terms involution and elementary abelian $p$-group but is expected to cope without help with a variety of terminology and notation concerning normalizers, commutators and conjugates and to absorb quickly some rather complex ideas. So I disagree with the claim on the back cover that the contents are "accessible to most mathematicians".

If, however, one views the book from the standpoint of a reader who already has some knowledge of finite simple group theory, a different picture emerges. Such a reader will find the book an interesting, concise and clear summary. The main ideas are brought into focus. The general plan for the classification is laid out and Fischer's work is given its due place. I like the way the author has drawn attention to the contrast between the properties of semisimple and unipotent elements and I found helpful his attempts to divide the properties of finite simple groups into what might be called typical (or generic, to use the author's term) and untypical, the typical properties being those capable of being handled by general methods and theorems, and the untypical being those requiring special methods of their own.

N. K. DICKSON

BAXANDALL, P. R. and LIEBECK, H. *Differential Vector Calculus* (Longman Mathematical Texts, Longman, London, 1981) 240 pp. £7.95.

CRAVEN, B. D. *Functions of Several Variables* (Chapman and Hall, London, 1981) 134 pp. £4.95.

These two books covering aspects of the calculus of functions of several variables are different as regards choice of material and poles apart as regards presentation.

Baxandall and Liebeck concentrate on the differential calculus, going as far as the Chain Rule and Taylor's Theorem for functions from $\mathbb{R}^m$ into $\mathbb{R}^n$ and the corresponding general versions of the Inverse Function Theorem and the Implicit Function Theorem. To assist the reader in grappling with these results, the authors break the development into three easy stages. First, they deal with the case $m=1$, introducing the basic ideas of continuity and differentiability and discussing applications to curves, differential geometry and particle dynamics. Next, they consider the case $n=1$, introducing the concepts of the differential and the gradient and progressing through the Chain Rule, Mean-Value Theorem, etc. to an examination of critical points. Finally, the theory is presented in all its glory for general values of $m$ and $n$. The reader, having seen special cases earlier, is now able to take the full force of Jacobians, etc., with relative ease. The importance of the theory is illustrated by a short concluding section on Lagrange multipliers. Not everything suggested by the title appears in the text; for instance, there is no mention of div or curl. However, the material selected is presented in a most readable and leisurely fashion. There is a plentiful supply of illustrative examples and exercises and, although a few tougher exercises would not have gone amiss, the reader will emerge with a very firm understanding of the material. There are a few misprints, wrong answers, etc., but these constitute a minor criticism of a book which can be warmly welcomed.

Craven disposes of the same material as Baxandall and Liebeck in a fraction of the space and goes on to cover much more including Kuhn–Tucker theory, surface and volume integrals, Stokes's Theorem, differential forms and even partitions of unity (in an Appendix). The style is very condensed and the notation used helps to make the going tough for the reader. A further drawback is the unacceptably large number of mistakes, misprints and wrong answers. The presentation seems rather disjointed and the text is more in keeping with a first draft rather than a finished article.

ADAM C. McBRIDE

FRANKEL, T. *Gravitational Curvature: An Introduction to Einstein's Theory* (Freeman, San Francisco, 1979) xviii + 172 pp. £18.50; paper, £8.95.

This little book, which presents the core of the general theory of relativity in a form suitable for mathematicians who have been exposed to a basic course on modern differentiable geometry, has much to commend it. In recent years it has become *de rigeur* for relativists to employ coordinate-free methods in their work rather than traditional tensor calculus with its sometimes tedious computations with components of tensors and a multiplicity of indices. This modern approach

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