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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has been of crucial importance in some recent developments and can be seen at its best in such a book as *The large scale structure of space-time* by Hawking and Ellis, to the study of which the book under review would be an excellent propaedeutic. The beginning relativist should, of course, make himself familiar with both the old and the new approaches; often, one simply has to revert to using components, and, it is not unknown for a result to have been obtained first by the old fashioned methods and then established by a more modern method.

Frankel's book is mathematically elegant throughout and has a number of distinctive features. Einstein's field equations are obtained heuristically in a novel way and are then written in several geometric forms one of which is particularly neat. The Schwarzschild exterior and interior solutions are obtained in a non-standard way. Free use of differential forms (including de Rham's forms of odd kind) is made throughout and particularly in the chapters on electromagnetism, where their usefulness is shown to good effect in the short proof of the conformal invariance of Maxwell's equations.

The book covers most of the topics included in a first course on general relativity and stops short of matters such as the Kruskal metric, the Kerr black hole, singularities in space-time and the Weyl tensor. My only criticism of the book is that it contains no unworked examples by which the student can test his understanding of the theory.

D. MARTIN

DODSON, C. T. J. and POSTON, T. *Tensor geometry: the geometric viewpoint and its uses* (Pitman, 1979), xiii + 598 pp. £24.00; paperback, £9.95.

This book provides a first course on differential geometry which is eminently suitable for beginning theoretical physicists, especially those wishing to study the general theory of relativity. The treatment is very modern, the style is discursive and clear, and only a minimum of mathematical knowledge is assumed. Even an introductory chapter on sets, functions and the like is included. I doubt if this chapter and the next, which gives an introduction to linear algebra, are really necessary for the readers for whom the book is intended; there must be few honours graduates in physics nowadays who have not been exposed to some linear algebra (treated in a modern way) in their ancillary mathematics courses.

As the title of the book suggests the motivation is geometric wherever possible—there are plenty of diagrams—and coordinate-free methods are used throughout. At the same time, classical tensor calculus is by no means neglected, since results expressed in terms of components are so often required by the working physicist. The contents of the book include such matters as tensor algebra, manifolds, vector fields, covariant differentiation, the curvature and Weyl tensors, and geodesics; brief accounts of both special and general relativity are also included. A notable omission is a treatment of exterior differential forms, but this will appear in a subsequent volume. A plentiful supply of exercises is provided, some of the exercises consisting of theory broken down into self-contained parts, which gently lead the student to the desired result.

Anyone conscientious enough to work carefully through this book will lay a solid foundation of knowledge on which to build a proper understanding of the more sophisticated geometrical techniques commonly used in some parts of theoretical physics today.

D. MARTIN

ROSE, J. A. *A course on group theory* (Cambridge University Press, 1978), 310 pp., cloth £19.75, paper £8.25.

The number of textbooks on group theory at present available in the better bookshops is quite large. So the first question that comes to mind when a new book on group theory arrives on one's desk is whether it fills a gap and is deserving of publication. In the case of this book the answer is an unqualified yes.