ISERLES, A. *A first course in the numerical analysis of differential equations* (Cambridge University Press, Cambridge, 1996), xvi + 378pp., 0 521 55655 4 (paperback) £19.95 (US$27.95), 0 521 55376 8 (hardback) £55 (US$74.95).

This is a well written and exciting book on the analysis of the numerical solution of ordinary and partial differential equations. The target market is mainly final year undergraduate and beginning postgraduate students in mathematics, but engineers and scientists with a sufficient degree of mathematical maturity would also be well served by the lucid treatment and motivation.

The book is split into three main sections: ordinary differential equations, the Poisson equation and evolutionary partial differential equations. The first section deals with the derivation and analysis of multistep and Runge-Kutta methods. Also included is a discussion on the important issue of automatic step size control. In contrast to many other books in this area the reader will not find any guidance on writing computer codes to implement such techniques, the author preferring to emphasise the mathematical derivation and analysis of methods. At the end of each subsection are exercises of varying degrees of difficulty and a very useful comments and bibliography section. The references are up-to-date and the comments give the reader a good picture of many of the modern developments in each area and on outstanding issues. This aspect of the book is especially pleasing and hopefully will be inspirational to good students.

The second section of the book deals with Poisson's equation, which is chosen as a generic example of an elliptic boundary value problem. This is used as a vehicle to describe finite difference and finite element discretisations. Both of these approaches result in Poisson's equation being swapped for a large set of sparse linear algebraic equations. Various solution techniques are investigated from classical iterative methods to the more modern multigrid methods.

The final section deals with evolutionary PDEs with the diffusion and advection equations as the parabolic and hyperbolic test cases. This section includes a clear distinction between Fourier and eigenvalue techniques for establishing stability. At one point the author proves that $1 = 2$, using a slight of hand which emphasises the role of non-normality in the use of eigenvalue techniques. At the end of the book we find a short compendium of mathematics that would prove useful for the forgetful student.

The book contains few typographical errors, but an incorrect statement of Gerschgorin's circle theorem in the main text is reproduced in the exercise section. This small matter apart, the exposition throughout the book is clear and very lively. The author's enthusiasm and wit are obvious on almost every page and I recommend the text very strongly indeed.

J. MACKENZIE

AUDIN, M. *Spinning Tops* (Cambridge Studies in Advanced Mathematics Vol. 51, Cambridge University Press, Cambridge, 1996), viii + 139pp., 0 521 56129 9, (hardback) £25 (US$34.95).

The intimate relationship between geometry and physics has always been an important component of mathematical thought. Indeed, certain periods of activity have fuelled very significant developments across the two areas, one of the most important examples of which was the one lasting from the time of Newton until the early part of this century. It was during this era that many of the key ideas in classical mechanics and geometrical analysis were developed, the one discipline being closely intertwined with the other. One need only consider the work of L. Euler, J.-L. Lagrange, P.-S. Laplace, A.-M. Legendre, C. F. Gauss, S.-D. Poisson, C. G. J. Jacobi, W. R. Hamilton, P. G. Lejeune-Dirichlet, J. Liouville, G. F. B. Riemann, M. S. Lie, C. F. Klein, H. Poincaré, D. Hilbert, E. Cartan, C. Carathéodory, A. E. Noether and G. D. Birkhoff, much of which reflects the central rôle played by mechanics. Of course from a late twentieth century viewpoint another instance of the fruitful interaction between geometry and