

elliptic theory and show how existence and uniqueness of solutions to certain boundary value problems can be proved by several techniques. These include Perron's method involving sub(super)harmonic functions and also the use of single and double layer potentials to reformulate the boundary value problems as integral equations. Following on from this, an account of Fredholm integral equations in L^∞ and L^2 is presented in Chapter IV and applications to eigenvalue problems for the Laplacian are considered.

The heat and wave equations are the subjects of Chapters V and VI respectively. In the case of the heat equation the Cauchy problem receives most attention, with existence and uniqueness results for solutions being established from integral representations involving the heat kernel in conjunction with the maximum principle. Results on nonnegative solutions are also presented. The chapter on the wave equation begins with the usual derivation of d'Alembert's representation of the solution of the one-dimensional Cauchy problem and then goes on to provide a description of the Poisson method of spherical means and the Hadamard method of descent for producing solutions to the N -dimensional Cauchy problem in the cases $N \geq 3$ and $N = 2$ respectively. A brief account of general linear second-order hyperbolic equations in two variables, including the Riemann function, is also given.

Quasi-linear equations are discussed in Chapter I, where the Cauchy–Kowalewski theorem is presented, and also in Chapter VII, which deals with first order equations and conservation laws. In the case of the latter the inclusion of an account of the work of Lax and Kruzhkov on entropy solutions is one of the positive features of the book.

At the end of each chapter is a set of *Complements*, containing problems and supplementary material such as the Ascoli–Arzelà theorem, Jensen's inequality and a brief account of metric spaces and compactness. Numerous footnotes also appear throughout the text, providing interesting information on the historical background of various topics and giving a clear indication of the author's expertise and breadth of knowledge in this field.

One or two aspects of the book are a little disappointing. There are occasions when notation is used before being properly introduced and when proofs of results are explained in a rather terse fashion. A number of typographical and mathematical errors occur. In addition, the author is possibly being optimistic in regarding the text as a 'self-contained, elementary introduction to Partial Differential Equations, assuming only advanced differential calculus and some basic L^p theory'. Newcomers to the subject with little prior exposure to partial differential equations are likely to find this book a difficult read due to the technical nature of the material and the inclusion of only a few elementary examples to illustrate the theory.

Despite these shortcomings the book will undoubtedly serve a valuable role as an intermediate text aimed at graduate students wishing to extend their theoretical knowledge of partial differential equations and as such I recommend it.

W. LAMB

AITKEN, A. C. *To catch the spirit* (with a biographical introduction by P. C. Fenton) (University of Otago Press 1995), 123 pp., 0 908569 99 8, NZ\$29.95.

A. C. Aitken's autobiographical memoir, which forms the second half of this book, covers the years 1923 to 1943. Aitken grew up in New Zealand. The University where he had been a student granted him a scholarship to pursue postgraduate studies under E. T. Whittaker in Edinburgh. In July 1923 Aitken left Dunedin bound for Edinburgh and never returned to his native country.

The memoir is compiled from diaries: for the years 1923 and 1924 entries were made almost daily. They give an entertaining account of his voyage from New Zealand to Scotland (he was travelling alone—his wife followed a few months later). This is followed by: a vivid description of his initial impression of Edinburgh; his first visit to Whittaker's house in George Square ('he came from the back, where he had been gardening'); making the acquaintance of other faculty members;

his contact with the musical life in Edinburgh, including the powerful Donald F. Tovey. Aitken was not only an able violinist and a keen chamber music player but he also took a hand at composition and could write down music he had heard or imagined. Regular entries in the diaries ceased in 1924. Thereafter he recorded impressions and experiences relating to his private life, his professional work and the world around him. Some of these accounts were written down many years after the events.

The first years in Edinburgh were beset with worries about money, work and health. At one time he was afraid that he would fail to submit his dissertation by the date required and he was most surprised when, quite exceptionally, he was awarded the D.Sc. degree instead of the Ph.D. degree for which he had applied. He was modest about the prizes and honours he received, notably the election to the Royal Society of London in 1936.

Aitken was a devoted family man: the love for his wife and two children shines through his description of family holidays, usually near Edinburgh. They all suffered when, during the Second World War, the family had to be separated for safety reasons.

He had a deep affection for nature; Scotland's beautiful scenery reminded him of the lonely walks he undertook as a boy in New Zealand.

His high sensitivity and powerful imagination, alas, also had its shadow side: there were occasions when he was incapacitated by what he termed severe nervous breakdowns.

The reader of this autobiographical memoir cannot fail to be moved by the frankness with which Aitken recounts his personal experiences and by the high literary quality of his style. It is a pleasure to share in his love for nature and music. Moreover, these pages preserve the memory of the cultural and academic life in Edinburgh in the two decades before the war. We have here a worthy sequel to his celebrated *Gallipoli to the Somme* (Oxford 1963).

The first half of the book, modestly called *Introduction*, is by P. C. Fenton of the University of Otago. It begins with an interesting history of Aitken's ancestors, who came from Scotland and settled in New Zealand. This is followed by a perceptive account of Aitken's boyhood and adolescence in Dunedin, his education at the school and University and his short and somewhat disappointing career as a schoolmaster. In a scholarly fashion Peter Fenton has appended numerous notes in order to identify the sources of his researches. His section of the book is nicely illustrated with photographs. He deserves thanks and credit for producing a book that brings to life a man of outstanding intellect, vision and culture. The title, we are told, is Aitken's own transcription used on a certain occasion of his initials A. C. A. to signify *ad captandam animam*. Perhaps we may vary it so that it also stands for *ad captandum animum*, that is, 'it captures both the spirit and the soul'. In this task Peter Fenton has eminently succeeded.

W. LEDERMANN

[This book was published in conjunction with a conference held at the University of Otago to celebrate the centenary of Aitken's birth in 1895. Copies may be ordered from the University of Otago Press through booksellers or directly from Dr P. C. Fenton, Department of Mathematics and Statistics, University of Otago, P. O. Box 56, Dunedin, New Zealand.]