Hilbert and finite Hilbert transforms in turn. Chapter 5 discusses a selection of approximate methods. Iterative methods for non-linear equations are followed by various methods for linear equations including the approximation of kernels and free terms, collocation, Galerkin's method and least squares approximation. Finally there are methods for obtaining approximations to eigenvalues and eigenfunctions. The book concludes with several appendices containing a collection of odds and ends required at various places in the main part of the text.

To illustrate the theory the author has included almost 80 worked examples and a similar number of exercises for the reader and these provide what is perhaps the outstanding feature of the book.

The author's overall philosophy is sound and the book might have been warmly recommended were it not for the fact that the entire text contains a plethora of mistakes. Indeed, the reviewer spotted almost 200 errors, some mathematical, others typographical. It might be said that missing integral signs, wrong dummy variables in summations and sign slips in the algebra will be obvious to most students; but even the most patient student will become exasperated when there are as many as six mistakes in almost as many lines (e.g. on p. 76 or p. 112). Furthermore, there are some more serious errors whose correction is perhaps not so easy for the reader. Thus the proof on p. 17 using (1.69) is wrong in detail. Again, (2.11) looks plausible but (2.12) (which is prefaced by "it is clear that") certainly does not follow from it; the reader has to work out what (2.11) should have been and, if lucky, might find his guess proved right when he gets to (2.23). One or two proofs seem incomplete such as that on p. 144 which appears to establish uniqueness only on a restricted interval, as it stands. In fact, in the theoretical sections, the logic is sometimes far from clear. Thus, on p. 23, the second paragraph doesn't make sense because of a misprint. Again, it is not always immediately clear what assumptions are being made about the kernels of an equation. Also, some new paragraphs begin in odd places, thereby disrupting the logical flow (and, surely, even a mathematical sentence should end with a full stop!). Some of these criticisms may sound childish. Yet it must be said that almost all of these faults could easily have been eradicated if more care had been taken; the impression is given of things being done in too much of a hurry, which is a pity.

In spite of these shortcomings, the book could still serve as a useful adjunct to a methods course. A student on such a course might perhaps have wished for additional physical applications or an explanation of where some of the kernels arise (for instance, the Poisson-type kernel which appears in Example 2.14 and elsewhere). Nevertheless he should find the exercises valuable and may well succeed in solving them, provided that he adds to his mathematical talents some of the qualities of a detective and a mind-reader.

ADAM C. MACBRIDE

CAIANIELLO, E. R., *Combinatorics and Renormalisation in Quantum Field Theory* (*Benjamin, 1974*), xv+121 pp., $16.00 (cloth), $9.50 (paper).

This book is another in the Benjamin Frontiers in Physics series. As such it is pitched at the level of a postgraduate course in mathematical physics. Appropriately enough, the exposition is informal and complete proofs of mathematical results are not always given. Its main virtue is that it gives in a single volume a comprehensive account of the important work of E. R. Caianiello and his collaborators, carried out over a period of almost twenty years, on the renormalisation problems of quantum field theory. The mathematical state of the art of renormalisation is not yet sufficiently advanced for field theories in three-space dimensions to give a rigorous treatment of this problem. Nevertheless, combinatorial theory can be used to good advantage in dispensing with the need for a "graph by graph" analysis of the formal perturbation series which arise. This is the main theme of the present text.

The book is divided into three parts. The first part deals with the relevant combinatorial tools such as Clifford's algebra, Grassmann's algebra, their interrelationships and various expansion theorems. Here the mathematical treatment is not sophisticated — most results being presented as formal manipulations of algebraic symbols. The first part also includes a chapter on miscellaneous applications of combinatorial theory (excluding quantum field theory and the Ising model). This may be of more general interest to classical applied mathematicians. The main content of Part I, however, is the intimate connection between combinatorics and Wick products — determinants and pfaffians being applied to fermion fields and permanents and hafnians to boson fields.

In Part II the formal theory of the particle propagators (Green's functions) is dealt with in x space, the methods of Part I being used to study unitarity, gauge invariance and the infrared divergences. It is here that one sees the economy of the combinatoric methods. For instance, with combinatoric methods, the linked cluster expansion of many body theory is derived for fermions in just a few lines. The fundamental problem of the existence of solutions is, however, only mentioned. The solution to this problem in general still seems a long way ahead, although the present methods clearly yield answers for specific models.

In the third and final part of the text two x-space regularisations are given and the analytic problems arising when these regularisations are removed are handled. Combinatorial tools are again used to great advantage in shortening many of the standard arguments. The last chapter deals with the Hartree Fock self-consistent field approximation and various models. Principally the Hartree Fock approximation is applied to the "Thirring" model and non-polynomial "Lagrangians". The exactly solvable Lee model is also discussed. In each case the prescriptions of the present text are applied and the relevant computations are carried out. The physical mass appears as the (non–unique) solution of a mass equation. The non-uniqueness of the physical mass is associated with the existence of inequivalent representations, interpreted in terms of spontaneous breakdown of symmetries. In the case of the Lee model the mass equation leads to "ghost particles" coinciding with the standard ones. The ease with which the calculations are done is again impressive.

The main results of the present text could be regarded as only advances in book-keeping. However, there may be analogies here with the situation regarding Feynman path integrals, say, some eleven years ago. If one reads Feynman's acceptance speech for the Nobel prize in 1965, one is left with the impression that he then regarded the path integrals as merely a useful book-keeping device. One wonders if, at that time, he foresaw the fundamental role which they would play in the hard analysis of constructive quantum field theory. The present text will, without doubt, prove a valuable addition to any mathematical physics library.

AUBREY TRUMAN

COLLINGS, S., *Theoretical Statistics — Basic Ideas Volume II* (*Transworld Student Library*), 148 pp., £0·85 (paperback).

Volume I of this series introduced the ideas of probability, random variables and discrete distributions. This volume on continuous distributions is essentially self-contained. The approach is summarised in the preface: "so much of the content of the subject resides in the mathematics, without which it is difficult to obtain a proper understanding".

The subject matter is distribution theory, the pre-requisite mathematical knowledge