to appear until perhaps 50 years after his death. This attitude is easily understood on a perusal of the book, for the reader is left in no doubt whatever that, although Courant was a remarkable man who was frequently brilliant and on many occasions kind and considerate, he was often perverse and decidedly objectionable. For instance, while in Göttingen, he arranged at his own expense a ski-ing holiday for a student who was recovering from a nervous breakdown, and in America, where he went as a refugee in 1934 and where he became Director of the institute which bears his name, he created minor posts for young people in need and paid their salaries entirely out of his own pocket. On other occasions, however, Courant seemed to have had a very definite bias in favour of himself, and there were instances when he was adversely criticised by fellow mathematicians for the lack of credit which he gave to his associates. Again, his calculating nature and his utter subservience to people, endowed with wealth but with few other attractive attributes, did not endear him to his colleagues.

In gathering material for her book, the author must have travelled far and wide tracking down associates of Courant and making tape recordings of their reminiscences. As a result, a higher proportion than is usual of the text is in direct speech, but this strengthens the authority of the narrative. The book, which consists of 28 chapters each dealing with a short period of Courant's life, begins with a short account of his pre-Göttingen days; then, after dealing with his association with Hilbert and with both the building up of the mathematical school in Göttingen and its dissolution after the advent of the Nazis in 1933, the book concludes with an account, which takes up almost half of the entire text, of Courant's creation of the institute in New York and of his advocacy of applied mathematics. Courant's original mathematical work, through which as has been said Dirichlet's principle runs like a thread, and his books are mentioned at appropriate places.

The book is altogether fascinating and is valuable not only for its portrait of Courant but also for the picture which it gives of the mathematical community in Göttingen both in its hey-day and in its time of extreme adversity from 1933 onwards. In this connexion the text is enhanced by a collection placed at the end of more than 30 photographs of Klein, Hilbert, Courant, Weyl, Emmy Noether, Born, Franck and other prominent personalities.

D. MARTIN

SAWYER, W. W., *A First Look at Numerical Functional Analysis* (Oxford Applied Mathematics and Computing Science Series, 1978), £9·00 (boards) and £4·25 (paper).

This book is a very readable introduction to the concepts of functional analysis, with the problems of numerical analysis at the forefront. The topics covered are limits, continuity, convergence, vector space, contraction mappings, Minkowski spaces, linear operators, Fréchet differentiation, integration, Newton–Kantorovich method, polynomial operators and majorants, Hilbert space, functionals and compactness.

The author endeavours to deal with as much non-linear analysis as possible, and deserves much credit for this. In particular the material on the generalisation of the Newton–Raphson Method is excellent, marred only by an error on p. 99, where the use of an incorrect ball invalidates the solution of an example.

The approach used to justify some of the definitions and to analyse some of the theorems is geometric. This works marvellously well, for example, in analysing Hölder's inequality.

This book is successful in the same way as all of Professor Sawyer's texts—he has a wonderful ability to make the subject he writes about come alive. There are a few blemishes. Compactness is given less coverage than it warrants (it does not even appear in the index) and there is no mention of that most useful result for numerical functional analysis, the principle of uniform boundedness. On p. 50 a matrix iteration is seen to converge, but it is stated not to be a contraction, apparently only euclidean norm is to be considered here but that is not so in other sections. Also contraction mappings are only considered in normed vector space although distance functions are presented. On p. 175 it is overlooked that closure is required for compactness in finite-dimensional space. The text is not free from misprints—I noted about 15. There are a fair number of exercises, but no solutions.

Lest these criticisms detract from a very worthwhile text, I would like to underline that it is a welcome addition to the literature, and should prove useful to functional and numerical analysts alike.

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