stakes have been raised, are responding to the threat by installing new techniques such as a form of caller identification as well as simply by cutting themselves off from the outside world — the ultimate in computer security. Some businesses and scientific institutions are following suit.

But academic computer systems, especially those which offer on-line access to remote users, still face some difficult

decisions. In some operating systems, increasing security necessarily means restricting access, which defeats the purpose of open networks. Clifford Stoll and his fellow guardians of the gates will have their hands full in the coming years in finding a happy medium. □

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Packing quite a punch

Simon Lavington

ICL: A Business and Technical History. By Martin Campbell-Kelly. *Oxford University Press: 1990. Pp. 409. £30, \$30.*

THE British computer industry, like the British car industry, is now firmly established as fair game for comment in saloon bars across the land. There are other similarities: computers, like cars, affect us all, and, as both products struggle to become more user-friendly, familiarity breeds contempt. Martin Campbell-Kelly's scholarly history of ICL (International Computers Ltd) pulls us up sharply. ICL is, for all practical purposes, the United Kingdom's only major computer company. It deserves to be taken seriously.

ICL has its origins in two punched-card office equipment firms: the British Tabulating Machine Company and the Accounting and Tabulating Machine Company (later Powers-Samas). Although the heyday of the punched-card machine came during the 1930s, this style of equipment saw service from the turn of the century through to the early 1960s. Indeed ICT, the successor company to BTM and the Acc and Tab, was still making 85 per cent of its money from the sale of punched-card equipment in 1960. It is therefore not surprising that the general-purpose computer does not come into the picture until well over half-way through this book. Computer buffs will want to skip the first 50 years of history and start at the point when the fondly remembered British computer manufacturers such as Elliott Brothers, English Electric and Ferranti became involved in the series of mergers with ICT that led to the formation of ICL.

This book is not, however, written

for computer buffs. It is an analysis of business opportunities in the evolving world of information technology. It is, above all, about market forces and the contrasting responses to these forces on both sides of the Atlantic. In this respect, it gives a series of case studies in technical and marketing strategy that should appeal to a wide audience. If the office-appliance industry was the barometer of the economy in the mid-1920s, its successor — the information-technology industry — will certainly be the economic barometer of the 1990s. Economic forecasters should read this book, heed its lessons and advise management accordingly.

1938 Powers-Samas sterling multiplying punch.

There is much that Campbell-Kelly could have said about the management of ICL. Instead, he contents himself with the gentlest of quotes from others. Thus Arthur Humphreys, who rose to become the company's managing director, is of the opinion that: "the British Tabulating Machine Co. was really run by English gentlemen, and I think the business came fourth after hunting, shooting and fishing". As for commercial success or setback, Campbell-Kelly lets the facts speak for themselves. It is a feature of his book that tables abound, charting the announcements, delivery dates, sales volume and

value of all manner of office and computing equipment from 1908 to 1985. These are always set in context, with comparative figures being presented for US and, latterly, continental European manufacturers. Through these figures we see the company's fortunes periodically rise and fall. To be fair to ICL, computer market trends have been notoriously difficult to predict. There is the oft-quoted remark of an undisputed computer expert, Professor Douglas Hartree, in conversation with 'the' Ferranti computer salesman in September 1951: "We have a computer here in Cambridge; there is one in Manchester and one at the NPL. I suppose there ought to be one in Scotland, but that's about all."

If 'scholarly' is the natural adjective to describe this book, what qualifications are demanded of its readers? They certainly need to be computer literate, not only to overcome the modest number of technical terms encountered here but also, more importantly, to appreciate the differences in power and scope of the various computing systems mentioned by Campbell-Kelly. This is especially true of ICL's developments since 1970, as the company struggled with the technical complexities of its "new range". The architecture of this new range is, in the words of Campbell-Kelly, "masterly and in advance of anything offered by any other manufacturer". We are not told why. Similarly, two very innovative ICL ideas — the distributed array processor and the content-addressable file store — are left dangling in the text in much the same way as the projects were left dangling for years within ICL before being presented in a realistic way to the market place. This book is thus technically tight-lipped.

For those with a taste for the technical, the book nevertheless contains some appetizing morsels. For example, there is the accounting machine invented by the Spaniard F. P. Campos in 1923. Containing 1,000 registers, it also offered Babbage-like possibilities for mathematical computation — if only it could have been made to operate reliably. There is also the important work done by the British Tabulating Machine Company for the 1939–45 war effort at Bletchley Park. Finally, there is the innovative work done by Ferranti and at Manchester University in connection with the Atlas computer which became operational in 1962. It is interesting to note that the ex-Ferranti West Gorton factory and Manchester University have again combined to provide much of the input to ICL's latest research project: a novel parallel computer called EDS, the European declarative system. □

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