



SURVIVAL OF THE FITTEST

There are millions of microprocessors in use throughout the world, doing jobs as diverse as controlling microwave ovens and video recorders, to powering the familiar home computer. And yet, despite the huge numbers involved and the diversity of applications, the market is dominated by just two designs: the Z80 and the 6502.

Computers on a chip came about almost by accident. In 1972, the chip manufacturer Intel was asked by Datapoint to develop a chip to replace the large number of TTL (transistor-transistor-logic) chips needed in the computer terminals of the time. The product they came up with was called the 8008. It was capable of processing data eight bits at a time, and would have made an ideal 'logic replacement' for use in Datapoint's terminals but for one drawback – it operated too slowly. Although Datapoint decided not to use it, the 8008's potential as a general-purpose computer CPU was soon spotted by engineers and hobbyists, and thus the affordable, desk-top computer was born.

The limitations of the 8008 in terms of speed and power soon became apparent, however, and so Intel set about designing a replacement. The chip they developed, the 8080, rapidly established itself as the dominant force in the market.

At about the same time as Intel announced the 8080, their competitors Motorola launched an eight-bit microprocessor called the 6800. The design philosophies behind the 8080 and the 6800 differed considerably, but they were equally powerful and suitable for use as the basis of a microcomputer design.

Although the 8080 and the 6800 were equally efficient, an accident of history paved the way for the phenomenal success of a third chip, the Z80. In 1974, Gary Kildall, now President of Digital Research, produced a disk operating system for Intel called CP/M. This allowed 8080-based computers to be used with the recently introduced Shugart floppy disk drives. Kildall's operating system was rejected by Intel, who thought that existing software was sufficient to use with the standard mainframe computer systems of the time.

However, smaller computers were becoming increasingly popular and CP/M greatly facilitated file-handling on these systems. This fact ensured the market dominance of the 8080 for many years, and cast the Motorola 6800 into relative obscurity. Various attempts were made to provide comparable disk operating systems for the 6800,



but the impetus had gone to the 8080, leaving the 6800 in the cold.

As the market for microprocessor-based products grew, chip manufacturers scrambled to come up with new designs, but always had to contend with the reluctance of the market to accept anything new unless it offered significant advantages. Investments in hardware design and software production also inhibited the adoption of any new, incompatible microprocessor.

A stroke of genius gave an unexpected break to a new chip design – the Z80. Zilog, a team of design engineers who had previously worked on the 8080 for Intel, realised that the instruction set could be extended. In other words, not all of the possible combinations of ones and zeros that could be recognised by the 8080 as instructions had been exploited. By using binary combinations not used by the Intel chip, Zilog were able to design a microprocessor that would perform identically to the 8080 when supplied with 8080 instructions, but that could offer a considerable improvement in performance. They were thus able to create a chip that used software written for the 8080.

The Vital Choice

Most home micros make the choice between a 6502 processor (as in the BBC Micro) or a Z80 (for example, in the Spectrum). The Dragon, one of the few to use other chips, has a 6809