After eight years, microprocessors are finally growing up. Those generally available since their introduction in 1971 have been technological marvels, but, by and large, architectural oddities. A combination of complexity limitations and designer inexperience resulted in chips which could execute instructions, but which were difficult to interface and frustrating to program when used as general-purpose computers.

Now, a new crop of microprocessors promises significant improvements. Technology has reached the point where chip complexity is no longer a major limitation, so instructions set design can be more rational and consistent. Almost as important, the new processors are being designed by people who are familiar with many other (large) computers and can draw upon the cumulative experience of computer architecture over the last quarter-century. These designers have avoided mistakes such as limiting the address space and have included features allowing the development of good operating systems and higher-level languages.

This is the year of the 16-bit microprocessor. The Intel 8086 was described in the June 1978 Computer, and two others are featured this month—the Motorola 68000 in the Microsystems section; the Zilog Z8000 in this special section authored by participants in the April 1978 Asilomar Workshop on Microprocessors. In the first of three articles originating from that workshop, Bernard Peuto of Zilog discusses some of the architectural tradeoffs of the Z8000 family, in particular the Z8000 microprocessor and the memory management unit.

In addition to these new microprocessor architectures, several complete "computers-on-a-chip" are in the production or planning stages. One is the Intel 8048, and the article by John Wakerly of Micro Systems Engineering is a critical analysis of that family, based on his experience with it and related processors.

The production of software for small machines is a matter of growing concern, and it is important to re-examine the suitability of existing techniques from both software and hardware domains. The article by Jack Landau of Singer describes the use of state machines to organize the software for industrial machine control; it is a simple, elegant approach which can be used in many applications.

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Guest Editors' Introduction:

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