

Generations of chips

A decade of upheaval is about to be followed by another, and then another. . . .

JUST when it becomes clear that the industrialized world's working life has been transformed by the ready availability of personal computers, it begins to be apparent that another wave of a no doubt recurring revolution is about to engulf us. So much is signalled by the steady dribble of news of technical innovation in the computer industry stemming largely from the United States. There is a sense in which what has happened so far amounts merely to a demonstration that individual desks can be equipped with the computing power for which large organizations were eager to pay 100 to 1,000 times as much as recently as the 1970s. Now, there is a prospect that next decade's desks will carry such great computing power that, for practical purposes and for most users, it will be essentially infinite.

Nobody should be surprised. A little reflection will show that the technical basis of the past decade's transformation is only narrow. The engines of change so far have been two families of microprocessors manufactured in the United States by the Intel Corporation and Motorola Inc. Those with personal computers on their desks might usefully reflect on the intellectual effort embodied in these devices, which hang on simulations on a single piece of silicon of the electronic networks which, in the 1970s, were known as mainframe computers; mass-production may have made these computing elements cheap, but one cannot but marvel that so much cleverness has been made affordable. That such a device will, of its own accord, interpret the verbal jumble 'MOV AX, *string*' as the instruction to load its accumulator with the address in memory of a previously defined variable called *string* makes available to ordinary mortals the experience accumulated over a quarter of a century by professional programmers.

Yet ordinary users are not required to be familiar with these intricacies. The pace of the past decade's change has been sustained by the commercial development of software programmes for performing large collections of cognate routine tasks without knowing much about the working of the machinery, much as people can drive vehicles successfully without knowing how carburettors work.

The successes are plain. The numbers of personal computer systems sold each year are of the order of one per cent of the working population of the industrialized world. Most are versions of the personal computers developed by International Business Machines Inc., but Apple Computer Inc. let it be known two weeks ago that it sold 900,000 copies of its distinctive Macintosh II system during its last financial year. It is also clear that, in the drive for general accessibility by hardware and software manufacturers, much of the technical potential even of existing hardware has been neglected; the fraction of users of the AT version of IBM's personal computer exploiting the full capacity of its Intel 80246 chip, for example, must be very small, while only now is the software for the more sophisticated 80346 chip, which handles 32-bit words, becoming available.

Meanwhile, the software that made the unimagined possible a decade ago comes to seem much less sophisticated than it might be. The routine functioning of most existing personal computers is guided by a version of IBM's operating system, originally PC-DOS, then MS-DOS. But opinion is now shifting to the view that the UNIX operating system developed by AT&T has advantages in handling large quantities of information; AT&T has joined with the US company called Sun Computers to develop a version of UNIX for general use, while its competitors (including IBM) are jointly working on an alternative. (Common sense would persuade the two camps to bury their rivalry, but that may not be the outcome.) Yet the software people and their users are already asking whether information need necessarily be organized linearly, as files.

Even before these issues have been settled, the personal computer business will be overtaken by new hardware developments. Work-stations differ from most personal computers in that a single microprocessor can orchestrate a much larger array of rapid-access memory (RAM, which stands for random-access memory). They are certain to capture a substantial part of the present market for graphics use and are likely to be at once affordable and, in some ways, simpler to use. Desk-top parallel computer systems are also on the way; witness the plan announced last week by Mr Stephen E. Jobs, one of Apple Computer's founders, to manufacture such a system, initially for educational users. It may be the best part of a decade before there will have been the intellectual effort required fully to exploit these developments, by which time the hardware manufacturers will no doubt be working on the chips suggested by recent developments in artificial intelligence and neurophysiology. Even as the new wave of revolution threatens, the beginnings of its successor can be discerned. □

Tobacco for sale

Reorganization in the tobacco industry suggests that business is coming to an end.

THE tobacco industry has gone a long way, in the past week, towards the recognition of its own eventual demise. That is the implication of the proposed reorganization of two of the largest tobacco manufacturers in the United States. For several years now, the weed-dispensers have been busily diversifying their interests. Less obviously damaging foodstuffs have been natural choices; the retail outlets are often the same, and there is a good chance that the same sales forces can win orders for both kinds of products which is what stock markets call synergy. Now, two manufacturers have devised schemes that will salvage something for shareholders from the eventual collapse of tobacco sales. Philip Morris, which makes Marlboro cigarettes, is offering to buy for a cool \$11,000 million the company called Kraft, best known for its rubber-like sliced cheese. And the management of RJR Nabisco, itself the result of an earlier merger between a tobacco company (R.J. Reynolds) and a food company (Nabisco), is offering to buy out other shareholders at a cost of no less than \$17,000 million.

Although the objectives of the two schemes are very different, the underlying assumptions are the same. Cigarette sales in the United States are now declining by roughly 2 per cent a year. Moreover, the cost of manufacturing cigarettes is only about a third of the revenues the manufacturers collect. Inevitably, there is also a substantial profit, nearly \$2,000 million a year in RJR Nabisco's case, which can be used to finance the purchase of some other business through the now-familiar financial instruments called 'junk bonds'. That is how Philip Morris would pay for Kraft, and how in the short run the management of RJR Nabisco would buy out the other shareholders (but it might then sell Nabisco, keeping the cigarette money for itself for the duration of this sordid business).

It will be for the stock markets to decide whether the bidders have offered enough for what they seek to buy. A more awkward question underlying the calculations is whether the tobacco market will hold up for long enough to enable the bidders to service the junk bonds they will issue. Part of the inspiration of both deals, and one of the reasons why the financial calculations are especially chancy, is that the climate for the tobacco companies has significantly worsened in the past year. The first product liability suit against a tobacco manufacturer has been lost in New Jersey (but the jury verdict is being appealed against). The spread of municipal regulations prohibiting tobacco smoke in public and even, sometimes, private places is a more telling reminder to shareholders that their assets are wasting assets. They will do less well than if they had sold some years ago, but hanging on can only make things worse for them. □