



# The Main Event Is Yet To Come

**A**t times life in the information revolution can feel like a dead heat on an electronic merry-go-round. We have been trying to make sense of personal computers ever since we invited them into our offices a decade ago. Surely the next 10 years can't be as crazy as the last. The pace of events must slow. Change-beleaguered managers will finally have the breathing room to absorb and understand today's machines before chasing something new.

Don't count on it. The changes of the 1980s are but a prolog to even greater turbulence and uncertainty ahead. A host of new technologies, from neural net computing to digital communications, waits in the wings. Many businesses are likely to respond to the organizational uncertainties of the 1980s by innovating even more aggressively than ever. The first decade of the personal computer affected the "how" of knowledge work; the second will change the "what," and the reverberations will extend to the very nucleus of organizational structures and individual interactions.

The good news is that it is possible to make sense of the changes ahead, provided one adopts a long-term perspective. Too often we suffer from "macromyopia"—a preoccupation with the present that causes us to overestimate

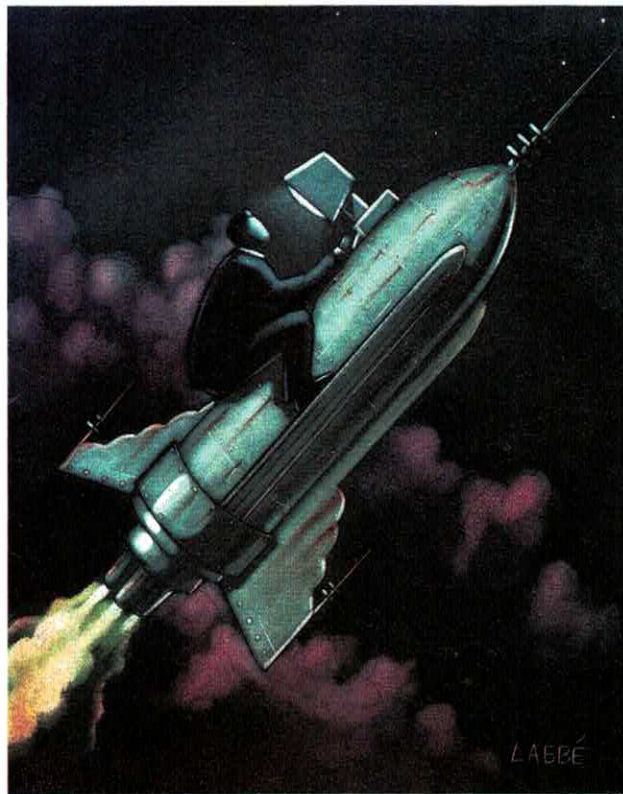
short-term impacts and underestimate long-term trends. Computer visionaries of the early 1970s forecast that by 1980 all but the smallest of businesses would have a minicomputer in their offices. They were half right and utterly wrong. The minicomputer future of 1980 never came to pass, but today most businesses have multiple personal computers, each more powerful than the most advanced mini of the time.

A sense of history and a vision of the future can do much to correct macromyopia. I hope to offer some of both in this column, but understanding the

changes around us also requires setting technology in cultural as well as temporal perspective. Technology does not drive change per se. Instead, it merely creates new options and opportunities for change. It is our collective response to technologies that drives change. We can exploit innovations any way we collectively see fit. We can even choose not to adopt a technology at all, just as the Japanese once eliminated firearms from their culture for the three centuries following the mid-1500s. The shift was triggered less by edict than a cultural consensus that guns were a particularly unesthetic form of violence and therefore undesirable.

This relationship between change-enabling technologies and our collective cultural response amounts to a constant in the history of innovation. Innovation today may occur at the speed of electrons, but diffusion remains limited by

the speed of thought and the weight of habit. No matter how fast we invent, the time required for our society to absorb and understand a really new invention remains steady at somewhere around 30 years. Moreover, the pattern within the 30-year-period is consistent across a wide range of innovations from the printing press to satellites. We generally spend the first 10 years applying new technologies to do the work of old. The first decade of movies was preoccupied with imitating theater, and radio emerged partly as a wireless option to the telephone. After a decade or so, the returns on doing old things in new ways wears thin and we begin to stumble onto new applications and approaches. This is the moment at which information technologies mature into mediums of communications. Radio as broadcast



## FUTURE TENSE

emerged from the second decade, and films began to reflect the first elements of modern cinematography. In the third decade, the once-novel technology becomes fully integrated into the surrounding culture. Infant radio and movies flowered into complex industries inhabited by a network of producers, distributors, advertisers, and an ever more sophisticated audience.

Personal computing is no exception to this 30-year-rule. In the first decade we were preoccupied with automating manual tasks such as typing, drawing, and calculating. We have just entered the second decade; it is no coincidence that interesting things are beginning to happen. Exotic concepts such as multimedia and information refineries are finding their way into products, much to the puzzled delight of us all. Hints of what the future holds abound, but the main events are yet to come.

**T**his column will explore the shape of pending events at the intersection of technology and culture that we call the personal computer revolution. Future essays will consider both the larger implications of current events and the immediate impacts of long-term trends. As I poke around these issues, I hope to identify options, opportunities, and surprises we may encounter as personal computing enters the 1990s. Here is a brief sampling of things to come:

- *The fall and rise of AI*—Artificial Intelligence has been a discipline long on promise and short on results. A series of spectacular corporate failures in the mid-1980s led many industry watchers to declare that AI as an industry was dead. Meanwhile a handful of users have been enjoying quiet success using expert systems in real-world applications. Word of these success stories and some new approaches emerging from the developer ashes may yet trigger an AI renaissance. One likely surprise is the use of small expert systems—ones with 300 rules or less—as a means of interactively presenting customized information.
- *Specialty time-sharing*—Personal computers once seemed destined to make time-sharing an artifact of the days when computing power was remote and expensive. Now the advent of specialty mainframes—supercomputers, data-

base engines, and neural net machines—seems certain to create a future with eerie parallels to that time-shared past. This time around, though, it will be our desktop machines that deal with the aggravation of connecting with the remote host, not the user.

- *Telecommuting and freeway bypass*—The notion of telecommuting, working from home via computer, has long been popular with futurists, but it remains an exotic curiosity for knowledge workers facing ever more horrendous commutes. Ambitious plans in several auto-clogged urban centers may force telecommuting into reality in the next decade but with surprising consequences to commuter and employer alike. Instead of working out of one's house, we may trade our long commutes for short drives to satellite offices in the suburbs.

- *Reference engines and information refineries*—We are on the verge of applying entirely new approaches to computer-aided interaction with free-form textual information. The days of infuriating key word searches may be numbered as a handful of companies offer us the promise of a more intimate relationship with our information. Imagine a library "reference engine" that would act as a guide through the card files, or a personal information refinery that abstracted a custom newspaper from a variety of wire services and news feeds. The availability of these technologies will create important new business opportunities.

- *Superconductivity and computing*—Recent advances in the field of superconductivity have been received with a frenzy of hype and excitement equalled only by that once accorded the personal computer itself. Experts conclude that practical applications of superconductivity will for the most part be decades in coming, but long before someone attempts a superconducting PC, this technology is likely to offer some surprises for personal computing.

- *Information shocks*—We experienced oil shocks in the 1970s and financial shocks in the 1980s. Some scholars and economists believe that we are headed for a series of information shocks in the 1990s. Does this mean we will face long queues in front of bookstores, or will the effect be more profound—a fundamental shift of economic and political power along information lines?

- *Productivity paradoxes*—Despite nearly a decade of information system purchases, white collar productivity appears to be dropping. Are our productivity measures wrong, or are our ever more capable new tools a menace to efficiency in the office? The absence of clear answers may cause corporate office automation to cluster at the extremes: some companies may elect to cease automating until the effects can be measured, while others are likely to respond to the uncertainty by automating more aggressively than ever.

- *Information surfing*—We live in an age of burgeoning information overflow. Basic literacy skills are no longer sufficient for personal, much less professional survival in today's society. Many commentators have identified a growing literacy crisis, but we may actually be witnessing the emergence of an entirely new form of literacy suited to the peculiar needs of the information age.

- *Computers and communications*—Events of the last decade have made it clear to us that computers and communications are merging into what will be a unified whole.

- *Information-based organizations*—Eventually companies will resemble orchestras—a set of autonomous professional teams coordinated by a small management cadre, much as a conductor coordinates musicians on a stage. Missing will be the multiple layers of middle level management, their information transmission tasks replaced by information systems. The first companies to implement this vision may realize important competitive advantages, but the effects on white collar management will be wrenching.

- *Biocomputing and nanotechnology*—The long-term future of computing is likely to be biologically based for the simple reason that it is possible to pack information processing power much more densely in biological material than on silicon.

The foregoing roster barely touches on the myriad issues and technologies we are likely to encounter in the 1990s. The next two decades are certain to be a period of acceleration and change as we discover how to use a steady stream of inventions and technologies. The 1980s were exciting, but the revolution has barely begun. ■