# Computing and the Future

**The Computer Age.** A Twenty-Year View. MICHAEL L. DERTOUZOS and JOEL MOSES, Eds. MIT Press, Cambridge, Mass., 1979. xvi, 492 pp., illus. $25. MIT Bicentennial Studies, 6.

*The Computer Age* presents the views of 20 "noted people," selected for "either a record of predictive/analytical ability or the power to initiate change by virtue of their positions," on the possibilities for and implications of computers and information processing in the next 20 years. It is an extensive and exhausting work, with so much content that it is hard to epitomize it in a short review. Two general causes for disappointment do emerge, however.

First, the material, having been first presented in 1976 as part of MIT's contribution to the celebration of the U.S. bicentennial, has been a long time in preparation, and little seems to have been done to keep the manuscripts abreast of the times. The years since 1976 have seen the appearance of many very sophisticated electronic toys for both young and old: Texas Instruments' Speak-and-Spell, talking chess games, the real market penetration of the personal computer, and the emergence of VIDEOTEX systems. None of these harbingers is even mentioned. During this same period, a significant shift in the perception of the potential of information technology has occurred, away from the old and now virtually dead idea of the Videophone, which is favorably mentioned at one point in the book.

The second matter for concern is the propensity of most of the authors for putting their wine in old skins. In particular, the economic aspect of information is given a very conventional treatment, with essentially no reference to the potential of the new technology to permit the evolution of new and better ways for society to evaluate, order, classify, and synthesize its information. The whole cultural-industry aspect of information and the role computers and communications could play in the evaluation process, leading to whole new forms of that industry, are ignored in preference to considerations of how computers will impact the scientific or technical kinds of knowledge. Perhaps having been raised in a music publisher's home gives me an unusual insight into the economic aspects of information. My interpretation of terms like "information," "economics," or "culture" is much less confining than those expressed by the various authors in this work.

In places the book soars, and in other spots it barely plods. However, what is flight for one person is simply flighty for another. For me, Nicholas Negroponte's "Return of the Sunday painter" soared. On p. 29, Negroponte shows two examples of "key frame animation," one where the image of a runner evolves into that of a Coke bottle and finally into a map of Africa. Three symbolic icons are linked together by a series of intermediate sketches to smooth the transition from one visual icon to the next. The second example is from Peter Foldes's film "Hunger." It makes extensive use of images that are sequentially transformed, or, as a musician would say, modulated, to smooth the transition to the new image or idea. Movies, television, and computer graphics can all reproduce these image sequences. However, neither Negroponte nor any of the other authors puts forth the idea that the capacity to produce smoothly linked sequences of symbolic images might lead to the evolution of a new iconic language. John Licklider has, in the past, made this very suggestion, but in his excellent chapter, "Computers and government," in this book he assiduously avoids the point, even when discussing the "fostering" role of government and how computers might affect that role. In a book so much of which is devoted to discussions of language, I find this strange. There is, throughout the volume, a tacit assumption that mankind will not significantly change, adapt, or evolve as we gain skills and powers by using the extensions, or tools, we build for ourselves.

In his fine chapter Marvin Minsky observes that "the procedures we so admire in specialized human experts, however difficult they may be to discover or learn, are often quite clear and simple in the final analysis. But the knowledge and processes we acquire and use to get around our infantile physical and mental worlds is—at least so it seems—a fantastically intricate mixture of many different structures." It may be that we need to return, in measure, to those more infantile approaches to unravel the complexities of what information technology really is.

By and large the book seems a bit pessimistic, for there is no assurance that all is unfolding as it should. The pessimistic note is sounded particularly in areas where concerted and wise government action or leadership is seen as important or urgent, as in encouraging the evolution of adequate networks.

The volume contains its own criticism, in the penultimate chapter. Unfortunately, both the criticism, by Joseph Weizenbaum, and the responses, by Daniel Bell and Michael Dertouzos, tend to refute particular points of view rather than use the divergence to construct a synthesis. Differing points of view can be used for mere argument, or they can be used in the making of useful riddles to explore the extent of the new potentials.

Too frequently, in an effort to be creative and forward-looking, books about the future are just naïve. *The Computer Age* certainly does not have this fault, for it is a very competent, albeit somewhat conservative, treatment of what is a most important subject.

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## Atmospheric Deposition

**Effects of Acid Precipitation on Terrestrial Ecosystems.** Proceedings of a conference, Toronto, May 1978. T. C. HUTCHINSON and M. HAVAS, Eds. Plenum, New York, 1980. xii, 654 pp., illus. $49.50. NATO Conference Series I, vol. 4.

Acid rain has been receiving considerable attention in the news media as well as in the scientific literature in recent years. We now know that stack emissions from fossil-fuel combustion sources can travel hundreds of miles, undergoing chemical change, finally to be deposited as "acid rain." Scientific interest in the subject has grown rapidly in North America over the last five years, with interest among European scientists tempered only slightly by a somewhat longer involvement with the problem.

Editors T. C. Hutchinson and M. Havas have produced a signal contribution to the literature on the effects of acid precipitation. This symposium volume will rank with the *Proceedings of the First International Symposium on Acid Precipitation and the Forest Ecosystem* (U.S. Forest Service, 1976) and the issue