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Review of John G. Kemeny's Man and the Computer

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another pip on the graph of the 20-year cycle of legal education. I encourage all university presidents and faculty to read it.

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MAN AND THE COMPUTER, by John G. Kemeny. New York: Charles Scribner's Sons, 1972. 146 pp. $6.95.

By David E. Drew

Even those reluctant to apply the term "renaissance man" must concede that John Kemeny has earned that label. For some time, he has pursued a dual career in mathematics and the humanities, particularly philosophy. While completing his doctorate at Princeton, he was a research assistant to Albert Einstein. As chairman of the Dartmouth mathematics department, he ventured into computing, a separate and distinct, albeit related, domain. His involvement in computing was not that of a dilettante. He was a prime mover in the establishment of a pioneering time-sharing system at the college for instruction and research while coauthoring a new source language, BASIC, now widely employed. More recently, as president of Dartmouth, he has extended his concerns to include administration and educational issues in general. (Concurrent with the presidency, he holds the Albert Bradley professorship for "innovation in teaching.")

Set against this formidable background, *Man and the Computer* will be a disappointment to those who expect a detailed, highly technical presentation. Rather, this book is a popular description of man-machine interaction via time-sharing systems, with particular emphasis on the Dartmouth experience, combined with a futuristic sketch of the ways in which such systems can benefit society. (For the uninitiated, under "time-sharing," a number of users access the same central computing facility virtually simultaneously; typically, these users are located at input/output terminals, e.g., teletypes, placed at some distance from the central processor.) This book is an expansion of a series of lectures Kemeny gave in 1971 at the American Museum of Natural History, which may explain the superficial treatment of some rather complex subjects.

Kemeny's unifying theme is the arresting notion that interaction between man and computer is a new form of symbiosis which could lead to more advanced life styles. As background, the author presents a personal history of his experience with digital computers over the past quarter century (when computers have come into their own). The symbiosis he outlines is dependent upon time-sharing systems.

The reader is instructed about the nature of these systems largely through description of the Dartmouth computer facility. This is one of the book's strong points. Some of the statistics Kemeny cites indicate the magnitude of that operation. Each year more than 14,000 different people use the facility. Ninety-eight percent of all programs are written in BASIC, although a variety of other languages are available. "On a particularly busy day the system had . . . a peak of 111 users . . . (and) . . . a total of 19,503 jobs for the day." Through this time-sharing system, the computer at Dartmouth has become not only a powerful aid in research, but also an integral part of the instructional process. Most undergraduates (about 90 percent) learn how to program early in their freshman year and find the machine an aid not only in their natural science courses, but also in the social sciences and even in the humanities.

Thus, the first half of the book is largely a descriptive presentation of the new symbiotic relationship, concluding with a discussion of some of the fallacious reasoning underlying some popular fears and misconceptions about computers.

The remainder of the book examines the world as it might look several decades from now if time-sharing systems were used as fully as Kemeny would like. Potential applications include, for example, incorporating computers in the educational process in ways beyond the rather rigid approach of many computer-aided instruction projects to date. The author briefly discusses libraries of the future, future management information systems with particular reference to college administration, and the possibility of having a computer terminal (or two) in every home, concluding with a section on the ways in

which computers can be used to solve such modern problems as urban transportation. Many of these futuristic notions have been discussed since time-sharing first was introduced in the early sixties; in some areas of application, e.g., libraries of the future, extensive hardware and software developments have been written about in much greater depth elsewhere. However, Kemeny is extremely articulate and has a talent for presenting highly technical subjects, such as man-machine interaction, clearly in layman's terms (unlike most practitioners in those fields whose written products read like the advanced stages of acute schizophrenia).

Kemeny's description and history of computers include some statements that might give a computer programmer pause. For example, "A random undetectable error is almost unheard of." Of course, this statement is literally true since (1) few are likely to "hear of" an error that went "undetected," and (2) few errors are "random," but many examples of such occurrences immediately spring to the programmer's mind. Similarly, Kemeny's assertion that IBM's (second generation) business computer

> had a rather short life, because the general-purpose scientific computer turned out to be more efficient for business applications than the special-purpose machines

is a questionable interpretation of history. Many who used both machines, including this reviewer, would have chosen the special-purpose machine for business applications. Both computers were replaced by IBM's third generation computer (the 360), a compromise system incorporating some aspects of both scientific and business machines. This compromise, dictated in great part by marketing considerations, led to a variety of hardware, software, and personnel problems during the early days of the system. For example, scientific programmers working on the larger 360 models found their flexibility constrained by parameters that resulted from the necessity to maintain consistency with smaller models developed along business lines.

As a result of messianic zeal, Kemeny fails to deliver on the promise made in the book's preface for "a critical evaluation of the present state of the art and the various applications of computers." The unfortunate result is that the book's value to college administrators is limited. The author would have performed a needed service if he had described in more detail alternative forms of computer systems and their value to different sectors of the university today, rather than focusing on potential uses of time-sharing. Professional educators and other decision makers will not find enough in this volume relevant to their daily problems. Students just beginning to learn about computers will be frustrated by the lack of technical detail and depth. Clearly, the appropriate audience is the "intelligent layman" who would like to read an entertaining, highly literate introduction to modern forms of computing, combined with some intriguing proposals for making these new techniques useful in solving social problems in the future.

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