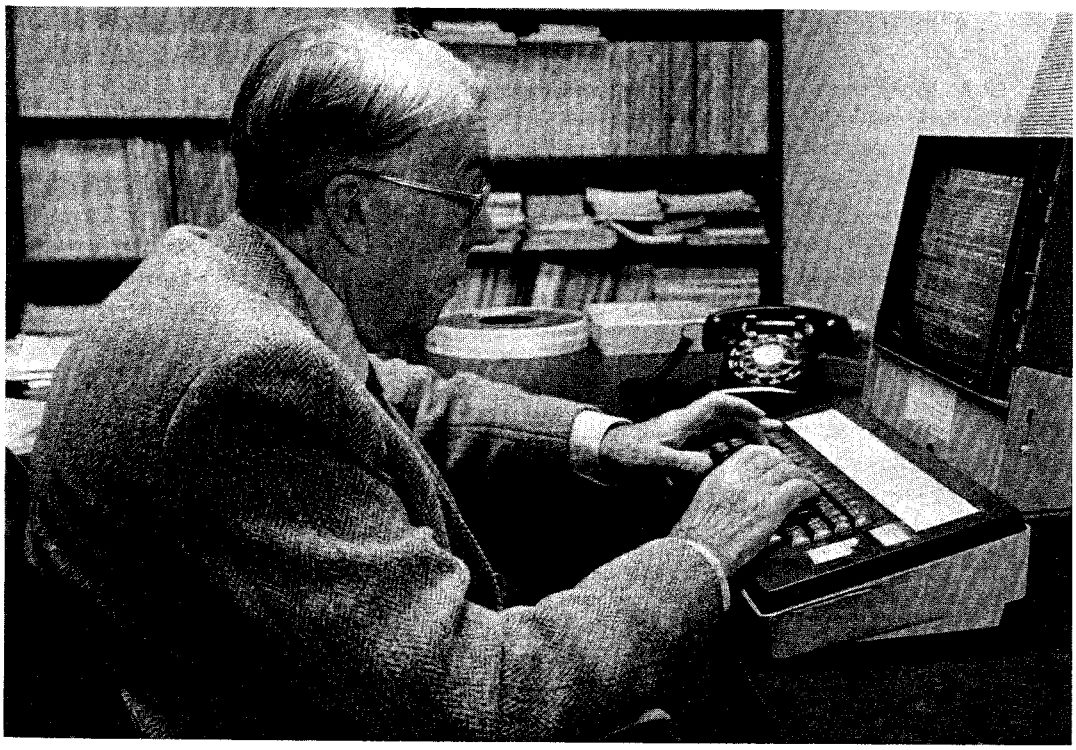
Arthur Lee Samuel, 1901–1990



The TEX community lost its beloved senior member on July 29, when Art Samuel died at age 88. He had devoted a great deal of time during the past decade giving personal attention to the needs of thousands of TEX users all over the world.

Art joined Stanford's TEX project in the spring of 1981, and he was a major participant in all of our activities during those crucial days of the early 80s until the project completed its work in 1985. He continued to answer numerous queries about TEX, electronic and otherwise, for several more years, even though the onset of disease made it difficult for him to walk and eventually confined him to a wheelchair. He was more than 50 years older than nearly everyone else in the TEX group, but he always was a lively contributor to our meetings and a source of inspiration.

TEX was, of course, only a footnote to his long and illustrious career. He did pioneering work on vacuum tubes at Bell Labs during the 30s; he played a leading role in the development of the ILLIAC computer as a faculty member at the University of Illinois in the 40s; he directed IBM's Poughkeepsie laboratory where significant research on transistors was carried out in the 50s; he devoted considerable time to government service, for example as chair of the Joint Services Committee on Electron Devices for 17 years; he received more than 40 patents for various inventions. When David Fuchs and I traveled with him to the Cincinnati TUG meeting in January, 1982, he regaled us with interesting stories about his experiences as a pilot. He is best known for the seminal research he did on machine learning, beginning in 1949; his famous program for playing checkers won a fine game against America's number-four-ranked player in 1962 (see [3]).

I think he also had a keen interest in publishing throughout much of his life. For example, he was editor of the *IBM Journal of Research and Development* from January 1962 to July 1966. He retired from IBM in 1966 and became a member of Stanford's Artificial Intelligence Project. MIT was also wooing him at that time, hoping that he would move to Massachusetts and participate in research on publishing automation, sponsored by the American Newspaper Publishers Association. We can only guess what the history of computer typography would have become if he and his wife had not preferred to settle on the West Coast.

TEX users know Art Samuel best from his classic booklet *First Grade TEX* [6], which came out almost simultaneously with *The TEXbook*. This

book was his own idea; he worked on it constantly for more than a year as TEX82 was taking shape. Naturally it was an immediate success. According to reports in *TUGboat*, more than 600 copies were sold by the TUG office in 1984; more than 800 copies in 1985; more than 1200 in 1986 [9]. And TUG was only one of several outlets for his book.

Art had long been interested in writing tutorials for beginners. For example, he had written the lead article for the IRE's first special issue on computers in 1953, entitled "Computing bit by bit, or Digital computers made easy" [2]. Every user of Stanford's SAIL computer was helped by his booklets "Essential E" [4] and "Short WAITS" [5], which provided brief introductions to the text editor and operating system. So he decided to do a similar thing for TEX. (He told me that his first goal was to write a kindergarten primer; but after awhile he found that TEX was too complicated, so he needed to go up to the first grade level.) He tried valiantly to keep the entire document at most 32 pages long. Finally, however, he accepted the 34-page length that seemed to be necessary. We can imagine his surprise when the Japanese translation was published in 1989—his book now ran to 175 pages! [8]

When I taught a special course about METAFONT in 1984, using a new operating system and a new text editor on new workstations, Art saved the day by writing key documentation so that our novice computer users could cope with the experimental equipment. He also attended the course: Some of his homework is displayed in [1].

Incidentally, he had written an article in 1964 predicting what computers would be like in 1984 [7]; people tell me that this article, by a senior researcher at IBM, was the first public prediction that personal computers would become commonplace before long. Some of his futuristic ideas of 1964 were indeed prophetic. But it is amusing to compare the orderly transition to a high-tech world envisioned in [7] with what Art himself was doing in 1984.

Surely Art must hold the all-time world record so far for correct computer instructions written after the age of 80. He did a great deal of significant programming for the TEX project, especially of device drivers; without them, we wouldn't have been able to print the results of our basic experiments when TEX82 and METAFONT84 were being created. Ultimately I printed tens of thousands of pages with his software, running it on three quite different machines. He incorporated some clever ideas about caching font data so that memory requirements would be low.

He also took a look at my GFtoDVI program, which originally had a fancy algorithm for positioning labels near the points on METAFONT proofsheets. I was quite happy with the algorithm, but he didn't like the way the labels looked in his own experiments. So he made his own personal GFtoDVI and hesitantly showed it to me. At first I thought it was terrible—my "elegant" data structure for non-overlapping rectangles had been replaced by a brute force search—but soon I had to admit that (a) Art's method gave better results than mine, and (b) it also ran faster. Needless to say, I soon abandoned my original approach and adopted his scheme. Sophisticated computer science can sometimes be too seductive.

All of us can surely be grateful for the many things Art Samuel accomplished during his lifetime, and for the many lessons he taught us. The fruits of his work will live on.

– Donald Knuth

References

[1] Donald E. Knuth, "A course on METAFONT programming," *TUGboat* **5**, 2 (November 1984), 105–118; see especially page 114.

[2] Arthur L. Samuel, "Computing bit by bit, or Digital computers made easy," *Proceedings of the Institute of Radio Engineers* **41** (October 1953), 1223–1230.

[3] Arthur L. Samuel, "Some studies in machine learning using the game of Checkers," *IBM Journal of Research and Development* **3** (1959), 210–229. Reprinted with an additional annotated game in *Computers and Thought*, edited by Edward A. Feigenbaum and Julian Feldman (New York: McGraw-Hill, 1963), 71–105.

[4] Arthur L. Samuel, *Essential E.* Stanford Computer Science Report STAN-CS-80-796 (March 1980).

[5] Arthur L. Samuel, *Short WAITS.* Stanford Computer Science Report STAN-CS-81-839 (February 1981).

[6] Arthur L. Samuel, *First Grade TEX: Beginner's TEX Manual.* Stanford Computer Science Report STAN-CS-83-985 (November 1983).

[7] Arthur L. Samuel, "Computers in 1984: The banishment of paper-work," *New Scientist* **21**, no. 380 (February 1964), 529–530.

[8] Arthur L. Samuel, *First Grade TEX*; a Japanese translation with notes (Tokyo: Kinokuniya, 1989).

[9] Samuel B. Whidden, "Acknowledgment of contributors," *TUGboat* **6**, 1 (March 1985), 5; **7**, 1 (March 1986), 7; **8**, 1 (April 1987), 5.