Oral history has to be viewed as an important additive. Its careful use helps to probe further into the various questions which have been raised during this morning's session, especially Ken May's thoughts regarding memoirs and Churchill Eisenhart's account of conversations.

Oral history is used to fill in the extra dimensions that are not normally available in conventional sources, such as the environment in an institution, the human aspects of particular individuals, the underlying motivations for a particular effort, the possible sequence of events which may have triggered a particular insight or approach to the solution of a problem, etc. The result of oral history is also to create a new set of documents which assist in giving the historian better insight into the topic under study.

I would like to illustrate this with a few examples from my own work on the evolution of the electronic digital computer.

One of the areas of scholarly controversy surrounding the early development of the electronic computer centers on the origin of the stored program concept. It is generally agreed that the idea evolved during the construction of ENIAC and the early planning for its successor, EDVAC (1944-1945). The first published enunciation of this concept was by John Von Neumann. Consequently, Von Neumann is usually identified as the conceptual originator. However, my interviews with many of the individuals associated with the ENIAC and EDVAC projects led me to different conclusions. The concept appears to have been an outgrowth of Richard Clippinger's suggestion regarding a more flexible use of ENIAC's function tables. But Von Neumann did play a critical role in articulation and dissemination of the concept. Herman Goldstine, who was a key figure in ENIAC, EDVAC and later developments with Von Neumann at the Institute for Advanced Study, manages, in a recent book, to give the impression that Von Neumann did it all.

An example of an important milestone in early computer history for which conventional documentation is not available is the early work (1937-1940) of George Stibitz, which led to a series of relay computers constructed by Bell Laboratories during World War II. This is a period for which only the oral communication of the participants can provide information. Fortunately, both Stibitz (now a member of the Dartmouth College Medical Faculty) and E. G. Andrews (now retired and living near Hanover, N. H.) were available for interviews and searched their homes for
documents which enabled me to get a fairly good picture of the major developments. As a by-product of my interviews with Stibitz, I was also able to provide for the organization, cataloguing, and publication of an index to his papers, which are now housed in the Dartmouth College Library [e].

There is also a tendency to restrict one's views of oral history to that of a trained historian interviewing selected individuals and recording the conversations on magnetic tape or in a notebook. This view is limited, at least in the case of computer history. The restriction would eliminate sources such as newsreels, radio broadcasts, television documentaries and other forms of oral records of which I would like to give one brief example.

In the mid-1960's, the Honeywell Corp. filed a suit against Sperry-Rand challenging the basic priority of the ENIAC patent. One of Honeywell's key arguments was based upon an attempt by John Atanasoff to build an electronic special purpose computational device at Iowa State College between 1937 and 1942. Atanasoff's work had never appeared in the literature until it was resurrected by Honeywell's attorneys. As a result of this litigation, which is a form of oral history, a variety of new documents and information has become available [f]. The attorneys for the litigants were most cooperative with me during my research at the Smithsonian, and allowed me to have access to the files of documents, depositions and testimony at the conclusion of the trial. Henry Halladay, Honeywell's trial attorney, also presented me with thirty video tapes of Atanasoff's pre-trial deposition. These tapes discuss the origins of his work, the technology involved, the problems he was interested in, his personal sources, the environment at Iowa State College, the role his colleagues played, his successes, his failures and his contacts with John Mauchly prior to 1942 [g].

Oral history is not, however, without its dangers, Although individuals rarely give incorrect information deliberately, there are the continuous dangers of faulty memory, after-the-fact rationalization and personal bias which color any individual's account of past events. I am reminded of a recent book by Lillian Hellman entitled Pentimento [h]. Miss Hellman was writing about people who had had a strong influence on her life, and as she looked back in time she realized that she saw these people, their roles and the events dimly. The word pentimento, as Miss Hellman says, conveys the idea of an old conception, replaced by a later choice, as a way of seeing and then seeing again [i]. This is the way oral history operates. You rarely get a precise or accurate picture on the surface.

The study of the origins of the electronic computer is ideally suited to oral history techniques, because the majority of the key pioneers are still alive and professionally active. In the history of mathematics of the past 100 years, the distance between
the scholar and the primary source is not too much larger. The late Leo Moser had a conjecture about the human diameter of the world. He defined the human diameter between two people as being the number of direct human contacts required to pass from individual A to individual B. Moser's conjecture was that the human diameter of the world is at most 5. A similar concept can be applied to the human diameter between historians today and mathematicians of the late 19th and early 20th century. My conjecture is that at the moment it is at most 3 and in a surprising number of instances, 1 or at most 2. In my own work on the biography of the late J. C. Fields (d. 1932) and the origin of the Fields Medal, I was able to locate a surprising number of people who had been associated with him at various times during his career. J. L. Synge, for example, was a colleague of Fields at the University of Toronto. He was Secretary of the Committee for the 1924 International Congress, of which Fields was a chairman and he was also present at Fields' bedside when Fields dictated his last will and testament. Prof. Synge proved to be a most cooperative and valuable source in my research.

As historians interested in the work of recent mathematicians, we should identify these individuals and document their personal accounts. The longer this is postponed, the greater the human diameter will become and the less substantive will be the human aspects of our work.

NOTES

a. The ability by which the program could be stored and modified electronically. In ENIAC, this process required many hours of rewiring.


c. For a discussion of this topic based on the Smithsonian oral history archive, see: Metropolis, N. and Worlton, J., "A Trilogy of Errors in the History of Computing," First USA-Japan Computer Conference Proceedings, Tokyo (1972), pp. 683-691. This paper also contains an excellent 93 item bibliography.


e. "An Inventory of the Papers of George Robert Stibitz Concerning the Invention and Development of the Digital Computer,"


g. Another valuable document dealing with the Atanasoff-ENIAC-EDVAC era is Judge Larson's published ruling: "Honeywell Inc. v. Sperry Rand Corp.," District Court D, Minnesota, Fourth Div., No. 4-67 Civ. 138. Decided 19 October 1973, pp. 673-773. Mauchly, who with J. Presper Eckert, holds the ENIAC patent, first proposed the construction of an electronic computational device, which ultimately resulted in ENIAC, in a privately circulated memoranda which was written in August 1942. This document is reproduced in Randell (1973), pp. 329-332. The original version had apparently disappeared when it, too, turned up in a file during a search connected with the above-mentioned litigation.


i. "Old paint on canvas, as it ages, sometimes becomes transparent. When that happens it is possible in some pictures to see the original lines: a tree will show through a woman's dress, ..., a large boat is no longer on an open sea. This is called pentimento ..." ibid., p. 3.

DISCUSSION

The subject of Tropp's paper brought the discussion back to the question of the role of computers in the history of very recent mathematics, a question which had been touched on the previous evening.

Kahane gave it as his opinion that there was nothing so important for the history of contemporary mathematics as a history of computers. Computation, he asserted, is tied to all major issues in modern mathematics. But Dieudonné objected. He rejoined that Riemann and Cantor would have nothing to do with computation! Kahane responded, "What we select in the present from what Riemann and Cantor did, is not the same as what others selected at an earlier period, and it is my contention that the main mathematical concepts of the present are related to the notions of computation."